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IMPLEMENTATION COMPLETION REPORT
(IDA-29630 TF-21581 TF-50269 TF-28365)

ON A

CREDIT

IN THE AMOUNT OF US$5.2 MILLION

TO THE REPUBLIC OF

SENEGAL

FOR A

SUSTAINABLE AND PARTICIPATORY ENERGY MANAGEMENT PROJECT

June 20, 2005

Energy Group
Infrastructure Department
Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective)

Currency Unit = FCFA
US$ 1.00 = FCFA 500

FISCAL YEAR
FY97 FY05

ABBREVIATIONS AND ACRONYMS

AFR	Africa Region
CPR	Country Portfolio Review
CDD	Community Driven Development
DE/MIME	Energy Directorate
QAE	Quality at Entry
ERR	External Rate of Return
ESRAP	Energy Service Rural Access Project
ESSD	Environmentally and Socially Sustainable Development
FPSI	Finance, Private Sector and Infrastructure
GEF	Global Environmental Fund
GIS	Geographical Information System
GoS	Government of Senegal
IDA	International Development Association
LPG	Liquefied Petroleum Gas
MEMI	Ministry of Energy, Mines and Industry
MEPT	Ministry of Envrionment and Protection of Nature
NGO	Non-governmental Organization
NPV	Net Present Value
NRM	Natural Resource Management
NWFD	National Water and Forestry Directorate
PAMECAS	Senegalese Micro-Credit Institution
PCU	Project Coordination Unit
PICOGERNA	IDA Forestry Sector Project
PROGEDE	Sustainable and Participatory Energy Management Project
PRSC	Poverty Reduction Strategy Credit
RPTES	Regional Program for the Traditional Energy Sector
SAR	Staff Appraisal Report
SENELEC	Senegal Electricity Company
TTL	Task Team Leader

Vice President:	Gobind T. Nankani
Country Director	Madani M. Tall
Sector Manager	Yusupha B. Crookes
Task Team Leader/Task Manager:	Boris E. Utria

SENEGAL
SUSTAINABLE PARTICIPATORY ENERGY MANAGEMENT

CONTENTS

Project ID: P046768	*Project Name:* SN SUST.PART.ENGY.MGMT.
Global Supplemental ID: P042056 *(Fully Blended)*	*Supp. Name:* SN-Energy Mgmt Sust Prtnshp SIL (FY97)
Team Leader: Boris Enrique Utria	*TL Unit:* AFTEG
ICR Type: Core ICR	*Report Date: June 17, 2005*

1. Project Data

Name: SN SUST.PART.ENGY.MGMT. *L/C/TF Number:* IDA-29630; TF-21581; TF-50269

Country/Department: SENEGAL *Region:* Africa Regional Office

Sector/subsector: Forestry (87%); Oil and gas (7%); Mining and other extractive (6%)

Theme: Participation and civic engagement (P); Biodiversity (P); Other environment and natural resources management (P); Rural non-farm income generation (P)

KEY DATES		*Original*	*Revised/Actual*
PCD:	02/16/1996	*Effective:* 12/10/1997	12/10/1997
Appraisal:	03/14/1997	*MTR:* 06/30/2001	05/06/2002
Approval:	06/12/1997	*Closing:* 12/31/2004	12/31/2004

Supplemental Name: SN-Energy Mgmt Sust Prtnshp SIL (FY97) *L/C/TF Number:* TF-28365

Sector/subsector: Forestry (87%); Oil and gas (7%); Mining and other extractive (6%)

Theme: Participation and civic engagement (P); Biodiversity (P); Other environment and natural resources management (P); Rural non-farm income generation (P)

KEY DATES		*Original*	*Revised/Actual*
GEF Council:		*Effective:* 12/10/1997	12/10/1997
Appraisal:	03/14/1997	*MTR:* 06/30/2001	05/06/2002
Approval:	06/12/1997	*Closing:* 12/31/2004	12/31/2004

Borrower/Implementing Agency: GOVERNMENT OF SENEGAL/MINISTRIES OF ENVIRONMENT AND ENERGY

Other Partners: Dutch Cooperation

STAFF	Current	At Appraisal
Vice President:	Gobind T. Nankani	Jean-Louis Sarbib
Country Director:	Madani M. Tall	Mahmood A. Ayub
Sector Manager:	Yusupha B. Crookes	Max Pulgar Vidal
Team Leader at ICR:	Boris Enrique Utria	Boris Enrique Utria
ICR Primary Author:	Boris Enrique Utria; Awa Seck	

2. Principal Performance Ratings

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HL=Highly Likely, L=Likely, UN=Unlikely, HUN=Highly Unlikely, HU=Highly Unsatisfactory, H=High, SU=Substantial, M=Modest, N=Negligible)

	Rating
Outcome:	HS

Sustainability:	HL
Institutional Development Impact:	SU
Bank Performance:	HS
Borrower Performance:	HS

	QAG (if available)	ICR
Quality at Entry:		HS
Project at Risk at Any Time:	Yes	

*Project was at risk prior to the MTR due to implementation delays in the Supply Management Component of the project, which corresponded to 75% of the project's investment envelope and 90% of the expected Developmental Outcomes. The component was re-organized during the MTR mission. Thereafter, the component recovered the accrued delays, its implementation became **highly succesful**, and the project closed having greatly surpassed the expected DO targets.*

3. Assessment of Development Objective and Design, and of Quality at Entry

3.1 Original Objective:

The developmental objectives of "Sustainable and Participatory Energy Management Project (PROGEDE)" were to meet an important part of the rapidly growing urban demand for household fuels, without the further loss of forest cover and the ecosystem's carbon sequestration potential and biodiversity, and to generate opportunities for employment and income generation in the participating communities. Those objectives would be met through: (i) supply side management activities in the form of implementation and monitoring of 300,000 hectares of environmentally sustainable community-managed forest resource systems in the Tambacounda and Kolda regions of Senegal, creating in the process a protection zone around the Niokolo-Koba National Park (Biosphere Reserve); (ii) demand side management activities in the form of promoting private sector inter-fuel substitution and private sector and NGO-based improved stoves initiatives; and (iii) a capacity development activities for strengthening the institutions involved in the management of the sector, and the promotion of the participation of the civil society (private sector, academic institutions, and NGO community) in the operation of the sector.

Over and above these main objectives, however, PROGEDE had **rural poverty alleviation** as its overarching expected development outcome. The reason for that was two-fold: (i) because the project team believed in the need to focus on poverty alleviation rather than specific output targets; and (ii) because it would not be possible to redress the problems of the sector unless social equity, income redistribution and generation, natural resource tenure rights and sustainability of the environment, as well as of the economic and social structures, were achieved through the project.

At the time of project preparation, forest-based traditional fuels (firewood and charcoal), mostly used for household cooking purposes, represented 53% of Senegal's final energy consumption. The household sector was the principal energy consumption sector of the economy (58%). Total national charcoal consumption in 1992 was estimated at 330,000 tons (equivalent to 1.8 million tons of fuelwood), of which 76% was consumed in the principal urban areas. The capital city of Dakar alone was believed to be responsible for an annual consumption of about 300,000 tons of charcoal. 86% of total fuelwood consumption in that same year (1.5 million tons) was consumed in the rural areas. While the supply of rural household energy needs was essentially based on dispersed subsistence gathering of dead wood, the supply of woodfuels to the urban and peri-urban areas was based on geographically concentrated and unsustainable forest resource management practices (clear cutting). The bulk of that energy flow was in the form of charcoal, produced by commercial traders utilizing inefficient “traditional kilns”. Over the years,

the operation of the charcoal industry had resulted in: (i) the gradual loss of forest cover (approx. 30,000 ha/year) and thus of the ecosystem's carbon sequestration capacity and biodiversity; (ii) the degradation of the rural environment (particularly of the soils); (iii) the impoverishment of the rural areas; (iv) an acceleration of the rural exodus; and (v) a massive transfer of wealth from the rural communities to a few urban-based traders. In addition to these negative impacts, it was anticipated that the Niokolo-Koba National Park (9,130 km2), which is located in the southeastern corner of the Tambacounda and Kolda regions, and which is a declared national and international biodiversity patrimony and "Biosphere Reserve", would come under threat of encroachment within the next decade, with irreparable biodiversity and ecological consequences at the national and global levels.

The forestry legislation historically gave the Forest Service the exclusive prerogative to assign commercial exploitation rights over forest resources nationwide. Unfortunately, these rights were always given only to urban-based traders through the practice of a “charcoal Quota system”, which resulted over time in the creation of a vertically integrated and oligopolistic industry with widespread corruption, economic and social inefficiency problems, and negative environmental impacts. From the perspective of poverty alleviation, the unsustainable and inequitable forestry exploitation patterns and systems that existed prior to PROGEDE were, in effect, the perfect combination of factors to perpetuate “extreme rural poverty”.

Within the above context, PROGEDE's participatory, community-driven and multi-sectorial design and approach constituted mayor innovations and departure from the classic forestry operations in Senegal -- and in the rest of the Africa Region. Additionally, from its early preparation days through a significant part of its implementation period, PROGEDE had to surmount multiple barriers which ranged from a reluctance of the Forestry Department to fully embrace institutional and functional reform, and institutional capacity constraints, all the way to the active opposition of the traditional operators in the charcoal trade (*"exploitants forestiers"*). PROGEDE's successful implementation also required the inception of historical changes in the prevailing forest legislation and natural resource tenure policies and changing the prevailing antagonistic relation between the Forestry Service and the rural populations. Both, PROGEDE's innovative features and its difficult implementation conditions need to be fully recognized within the context of the present ICR.

3.2 Revised Objective:
N.A.

3.3 Original Components:

PROGEDE consisted of three components: "Preparatory and Support Activities", "Sustainable Woodfuels Supply Management" and, "Demand Management and Inter-fuel Substitution Options".

The Preparatory and Support Activities Component entailed the implementation of: (i) a comprehensive vegetation cover assessment of the Tambacounda and Kolda regions; (ii) a series of participatory rural appraisals in the project zone; (iii) the design of monitoring and evaluation systems for the implementation of the project; (iv) the elaboration of capacity building programs and field extension guides, with special emphasis on the training and extension needs of the regional Forest Services offices, community groups and NGOs; (v) institutional development and capacity building support to the different governmental, community associations and NGOs that were going to participate in the implementation of the project, with special emphasis in the training and recycling of the Forest Service staff who would be directly responsible for the implementation of the Sustainable Woodfuels Supply Management component;

(vi) the preparation of a detailed implementation plan for the annual participatory forest management modules; (vii) the preparation of a detailed implementation plan for the Demand Management and Inter-fuel Substitution Options Component, including, the selection of the private sector and NGO initiatives to be supported by the project; and (viii) the design of a comprehensive project implementation communication strategy to promote an increased participation of civil society (community, NGOs and private sector) in the management and operation of the sector.

The Sustainable Woodfuels Supply Management Component entailed the implementation of: (i) a sustainable community-run forest management system over an area of 300,000 ha during a total period of six years, from which woodfuels would be produced. In doing so, the project would simultaneously seek to create a buffer zone around the Niokolo-Koba National Park. The implementation of this component was to be done on the basis of annually increasing "management modules"; (ii) an assessment of the availability of dead wood at the national level to review the situation and future prospects of the rural subsistence supply of woodfuels; (iii) technical support and extension services to the participating rural communities and NGOs for the implementation of the participatory management modules and for the exploitation/production and marketing of woodfuels and other potential wood and non-wood products; (iv) support for the establishment of community-based micro-enterprises, such as community-operated carbonization units, agro-forestry processing units, etc.; and (v) the implementation of a comprehensive communication strategy in support of the implementation of the Sustainable Woodfuels Supply Management component.

It is important to note that the original project's implementation zone (300,000 ha) represented at the time of Appraisal 50% of the total woodfuels production area of the country. By the end of the project implementation, however, and because of the end of the conflicts in the Cassamance region and the consequent opening-up of the region for possible natural resource exploitation, the potential woodfuels supply area of the country increased. While that implies a larger potential woodfuels supply base in the country, it also implies the need to include those new potential supply zones in the government's plan and budget to scale-up and/or replicate the PROGEDE model.

The Demand Management and Inter-fuel Substitution Options Component entailed the implementation of: (i) support for the reorganization and modernization of the urban charcoal trade to establish long-term supply agreements (contracts) between rural communities and urban traders; (ii) providing technical assistance and limited financial support for the economic diversification of existing urban charcoal traders *("exploitants forestiers");* (iii) the execution of specific technical and market-feasibility studies to support the further promotion of LPG and Kerosene as substitute household fuels; and (iv) providing support for the continuation of inter-fuel substitution options (kerosene and LPG) and dissemination of improved stoves by the private sector and the NGO community. This component mainly sought to complement the activities and expected outcomes of the Sustainable Supply Managemenent Component by contributing to control the growth of the demand and thus reduce pressure on the woodfuels supply system.

3.4 Revised Components:

N.A.

3.5 Quality at Entry:

The project does not have a Quality-at-Entry (QAE) rating as it went to the Board in 1997. Nevertheless, QAE of this project was **highly satisfactory**. The project was based on a comprehensive

two-year Economic and Sector Work Activity (ESW) and capacity development exercise undertaken by the Borrower with support from the Bank's "**Regional Program for the Traditional Energy Sector (RPTES)**". The preparation of the project was based on a detailed borrower-led retrospective review of its policies, programs and projects in the traditional energy sector, and on substantive consultation with all main stakeholder groups (villagers, charcoal entrepreneurs, government officials and consumers groups), including the realization of more than 20 "participatory project design workshops" at the village level in the Tambacounda and Kolda regions. Additionally, AFR introduced in FY07 the need for a "participation Plan" and PROGEDE was one of the first projects to incorporate such a plan in the preparation process and to document it in the SAR.

This entire process resulted in the Borrower having a clear understanding of the project's design and implementation requirements and a high implementation ownership/commitment. This, in turn, facilitated the introduction by the Borrower of unprecedented changes in the sector's institutional and policy framework ("terms of reference" of the Forestry Service, institutional delegation, tree/land tenure regulations, charcoal quota administration, and fiscal/taxation regulation) which were essential to the success of the project. While these changes might not appear to be very significant in 2005, they constituted historical landmarks in 1987. It must be recalled that the Bank's PICOGERNA project (the last operation in the forestry sector in Senegal prior to PROGEDE) had to be cancelled in mid-implementation because of the Government's authorization of the clear-cutting of nearly 40,000 hectares in the Mbege Forest during the 1992 electionary period.

4. Achievement of Objective and Outputs

4.1 Outcome/achievement of objective:

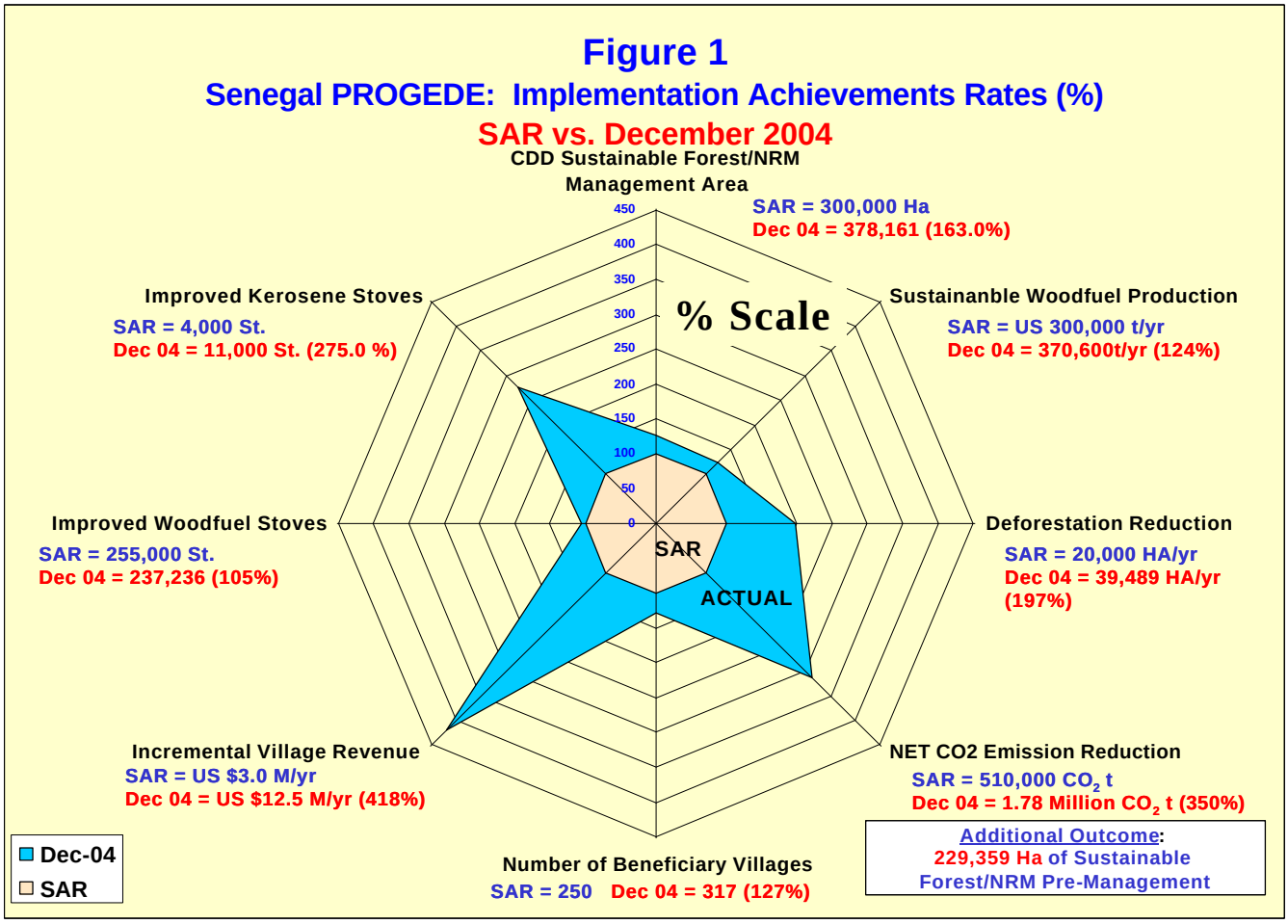
PROGEDE was **highly satisfactory** in terms of the achievement of its expected developmental objectives, outcomes and targets. Most development objectives and outcomes had performance/achievement rates which largely surpassed the expected SAR levels. Besides achieving the anticipated energy outcomes (promote sustainability of woodfuel supply system and increase energy transformation and end-use efficiency), PROGEDE was able to generate significant and quantifiable positive outcomes in terms of poverty alleviation (rural community empowerment and social change, generation of rural employment and incomes, targeted gender development, arresting natural resource wealth losses to the rural populations, creation of new economic activities, etc.), environmental sustainability (promotion of sustainable forest and natural resource management principles and practices, ecosystem conservation, deforestation reduction, CO2 abatement, reduction of forest fires, biodiversity conservation, etc.) and institutional development (transformation of an important segment of the forestry sector institutions from being a "para-military" system to technical assistance and service provider, introduction of sound and scientific forestry planning and management systems and practices, capacity development, introduction and effective implementation of differential forestry policy for sustainably and participatorilymanaged forestry areas, laying the foundation for the effective dismantling of the charcoal quota system, etc.).

Table 1 and **Figure 1** present a summary of the project's main achievements through December 2004 (closing) with respect to its original Developmental Objectives and Outcomes. The project's performance indicators are presented in Annex 1.

Table 1: *Summary of PROGEDE's Main Developmental Outcomes/Outputs*

Senegal PROGEDE: Main Development Outcomes/Outputs	S.A.R. Target	S.A.R. Unit	Closing (Dec. 2004)	Achievement Index (*)
Area Under Sustsinable NRM Management	300,000	Ha.	378,161	126.1
Annual Sustainable Woodfuel Production	300,000	Tons/yr.	370,596	123.5
Annual Deforestation Reduction Impact	20,000	Ha/yr.	39,489	197.4
NET CO2 Emission Reduction	510,000	Tons/yr.	1,786,214	350.2
Number of Beneficiary Villages	250	Villages	317	126.8
Annual Incremental Revenue to Villages	3,000,000	US $/yr.	12,530,732	417.7
Woodfuel Stoves Promotion	225,000	Units	237,236	105.4
Kerosene Stoves Promotion	4,000	Units	11,000	275.0

Note: (*) Amounts achieved with respect to SAR performance indicators.



In reviewing PROGEDE's outcomes it is important to note that a key factor in its success was the close collaboration that existed between the Bank and the Dutch Cooperation (co-financier) along the entire process (from preparation to supervision). Additionally, both the financial flexibility provide to the project by the Dutch Cooperation and the GEF funding of the project enable the Borrower to make many necessary adjustments through the implementation process.

4.2 Outputs by components:

The **Preparatory and Support Activities Component** entailed and **satisfactorily** achieved: (i) the preparation of a comprehensive vegetation cover assessment and inventory of the Tambacounda and Kolda regions; (ii) the execution of a series of participatory rural appraisals in the project zone; (iii) the design of monitoring and evaluation systems for the implementation of the project; (iv) the elaboration of capacity building programs and field extension guides for the participating regional Forest Services offices and staff, community groups and NGOs; (v) the provision of institutional development and capacity building support to the different governmental agencies, community associations and NGOs that were going to participate in the implementation of the investment components of the project, with special emphasis in the training and "recycling" of the Forest Service staff who would participate in the implementation of the Sustainable Woodfuels Supply Management component; (vi) the preparation of a detailed implementation plan for the annual participatory forest management modules; (vii) the preparation of a detailed implementation plan for the Demand Management and Inter-fuel Substitution Options Component, including, the identification of private sector and NGO initiatives to be supported by the project; and (viii) the design of a comprehensive project implementation communication strategy to promote an increased participation of civil society (community, NGOs and private sector) in the management and operation of the sector.

This component is rated only as **satisfactory** in spite of having achieved all of its original objectives and outputs, because it suffered a significant implementation delay (one year) which delayed the implementation of the investment components of the project. The implementation of the preparatory component fell behind schedule for two reasons. First, there were procurement delays in the contracting of the technical assistance services for the vegetation cover inventory and goods (vehicles and field equipment). Second, after the procurement problems were solved, the actual execution of the required remote sensing work had to wait nearly six months until after the end of the rainy season due to seasonal cloud coverage.

The **Sustainable Woodfuels Supply Management Component** entailed and **highly satisfactorily** achieved: (i) the establishment of sustainable community-based forest management systems over and area of 378,161 hectares (actual achievement), with a capacity to supplying more than 370,596 tons (actual achievement) per year of sustainable fuelwood, equivalent to some 67,400 tons of charcoal per year; (ii) the strengthening the buffer zone around the Niokolo-Koba National Park; (iii) provision of technical support and extension services to the participating rural communities and NGOs for the implementation of the participatory management modules and for the exploitation/production and marketing of woodfuels and other potential wood and multiple non-wood products; (iv) the provision of support for the establishment of community-based micro-enterprises, including beneficiary-operated improved carbonization units, apiculture cooperatives, collective (women) and individual agricultural diversification systems/units; livestock and poultry raising, artcrafts units, etc.; and (v) the implementation of a comprehensive communication strategy in support of the implementation of the Sustainable Woodfuels Supply Management component.

This component is rated as **highly satisfactory** because in spite of the initial start-up delay and the need to re-organize the component's field implementation structure and team by mid-term, the component largely surpassed all its original outcomes, outputs and targets. Two key examples of that are: (i) the implementation of "pre-management" schemes in an additional area of 229,359 hectares; and, (ii) the establishment of a new and sustainable productive activities base capable of generating an incremental revenues of more than US$12.5 million per year among the 317 participating villages (as opposed to the

US$3 million originally expected). This component benefited directly some **250,000 people** (including man, women and children) -- equivalent to approximately 21% of the population in the Tambacounda and Kolda regions -- and an estimated 100,000 urban charcoal consuming families. The preservation of the forest resources and the environmental multiple extenalities that resulted from the project benefited, at least indirectly, the entire country. Table 1 and Figure 1, above, present the component's specific original (SAR) and actual (ICR) achievement rates.

The **Demand Management and Inter-fuel Substitution Options Component** entailed and **satisfactorily** achieved: (i) the delivery of support for the reorganization and modernization of the urban charcoal trade to establish long-term supply agreements (contracts) between rural communities and urban traders; (ii) the provision of technical assistance and limited financial support for the economic diversification of existing urban charcoal traders ("*exploitants forestiers*"); (iii) the execution of specific technical and market-feasibility studies to support the further promotion of LPG and Kerosene as substitute household fuels; and (iv) the provision of support for the continuation of inter-fuel substitution options (kerosene and LPG) and dissemination of improved stoves by the private sector and the NGO community. Further to the originally planned activities the Borrower decided to add to this component the following activities: (i)the establishment of a permanent energy sector digital database and information system; (ii) concept design and establishment of urban and peri-urban "Energy Boutiques"; (iii) provision of support to several research and pilot testing initiatives on renewable household cooking fuels (rice husks briquettes, ethanol production from cashew apples, gelfuel production, jatropha oil production, solar cookers, etc.); and (iv) rural village biomass-based power generation studies and pilot project design. This component benefited directly some **250,000 families** (improved woodfuel or kerosene stoves) in the principal urban and peri-urban areas of the country. That number of families corresponds to approximately 30% of the urban and peri-urban families of the country. Additionally, the component benefited several hundred urban-based traders including charcoal wholesaler, charcoal retailers, and stove artisans. The improvements in energy planning systems and management of the sector -- and the consequent energy service delivery and economic efficiency gains -- that resulted from the project benefited, at least partially and indirectly, the entire population of the country.

While the expected stove dissemination target was met, this component is rated only as satisfactory because it suffered a substantial delay in the implementation of the improved stoves sub-component. The delay was due to protracted procurement problems with the selection of the financial intermediary that was needed to manage the component's "stove producers revolving fund". Both the Borrower and Bank were partially responsible for the delays. Now, it is extremely important to state that the essential outcome expected from the stove sub-component -- as clearly indicated in the SAR -- was the establishment of an operational market-based model for improved stoves financing, production. PROGEDE's objective was not to fund the production and sale of a given number of stoves. That approach has systematically failed in most donor funded projects which provide subsidies to promote improved stove dissemination, thereby not leaving behind and economically viable stove production system. PROGEDE sought to: (i) fund training to new stove producers to increase in-country stove production capacity; (ii) fund consumer awareness and marketing support to help stove dissemination; and most importantly, (iii) set-up a sustainable financial intermediation system which would enable certified new stove producer to set-up production facilities and operate until they would capitalized themselves and would qualify for regular commercial banking loans. These three objectives were fully met, with the additional merit that the participating financial institution (PAMECAS) agreed to provide a 1:1 matching fund against the IDA resources, which was not originally envisaged at Appraisal.

4.3 Net Present Value/Economic rate of return:

The economic analysis of natural resource management activities in developing countries was (at Appraisal) and still is the subject of discussion. Different methodologies have been elaborated for individual cases making use of available data (resource stocks, depletion and regeneration rates, real prices, economic value, etc.) and relative social values (environmental conservation, resource sustainability, social preferences, etc.), but a clear methodological consensus among experts is yet to be formed. Within that context, a simplified economic analysis methodology was developed for the evaluation of PROGEDE at Appraisal and the same methodology has been used for the present ICR. That detailed economic analysis methodology was included as Annex 8 in the SAR. **Annex 3** of the ICR presents the detailed results of the ex-post economic evaluation of the project, together with a summary of the original economic analysis methodology. The evaluation methodology is based on the following main principles:

Project Components. All three components of the project (Preparatory and support Activities Component; Sustainable Supply Management Component; and Demand Management and Inter-fuel Substitution Options Component) where included in the economic analysis as they are judged to be necessary and integral elements of the proposed investment. Within that context, no differential valuation treatment was given to investments for productive (forest management, improved kilns, improved stoves, inter-fuel substitution options, etc.) or nonproductive sub-components (data generation and gathering, institutional development, capacity building, social support services, communication strategy, etc.).

Time Horizon and Discount Rate. Given the long-term nature of the expected project impacts, a minimum 20-year horizon was adopted for the evaluation of the project. A discount rate of 12 percent was applied to all project components and sub-components.

Project Costs. All budgeted costs during project implementation (7 years) were included in the economic analysis of the project. From years 8 to 20 continued implementation costs were assessed at approximately 10 percent of year 7, gradually decreasing at a relative rate of 10 percent per year until year 20.

Project Benefits. While the proposed project was expected to result in a large number of quantifiable and non-quantifiable benefits, the economic analysis undertaken limited the valuation to the following benefits: (i) value of “sustainable” wood production from the implementation of the sustainable and participatory forest/natural resource management systems; (ii) value of incremental charcoal production from the promotion of improved kilns; (iii) value of global environmental impacts (CO2 abatement and biodiversity conservation) from the implementation of the sustainable and participatory forest/natural resource management systems; (iv) value of rural income generation and transfer from the direct sales of fuelwood by the participating rural communities; (v) value of “other” rural revenues from the development of parallel agro-forestry production activities in the participating communities; and (vi) value of charcoal saving due to the promotion of improved charcoal stoves.

ICR Evaluation Adjustments. The physical achievement targets (area under sustainable management, incremental wood production, incremental charcoal production, "Other" rural revenues, and stove dissemination) that drive the economic analysis model were replaced with "actual" project achievements. In addition to that, all key valuation parameters (economic value, market prices, and rates) were adjusted to reflect changes between Appraisal and ICR conditions. Table 2 presents a summary of the values used for the economic analysis of the project at Appraisal and for the ICR.

Table 2: Economic Valuation Parameters at Appraisal and ICR

PROGEDE: Economic Analysis Valuation	Unit	Appraisal Values	ICR Values
Sustainable" wood production	US$/ton	15	15
Incremental charcoal production	US$/ton	190	285
Global environmental impacts (CO2 abatement and biodiversity conservation)	US$/CO2 ton	1.01	1.01
Rural income generation and transfer from direct sale of Community-produced woodfuel	US$/ton	15	15
"Other" rural revenues	US$	20% of Rural Income & Transfer	Actual US$ Earned
Charcoal saving	US$/ton	190	285

At Appraisal, the 20-year horizon evaluation of the project resulted in an economic rate of return (ERR) of 37.3% and a net present value (NPV) at 12 percent discount rate of US $34.2 million. As per the ICR analysis the project resulted in a substantially higher economic rate of return (ERR) of 137.55% and a net present value (NPV) of US $96.1 million.

Table 3 presents a summary of the economic analysis results.

SENEGAL: PROGEDE / ICR — Basis: US $ MILLION

PROJECT COMPONENTS: I + II + III	1997	1998	1999	2000	2001	2002	2003	2004			
YEARS	1	2	3	4	5	6	7	8	9	10	11
TOTAL COSTS	0	-1,012	-1,606	-2,473	-2,521	-2,491	-2,864	-6,729	-171	-154	-139
TOTAL BENEFITS	0	6	775	2,793	6,660	19,223	23,096	23,966	24,797	25,619	26,441
NET COST-BENEFIT FLOW	0	-1,006	-831	320	4,139	16,732	20,232	17,237	24,626	25,465	26,302
ACTUAL COST/BENEFITS FLOW:	0	-1,006	-831	320	4,139	16,732	20,232	17,237	24,626	25,465	26,302

YEARS	12	13	14	15	16	17	18	19	20	TOTAL
TOTAL COSTS	-125	-112	-101	-91	-82	-74	-66	-60	-54	-20,923
TOTAL BENEFITS	27,263	28,085	28,907	29,729	30,551	31,373	32,195	33,017	33,838	428,330
NET COST-BENEFIT FLOW	27,138	27,972	28,806	29,638	30,469	31,299	32,128	32,957	33,785	407,407
ACTUAL COST/BENEFITS FLOW:	27,138	27,972	28,806	29,638	30,469	31,299	32,128	32,957	33,785	

Actual Internal Rate of Return:	ERR	137.55%
Actual Net Present value (12%):	NPV	96,109

The ICR evaluation resulted in a substantially higher return than the one anticipated, even under the high-end variants of the ex-ante sensitivity analysis. The highly successful implementation performance is responsible for a substantive part of that difference, specially: (i) substantially higher than expected "other rural revenues" (417.7 % over SAR level); (ii) significantly higher Net CO2 emission reductions (350 % over SAR level); and, (iii) higher than expected sustainable woodfuel production (123.5 % over SAR level). However, there are three specific factors which significantly contributed to the final valuation of the project: (i) the project's actual disbursement profile went from being 70 % front-loaded at Appraisal to 70 % back-loaded at ICR. At the same time the profile of project benefits remained broadly same. The effect of the 12 % discount rate over that disbursement shift without a significant change in the stream of

benefits resulted in a more than doubling of the ERR and the NPV; (ii) the market price of charcoal increased from US $190 per ton at Appraisal to US $335 ton at ICR. The ICR evaluation used a value of US $285 as average, which corresponded to the highest value considered within the ex-ante sensitivity analysis; (iii) the market price of wood also increased from about US $80 per ton at Appraisal to US $140 ton at ICR, which corresponded to the highest value considered within the ex-ante sensitivity analysis. Both price increases where due to a delayed adjustment of the "regulated" prices for woodfuels after the devaluation of the FCFA in FY06, and thereafter due to general inflation through-out project implementation.

While it is clear that the ex-ante calculations and economic valuation turned-out to be substantially lower than those of the ex-post analysis, that difference can not be attributed to an underestimation of expectation. Rather, after discounting the impact of the shift in the project's disbursement profile, this project leaves behind a major lesson as to the poverty alleviation value of multi-sectoral community-based natural resource management interventions in Senegal, and by extension, in the African context.

4.4 Financial rate of return:

Given the nature of the project a financial analysis was not done either at Appraisal or at ICR.

4.5 Institutional development impact:

While PROGEDE cannot claim credit for all the institutional changes that have occurred in the forestry and traditional energy sectors in Senegal in the last years, it was one of the main instruments through which the Borrower operationalized its administrative decentralization process in the Tambacounda and Kolda regions, and it had substantive and tangible institutional development impacts on at least five levels:

(i) Forest Service (national and regional government), which was transformed from a "para-military law enforcer agency" with extremely limited transparency and accountability to a technical assistance and capacity development agency with a now recognized participatory vocation and significantly improved governance. This transformation is widely recognized by the project's beneficiaries and was incrementally evidenced and documented along the implementation supervision process. PROGEDE established a *state-of-the-art*forestry and vegetation cover Geographical Information System (GIS) -- which is an essential tool in the monitoring and evaluation of sectoral interventions and forest resource extraction activities -- and provided substantive institutional strengthening and capacity development support to the regional bureaus of the Forestry Service. The introduction of differential taxation for charcoal production in managed zones should also be regarded as a key policy and institutional contribution and outcome of PROGEDE.

(ii) Energy Directorate. PROGEDE included a series of energy data/information gathering, processing and management activities which resulted in the establishment of a "Permanent Energy Sector Information System". In spite of there having been several World Bank funded and other donor-funded energy projects in the past in Senegal, no efforts was given to establishing a proper and interactive energy sector and markets information system (beyond the collection of electricity production and distribution information by SENELEC) and macro-level statistics on petroleum imports and internal market movements. Through PROGEDE, the Ministry of Energy was able to

set-up such a system and, thereto, introduce proper on-line energy analysis and sectoral planning and policy making. PROGEDE also promoted establishment of a senior advisor position on Renewable Energy in 2003 to provide specific advice to the Minister of Energy on biomass energy and other potential renewable energy technologies.

(iii) Rural Community/Villagers (Main Beneficiaries). By providing a change in resource tenure rights within the project zone and providing capacity development and material support to reorient economic activities and/or introduce new ones, PROGEDE resulted in the revitalization and strengthening of the traditional social institutions and of their natural resource management roles and responsibilities. These had been largely abandoned over time as a consequence of the lack of enforceable natural resource tenure rights at the rural community level. The materialization of tangible development outcomes resulted in the further empowerment of the social institutions at the village level, thus setting in motion a "self-reinforcing cycle" of increasing local empowerment and mobilization and increased development outcomes/outputs. PROGEDE recognized and promoted the role of **women** within the village structures, and provided substantive capacity development and revitalized all women's groups and associations. PROGEDE's gender activities in fact resulted in some of the project's most important social development impacts. PROGEDE did not create new institutions as such within the villages, rather it revitalized and rendered fully operational and performing largely dormant structures such as the "Village Committee for Development Management (*CVGD*) and Inter-village Committee for Development Management (*CIVGD*).

(iv) Charcoal Traders, within the PROGEDE management zone (378,000 ha+) there are now legal charcoal supply contracts between village producer groups and several charcoal traders. Within the PROGEDE zone charcoal trader have gone from being "enemies" of the rural communities to becoming actual commercial partners. It is important to note that this improvement relates only to the project zone and, thus, further work in the rest of the country is still needed.

(v) Consumers (Indirect Beneficiaries). The consumer awareness on energy efficiency (at the individual household level) and the awareness as to the structure and function of the traditional energy sector (at the collective consumers level) have resulted in a positive change in the understanding of consumers and in their support for sector reforms. As an example of that, the PROGEDE information system was utilized in 2003 and 2004 to sensitize the public as to changes in the charcoal quota system to gradually increase the quota allocation to PROGEDE producers. Contrary to previous years, were attempts to do that prompted a threat by the traditional charcoal supplier to disrupt urban supplies, which in turn prompted wide-spread consumer protests, in 2003 and 2004 there was widespread consumer support for the measures and the charcoal wholesalers were forced to back-down. PROGEDE's communication/information system -- a precursor to the communication strategies and systems now being put in place to support power sector reform efforts -- has thus significantly contributed to the advancement of the reforms in the biomass energy sector.

5. Major Factors Affecting Implementation and Outcome

5.1 Factors outside the control of government or implementing agency:

Cloud Cover and Field Conditions. While the Borrower was responsible for a delay in the procurement of the vegetation cover inventory and the preparation of the forest resources GIS monitoring system of the Preparatory and Support Activities Component (see details in section 5.3, below), once a contact was finally awarded it was necessary to wait an additional six months until the cloud cover pattern and field conditions of the rainy season changed to be able to conduct the remote sensing work (satellite imagery) and the subsequent "ground truthing" work. Since the satisfactory completion of this component was a trigger for the disbursement of the funds for the project's two investment components, this delay had a big impact on the project's overall implementation process.

5.2 Factors generally subject to government control:

Sector Policy Issues. The Borrower had assumed the commitment to introduce a differential "policy regulatory and fiscal framework" for areas under sustainable forest/NRM management in the project implementation zone and, on the basis of the progress of the implementation of such systems, to remove the prevailing "Charcoal Quota" system. While the Borrower promptly enacted a differential policy treatment for the PROGEDE managed zones and judiciously respected it through out implementation the charcoal quota was modified to accomodate a gradually increasing quota allocation for sustainable charcoal, but the quota system as such was not removed.

The status of the Charcoal Quota and of the Market liberalization. The elimination of the charcoal quota is neither a necessary nor positive result in and of its own. The real issue to address is the effective liberalization of the charcoal trade to open-up the access to the urban market to the sustainable producer in a way that maximizes producer revenues and provides the right incentives to maintain and expand sustainable forest management practices in the country. While the Government's commitment to reform the sector has been question because of its delay in eliminating the charcoal quota, in practice the application of the quota it has been gradually modified, moving the sector towards the desired liberalization point. Since 2003 a gradually increasing allocation of charcoal quota for PROGEDE producer has been assigned. For the 2005 charcoal production campaign the Forest Service allocated 180,000 quintals (96,000 tons, equivalent to 32%) out of the total national quota of 500,000 quintals (300,000 tons) to PROGEDE's sustainable production zone. That volume represents less than 50 percent of the PROGEDE zone's current effective sustainable production capacity. The "sustainable" quota will be increased as the PROGEDE and other sustainable management models are extended. Tripartite discussions held during the March 2004 supervision mission between the Borrower, the Bank and the Dutch Cooperation resulted in an agreement for the effective liberalization of the charcoal trade by 2007, moving the original target date beyond the PROGEDE implementation period. A key underpinning element of that agreement will be the implementation of the PROGEDE II (transition phase), through which the original forest area brought under sustainable and participatory management by PROGEDE will move into full "green" and "dead wood" exploitation (until 2004 all woodfuels produced from the PROGEDE zone came from deadwood sources) and that an additional 230,000 Ha of natural forests will be added to the sustainable exploitation area. The combination of those two elements will provide a supply volume of woodfuels from sustainably managed areas capable of replacing the existing quota-based system without there being a flow disruption of woodfuels to the urban energy markets.

5.3 Factors generally subject to implementing agency control:

Procurement Delays. Throughout the entire implementation process the project suffered delays

of varying impact as a result of procurement problems. This is a problem which has long since affected the Senegal portfolio and is periodically discussed during the annual CPR. The two main examples of procurement problems/delays which affected the project's performance were: (i) a six-month delay in the procurement of the vegetation cover inventory, mapping and GIS forest management monitoring system; and (ii) a one-and-a-half year delay in the procurement of the financial intermediary institutions required for the management of the stove producers "revolving credit fund". In these two instances, while the problems were finally resolved and implementation delays were overcome without sacrificing the achievement of targets, they did cause implementation problems. In the case of the stove producer fund, in particular, the stove dissemination target expected (achieved) could have provably been doubled if the procurement problem had not delayed its activation.

5.4 Costs and financing:

Annex 2 provides the detailed information on project costs and financing. The total project costs were estimated at US $19.93 million in the SAR. The final cost were US $19.54 million, i.e. 98.8.% of the SAR estimate. Albeit with some periodic delays, the Borrower satisfactorily fulfilled its counterpart funding obligations under the project. In spite of the accrued start-up delays, the project managed to achieve or largely surpassed all its expected outcomes and outputs and closed within budget and required no closing extensions to complete disbursements.

6. Sustainability

6.1 Rationale for sustainability rating:

The sustainability of the project is rated as **highly likely.**

The long-term sustainability of the project's development objectives and outcomes depends on two main factors: (i) commitment by beneficiaries to maintain the project achievement; and (ii) commitment by Government to extend sustainable forest resource management to the rest of the country and to liberalize the charcoal trade.

Commitment by beneficiaries to maintain the project achievements. The main achievements comprise the sustainable forest and natural resource management systems that were implemented, and the diversification of the economic base in the participating villages and the strengthening of their local institutions and organizations (producer associations, inter-village councils and producer groups, saving groups, women's committees, etc.). In additional to that, PROGEDE fostered substantial and irreversible social change within the beneficiary community as well. The 317 villages involved in the project experienced fundamental changes in terms of their: knowledge base and capacity; awareness of rights and responsibilities; empowerment for community-driven action; awakening of "developmental expectations" and a clear sense of self-reliance to achieve them; and, determination to move towards progress. The beneficiaries are determined not to lose what they perceive as "their conquests and achievements". A return to the previous state of disenfranchisement and lack of ownership and control over their natural resource base is, as expressly stated in village after village, unacceptable. The beneficiaries clearly understand that the key for them to retain legal control over their resource base is the fulfillment of the sustainable forest and NRM plans and principles adopted under PROGEDE. That level of understanding and commitment provides the basis for the highly likely rating of the sustainability that relates to the beneficiaries.

Commitment by Government to Complete the Reform of the Traditional Energy Sector. Completing the reform of the traditional energy sector and extending sustainable forest and NRM practices to the rest of the woodfuels supply zones of the country is essential in order to protect the country's forest resource base and the commercial viability of the managed production zones. As discussed in Section 5.2, above, **the GoS understands this issues and is committed to the liberalization of the charcoal trade by 2007 and to extending sustainable management practices.** The Government's delay in moving faster has been based on its concern of avoiding charcoal market disruption and/or political problems, and from the need to mobilize sufficient resources -- either internal or donor -- to finance the extension of sustainable management systems to the rest of the county.

6.2 Transition arrangement to regular operations:

The reform of the traditional energy sector -- to render it socially equitable, economically viable and environmentally sustainable -- is well underway, but is still not completed. Additional investments are required to expand sustainable forest and natural resource management systems and principles nationwide. The Borrower is committed to extending the PROGEDE model to the rest of the country, and is counting on mobilizing additional resources from IDA, GEF and other donors to do so. IDA was not able to accommodate a stand alone follow-up operation as it decided to consolidate all its CCD operations into a single PRSC-based instrument starting as of FY06. Since PROGEDE was due to closed in December 2004, IDA agreed to fund and two year "transitional phase" of the program to provide continuity and maintain the pace of implementation of the reforms until the proposed new CDD PRSC instrument was ready for implementation. The funding for the "transitional phase" was included as an investment component within the new **Senegal: Electricity Services for Rural Areas Project**. Unfortunately, due to delays in the effectiveness of the project, the funding under the ESRAP has not yet been made effective. That has resulted in that all PROGEDE contractual staff – ranging from senior management to field *animateurs* -- have gone unpaid and all investments and/or funding for beneficiary-managed activities has been suspended since December 2004. It is now expected that the funding will begging to flow shortly.

It is recommended that IDA review its investment program for Senegal and consider allocating an additional US $10 million to support the GoS to complete the needed sectorial reforms**;** and, **(ii)** that the expansion of the PROGEDE model is fully included in the forthcoming CDD multi-sectoral operation.

7. Bank and Borrower Performance

Bank

7.1 Lending:

The Bank performance during preparation was ***Highly Satisfactory*** both in terms of sectorial dialogue and of the quality of the design on the project and of the reform program to be undertaken.

Innovation. PROGEDE's preparation team, approach and design were, literally, precursors to the Bank's current "multi-sector operations". Long before the Bank move towards multi-sector operational work, and even having to surmount significant budget and staffing cross-support rigidities, PROGEDE was prepared by a multi-sectorial and multi-disciplinary team. The preparation team included AFR's leading experts on the traditional energy sector, participatory development, decentralization and environmental managemen. The project -- specially being and energy sector operation -- included many innovative design

features, such as, supply side management focus, forest policy reform, beneficiary-participatory and decentralized implementation approach, multi-sectorial interventions, gender focus, climate change funding, etc.).

Borrower leadership and beneficiary participation. The project was based on a comprehensive 2-year ESW and capacity development exercise undertaken by the Borrower with support from the Bank's "Regional Program for the Traditional Energy Sector (RPTES)". The Borrower undertook a detailed retrospective review of its policies, programs and projects in the traditional energy sector. The Project preparation team held substantive consultation with all main stakeholder groups (villagers, charcoal entrepreneurs, government officials, consumers groups, and CSOs/NGOs), including the realization of more than 20 "participatory project design workshops" with beneficiaries at the village level in the Tambacounda and Kolda regions.

The Bank's role as an "honest broker". A key feature of the preparation process of the project was the need to undertake substantive mediation and consensus building between government official, charcoal traders and the beneficiary rural communities. The Bank team -- with support from the RPTES Program -- played the "honest broker" role very effectively being able to engage all parties in the project preparation process and to steer them into a consensus on its components and implementation mechanism. The most critical part of that work was being able to bring the charcoal traders into the fold and thereby avoiding a frontal confrontation and political sabotaging from them during project implementation.

7.2 Supervision:

The Bank performance during supervision was ***Highly Satisfactory.***

Decentralized supervision. Given the multi-sectorial nature of the project, and the need to closely supervise and support its implementation process, the team decided to delegate daily supervision of the project to a Country Office staff (Demba Balde) who effectively became the project's Field TTL. Overall supervision responsibility rested with the HQ-based Task Team Leader, who supported the Field TTL as needed and conducted annual supervision missions. The delegation of daily supervision to the field was – at the time – a highly innovative, albeit somewhat controversial, approach which enable the team to increase the supervision coverage/presence while reducing supervision costs, to establish a close Bank-Borrower team, to improve the timing and therefore quality of the supervision work and ultimately to increase the delivery of project outcomes and outputs. That approach also contributed at the time to advancing the further decentralization of operational responsibilities within AFR. During the first 4 year of the project the Field TTL responsibility was assured by an ESSD rather than FPSI staff, another precursor to current multi-sectorial operational practices. During the last three years of the project that role was taken over by a FPSI (energy) local staff with specific qualifications on biomass energy and participatory natural resource management systems.

Knowledge management and capacity building. During the project's annual supervision the team organized regional knowledge management and capacity building activities. During most annual supervision missions Officials from other African countries and/or Bank staff from other country teams (Benin, Burkina Faso, Ethiopia, Gambia, Guinea Bissau, Mali, Zimbabwe, Zambia, etc.) who were working in the preparation of similar projects were invited (funded by the RPTES Program) to join the supervision missions.

Trust funds support. The supervision of PROGEDE benefited from funding support from the

RPTES Program. RPTES Trust funds were selectively mobilized to cover incremental work when required to support project implementation and supervision. RPTES benefited from the access to the PROGEDE experience and documentation for its regional capacity development and information dissemination activities.

QAS6. As per the QAS6 final report, between 1999 and mid-2003 PROGEDE had only limited management attention and support, which at times diminished the operational capability of the team and resulted in some problem going unresolved during that period. PROGEDE received a QAS6 rating of 2.

Independent International recognition. In addition to PROGEDE having been used as a "best practice" case study in numerous Africa regional and international biomass energy workshops and conferences since 2002, during the "***2nd. World Conference and Exhibition on Biomass for Energy, Industry and Climate Change***", Rome, May 2004, a group of World Bank staff received the prestigious "***EUBIA Award 2004***" for their "outstanding contributions to the development of the biomass energy sector and its markets in Africa". The design, implementation and level of developmental achievements of PROGEDE where among the main criteria for the issuing of the Award.

7.3 Overall Bank performance:

Overall Bank performance is rated as ***highly satisfactory.***

Borrower

7.4 Preparation:

The Borrower's performance in preparation was ***highly satisfactory.***

As indicated in section 7.1, above, the Borrower undertook a comprehensive 2-year ESW ("Review of Policies, Program and Projects in the Traditional Energy Sector") which concluded with the elaboration of a ten-year sector reform and investment program. That work was done by a multi-sector, multi-disciplinary team of national experts (governmental and non-governmental) under the co-leadership of the Directors of Energy and of Forestry, and was done within the context of the activities of the Bank's RPTES Program. The preparation of PROGEDE, which sought to finance the first half of the national investment program, was based on a highly participatory methodology. Activities ranged from wide consultation with all relevant stake-holder to multiple beneficiary design workshop at the village level. That process even included an unprecedented five-day joint Borrower-Donors tour through villages in the Tambacounda and Kolda regions led by His Excellency Abdoulaye Bathily, Minister of Environment and protection of Nature, to discuss the project concept with target beneficiaries.

7.5 Government implementation performance:

The Government's performance in implementation was ***satisfactory.***

The Government's commitment to the implementation of the project is evident from the project's highly successful outcome. In particular, the Government proved steadfast in the enactment and enforcement of the differential taxation policy and exploitation exclusion protection of the PROGEDE zone. That notwithstanding, a more pro-active handling of three factors under the control of the Government would have enhanced PROGEDE outcomes: (i) accelerating the elimination of the charcoal

quota and the liberalization of the charcoal trade; (ii) correcting persistent procurement shortcomings -- which affect the IDA Senegal portfolio across the board; and (iii) a more consistent timely release of counterpart funding.

7.6 Implementing Agency:

The performance of the implementing Agencies was ***highly satisfactory.***

The Ministry of Environment and Protection of Nature (MEPT) and the Ministry of Energy, Mines and Industry (MEMI), through the appointment of a National Project Director and the establishment of a Project Coordination Unit (PCU), were made jointly responsible for the overall implementation of the project.

The **National Water and Forest Directorate (NWFD/MEPT)** was responsible for the implementation of all the forest and natural resource management activities of the project, which represented over 75 percent of the activities and investment funds. While some delays were accrued in the first half of the implementation cycle, implementation pick-up in the second half and was excellent. The work that was done by the project amounted to a fundamental transformation of the mode of operation and interaction of the Forest Service with the local population. While that would have not been possible without the explicit support of the Forest Directorate and of the Ministry of environment and Protection of Nature, the Project Coordination Unit, with special emphasis on the technical field teams, deserves full recognition for an outstanding implementation performance.

The **Energy Directorate (DE/MIME)** was responsible for the implementation of the energy demand management and inter-fuel substitution options activities of the project. With the noted exception of the setting-up of the "stove producer revolving fund", which accused a serious two and a half year implementation delay due to persistent procurement problems, the implementation performance of the DE and of the Demand Side Management team of the project's Coordination Unit was ***highly satisfactory***. The Demand side management team was responsible for adding several valuable outputs to the project, such as: (i) the establishment of a permanent energy sector digital database and information system; (ii) concept design and establishment of "Energy Boutiques"; (iii) provision of support to several research and pilot testing initiatives on renewable household cooking fuels (rice husks briquettes, gelfuel, jatropha oil production, solar cookers, etc.); and (iv) rural village biomass-based power generation studies and pilot project design. The delay in the setting-up of the stove revolving fund was due to serious procurement problems on the part of the Borrower and of IDA. By the date of closing, however, the proposed stove dissemination support targets had been met, and more importantly, the objective of establishing a "sustainable financial mechanism to support private sector-based improved stove production had been achieved (see Section 4.2).

While not formally considered an "implementation agency" the beneficiary population (317 villages) played a central and outstanding implementation role and is equally responsible for the success of the project. Special mention is due to the **women groups** which played a critical intra-village organization role and were directly responsible for the many human development outcomes and outputs of the project.

7.7 Overall Borrower performance:

The overall rating of the Borrower performance is ***highly satisfactory.***

8. Lessons Learned

PROGEDE and the ongoing sector reform process have serve to ratify and/or distill a series of important lessons about the traditional energy sector and about energy planning and policy making in Senegal. These lessons are of direct relevance to other African countries.

Traditional energy supply systems can be sustainable. Perhaps the most important of those lessons is that the structure and mode of operation of the traditional energy sector can be transformed from its typical environmentally and socially unsustainable form to a sustainably managed and socially progressive economic sector. While there is full consensus on the desirability to substitute all traditional biomass energy with clean and modern household fuels in Africa, there is clear understanding and acceptance that the large majority of African households will continue to depend on traditional biomass fuels for the next two to three decades. In fact, all leading projections suggest that the consumption of traditional biomass fuels by the household sector in Africa will increase in relative terms over the next 30 years as demographic growth continues to outstrip penetration of other modern fuels (kerosene and LPG) and incremental access to electricity. PROGEDE has served to demonstrate that the production and marketing of traditional biomass fuels can not only be stabilized, while arresting deforestation and contributing to ecological conservation, but that it can become a highly effective social and economic rural development strategy. This, which today stands as too much of common sense to be touted as an important outcome of PROGEDE -- and of an emerging body of similar operations – was neither common sense at PROGEDE's Appraisal time (1997) nor was it being implemented by either African governments or Donor Agencies. Had that been the case, traditional energy would have been rendered sustainable across Africa long ago. Rather, the recentness of this is such that today Senegal leads Africa by a significant margin with more than 30 percent of its total supply of traditional fuels being produced in an environmentally and socially sustainably manner. Within the next two years that figure will grow to at least 50 percent. Since biomass energy accounts for 60 percent of Senegal's total national energy consumption, thanks to PROGEDE some 20 percent of Senegal current energy supplies come effectively from renewable sources.

Supply side management is essential. The second important lesson is that the stabilization of the traditional energy sector essentially depends on the implementation of comprehensive changes in the woodfuels' supply systems and chains. While demand management interventions are important and need to be pursued – specially dissemination of improved end-use technologies and practices – they alone simply cannot resolve the existing problems. In spite of the growing number of PROGEDE like operations, demand management is still today believed by many to be the preferred course of action to correct the problems in the sector.

Community-based natural resource management works. The third lesson is that the establishment of environmentally and socially sustainably woodfuel supply systems can only be achieved through the introduction of integrated community-based forestry and natural resource management schemes, that is Community Driven Development (CDD) schemes. Governments lack the financial resources, the man power and the incentive to effectively manage the forests and other natural resources. While the mostly unsuccessful Government-run forest management and reforestation programs that were implemented in the Sahel up until the mid-90s had an averaged cost of US $750 per hectare, PROGEDE's costs were less than US $65 per hectare. The private sector is not interested in entering the sector because of the long-term payback period involved in forest plantations and management activities, because of the inherent high risks, and the low profit margins involved. Community-based natural resource management systems constitute by far the least cost option and at the same time provide the highest success opportunity

for this kind of interventions while having significant rural development and poverty alleviation impacts.

A "minimum policy platform" is required. PROGEDE served to identify and operationally test the "minimum policy platform" that is required to underpin a well functioning traditional energy supply system: (i) clear and legally enforceable forest resource and land tenure rights and responsibilities must be established, in other to provide the necessary incentives for the community (or other economic agents) to invest in the management and conservation of the resource base; (ii) a fair and transparent decentralized fiscal and taxation system needs to be in place, in order to adequately fund the oversight and supervision functions of the respective local levels of government; (iii) a clear and fair pricing system which maximizes producer prices needs to be in place, in order to provide the necessary incentives for sustainable resource management and to maximize rural social and economic development impacts; and, (iv) woodfuel producers need a guaranteed access to final consumer markets, preferably on a completely open access basis (liberalized trade), in order to avoid the deviation of rents from producers to intermediaries.

Localized sustainability is not sufficient. PROGEDE's community-based sustainable management model has proven to be highly successful. However, for the model to be fully sustainable it will be necessary to end unmanaged production of woodfuels in the country. Unmanaged zone(s) and unregulated producers are able to supply cheaper product to the markets and can ultimately undercut the more expensive "sustainable woodfuels". If unmanaged production were to be allowed to continue, it could compromise the sustainable management systems. Thus, completing the reform of the traditional energy sector and extending sustainable forest and NRM practices to the rest of the woodfuels supply zones of the country is necessary in order to protect the country's forest resource base and the competitiveness of the managed production zones. This, which is stated herein as a key lesson from the project, is fully consistent with the highly likely rating on the sustainability of the project (see section 6.1, above) as the Borrower is fully expected to complete the reform of the sector.

Its about poverty alleviation and rural development. The success of the PROGEDE intervention model is based on the following main features: (i) multi-sectorial CDD/assets-based development Approach; (ii) the valorization of a broad spectrum of the local natural resources base as opposed to only woodfuels production; (iii) promotion of economic diversification at the village level; (iv) full recognition, valuation and mobilization of the gender potential; (v) strong beneficiary capacity development and local institution strengthening approach to ensure long-term sustainability of actions; (v) functional capacity development focus; (vi) functional incrementality and sequencing of assistance and investment support; and (vii) scalable modularity of new activities and systems.

Gender investments are real poverty alleviation work. Women play a specially critical and multifaceted role in the African societies. Yet, they are frequently sidelined in terms of investment and capacity development opportunities. PROGEDE made a explicit and concerted effort to identify specific **gender investments** (targeted capacity development in organization and activity management, establishment of rural vegetable gardens, construction of water wells, micro-credit, etc.). Without a doubt the gender investment done resulted in the most significant and tangible poverty alleviation impacts, specially in terms of the **health**, **nutrition** and **education** of the beneficiary population, and particularly of the children. Thus, PROGEDE constitutes an operational demonstration that the full recognition, valuation and mobilization of the gender potential should be an essential component of any poverty alleviation strategy.

Beneficiary-level investments have little or no absorption capacity constraints. Accumulated experience in development assistance suggests that "absorption capacity" constitutes a major barrier to effectively moving investment financing in recipient countries. Having resources available, often

development outcomes and outputs are not met because of the government's and market's incapacity to absorb investments and deliver required goods and services. Often lack of counterpart financing delays and/or prevents proper implementation of investment components. While the PROGEDE experience does not contradict that notion, it has provided a robust argument to reinforce the value of CDD approaches, within which there seems to be little or no absorption constraints to the provision of well targeted capacity development, organizational and institutional development support and investment financing directly to the rural community (beneficiaries). Furthermore, it is suggested that properly accounted and valuated in-kind contribution by beneficiaries should be accepted as counterpart project funding in future operational designs.

Community-based biomass energy management: a gateway to increasing rural access to modern energy services. Unless a minimum stable local income base and a productive demand for energy already exists or can be rapidly created in rural areas, increasing access to modern energy services can only be done on the basis of large and long-term subsidies. Doing so under present conditions would be macro-economically untenable. PROGEDE resulted on the establishment of incremental economic activities, on the creation of a sustainable income base and on the emergence of a productive demand for energy in the participating villages. Having an average incremental annual income per village of about US $40,000 and a well organized diversified emerging production system (woodfuels, wood and non-wood forest products, 10 to 15 agricultural crops, animal husbandry, poultry, apiculture, etc.), PROGEDE villages are today prime candidates for decentralized rural electrification an increased access to other modern energy services. Increasing access to modern energy services in these villages, at this time, should enable them to rapidly advance to higher levels of economic diversification and development without the need for untenable subsidies, and would maximize the developmental outcome of the investment support mobilized (functional incrementality and sequencing of assistance).

Continuity in Bank Teams works. A key feature of PROGEDE is that from project preparation to project closing (8 years) the core Bank team suffered only minor changes. That, resulted in an uncommon level of knowledge about the sector, the project, the Borrower's institutions, the actors, the issues and the opportunities. While it is highly unlikely that the continuity of PROGEDE could be replicated in many other operations, the level and quality of outcomes of the project does provide sufficient grounds to suggest that increasing continuity of operational teams could improved the quality and poverty alleviation impact of operations in the Bank.

9. Partner Comments

(a) Borrower/implementing agency:

See **Annex 8.**

(b) Cofinanciers:

Project supervision was done in close cooperation with the Dutch Cooperation. Annual Supervision Mission Reports and final project comments are available in the project files.

(c) Other partners (NGOs/private sector):

Comments from several PROGEDE partners are available in the project files.

10. Additional Information

None.

Annex 1. Key Performance Indicators/Log Frame Matrix

Outcome / Impact Indicators:

Indicator/Matrix	Projected in last PSR[1]	Actual/Latest Estimate
1. Reduce woodfuel-related deforestation and loss of biodiversity.	1. Reduce deforestation by: Date Ha./yr. B-line: 1,000 M-term: 5,200 Full imp.: 20,000	1. Participatory sustainable forest management systems implemented in 317 villages covering 378,161 ha and resulting in reduction of deforestation in the project zones by approx. 39,830 ha/yr.
2. Reduce net CO2 emissions	2. Reduce net CO2 emissions by: Date Tons/yr. B-line: 25,000 M-term: 130,000 Full imp.: 510,000	2. Net CO2 emission reductions from project's sustainable forest management and charcoal production systems estimated at about 1,786214 ton/yr of CO2 at full implementation.
3. Increase income of participating villages, with special attention to women.	3. Generate revenues in participating villages: Date US $/yr. B-line: 150,000 M-term: 780,000 Full imp.: 3,000,000	3. Total incremental income to rural communities from sale of woodfuels and new agricultural, and animal husbandry products (improved cow genes and poultry raising, cattle fattening, vegetables, cereals, beans, milk products, honey, etc.) was calculated at US $12,530,732 at full implementation.

Output Indicators:

Indicator/Matrix	Projected in last PSR[1]	Actual/Latest Estimate
1.a Implement sustainable community-based forest management systems	1.a Area under management: Date Hectares B-line: 15,000 M-term: 80,000 Full imp.: 300,000	1.a Participatory sustainable forest management systems implemented in 317 villages covering 378,161 ha. An additional 229,359 ha were also placed under a "Sustainable Pre-Management" system and will be further developed during project 2nd. Phase.
1.b Sustainably produce fuelwood	1.b Annual sustainable fuelwood production: Date Tons/yr. B-line: 15,000 M-term: 80,000 Full imp.: 300,000	1.b Sustainable production of fuelwood systems and producing 264,712 m3 equivalent to 370,596 tons/yr are in place since 2004.
2. Increase urban use of improved charcoal stoves.	2. Marketing of improved charcoal stoves (cumulative): Date Stoves B-line: 20,000 M-term: 100,000 Full imp.: 255,000	2. Project has provided support and TA for stove development & preparation of PS/NGO production. While promotion of 237,236 new improved stoves has been achieved, the delay in setting-up the revolving fund seriously reduced the dissemination process. In spite of that, the intended financial support mechanism is now fully in place and is proving to make a significant difference.
3. Increase Inter-fuel substitution /support promotion of kerosene and LPG (private sector) and improved stoves (NGO)	3. Incremental penetration of kerosene (Indictaive 4000 Kesorene units target).	3. Active promotion and support has been provided to (private sector and NGO which responded by increasing commercialization of kerosene stoves. From an original indicative target of 4,000 units 11,560 improved kerosene stoves were sold by December 2004.

[1] End of project

Annex 2. Project Costs and Financing

Project Cost by Component (in US$ million equivalent)

Component	Appraisal Estimate US$ million	Actual/Latest Estimate US$ million	Percentage of Appraisal
Preparatory and Support Activities	3.51	3.81	108.7
Sustainable Woodfuels Supply Management	11.76	11.53	98
Demand Management and Inter-Fuel Substitution Options	2.31	2.86	123.8
Total Baseline Cost	17.58	18.20	
Physical Contingencies	1.65	1.04	
Price Contingencies	0.70	0.30	
Total Project Costs	19.93	19.54	
Total Financing Required	19.93	19.54	

Project Costs by Procurement Arrangements (Appraisal Estimate) (US$ million equivalent)

Expenditure Category	Procurement Method[1] ICB	NCB	Other[2]	N.B.F.	Total Cost
1. Works	0.00 (0.00)	1.04 (0.11)	0.00 (0.00)	0.00 (0.00)	1.04 (0.11)
2. Goods	2.56 (0.33)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	2.56 (0.33)
3. Services	0.56 (0.31)	0.00 (0.00)	4.91 (1.13)	0.00 (0.00)	5.47 (1.44)
4. Consultant Services	0.00 (0.00)	0.00 (0.00)	3.57 (0.55)	0.00 (0.00)	3.57 (0.55)
5. Recurrent Costs	0.00 (0.00)	0.00 (0.00)	6.07 (2.76)	1.20 (0.00)	7.27 (2.76)
Total	3.12 (0.64)	1.04 (0.11)	14.55 (4.44)	1.20 (0.00)	19.91 (5.19)

1/ Figure in parenthesis are to be financed by the IDA Credit. All costs include contingencies.

2/ Includes civil works and goods to be procured through national shopping, consulting services, services of contracted staff of the project management office, training, technical assistance services, and incremental operating costs related to (i) managing the project, and (ii) re-lending project funds to local government units.

Project Costs by Procurement Arrangements (Actual/Latest Estimate) (US$ million equivalent)

Expenditure Category	Procurement Method[1]				Total Cost
	ICB	NCB	Other[2]	N.B.F.	
1. Works	0.00 (0.00)	1.02 (0.11)	0.00 (0.00)	0.00 (0.00)	1.02 (0.11)
2. Goods	2.51 (0.33)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	2.51 (0.33)
3. Services	0.55 (0.30)	0.00 (0.00)	2.82 (1.11)	0.00 (0.00)	3.37 (1.41)
4. Consultant Services	0.00 (0.00)	0.00 (0.00)	3.38 (0.54)	0.00 (0.00)	3.38 (0.54)
5. Recurrent Costs	0.00 (0.00)	0.00 (0.00)	8.06 (2.73)	1.20 (0.00)	9.26 (2.73)
Total	3.06 (0.63)	1.02 (0.11)	14.26 (4.38)	1.20 (0.00)	19.54 (5.12)

[1/] Figures in parenthesis are the amounts to be financed by the IDA Credit. All costs include contingencies.

[2/] Includes civil works and goods to be procured through national shopping, consulting services, services of contracted staff of the project management office, training, technical assistance services, and incremental operating costs related to (i) managing the project, and (ii) re-lending project funds to local government units.

Project Financing by Component (in US$ million equivalent)

Component	Appraisal Estimate			Actual/Latest Estimate			Percentage of Appraisal		
	IDA	Govt.	CoF.	IDA	Govt.	CoF.	IDA	Govt.	CoF.
Preparatory and Support Activities	1.04	0.24	2.67	1.02	0.24	2.64	98.1	100.0	98.9
Sustainable Woodfuels Supply Management	3.47	0.80	8.96	3.43	0.80	8.84	98.8	100.0	98.7
Demand Management and Inter-Fuel Substitution Options	0.68	0.16	1.76	0.67	0.16	1.74	98.5	100.0	98.9
TOTAL	5.19	1.20	13.39	5.12	1.20	13.22	98.7	100.0	98.7

Annex 3. Economic Costs and Benefits

ICR Ex-Post Economic Analysis Note

Introduction

1. The economic evaluation of natural resource management activities and investments in developing countries has been the subject of continued discussion during the last three decades. The lack of consensus among economists on the subject stems primarily from the difficulties in arriving at a proper valuation of the natural resources in question, delimiting the frontiers of the systems and activities under analysis, and defining the objective function of the problem under analysis. At the time of PROGEDE's Appraisal and Board presentation there was much controversy in the Bank on this subject because the "Household Energy Project" in Chad had just been recently derailed from Board presentation due to unsurmountable internal disagreements regarding its economic evaluation methodology and results. Within that context, the project team prepared a comprehensive yet simplified economic analysis methodology for the project, which was readily accepted by AFR's Regional Operations Committee and subsequently cleared the Board without any issues being raised. While OED has since introduced a template for economic evaluations, the project team felt the need to undertake the ex-post evaluation of the project utilizing the same methodological framework and model that was used at Appraisal. This note contains a summarized version of the principal elements of the methodological framework developed for the original evaluation of the project. The complete methodology is contained in Annex 8 of the project's SAR.

The Project Rationale

2. At the time of Appraisal the supply of woodfuels to the urban and peri-urban energy market in Senegal was entirely based on geographically concentrated and non-sustainable forest resource management practices (clear cutting). Given the relatively low efficiency of wood-to-charcoal conversion (18%) due to inefficient carbonization, total charcoal consumption was and still is equivalent to about 1.2 times the total consumption of fuelwood. Charcoal was and is still currently produced in the Kolda and Tambacounda regions, some 400 km away from the principal urban (Dakar and Thies) and peri-urban markets.

3. Until PROGEDE forestry legislation gave the Forest Service the exclusive prerogative to assign commercial exploitation rights over forest resources nationwide. These rights were historically given only to urban-based traders which resulted in the establishment of a vertically integrated and oligopolistic industry with widespread corruption problems. Among other issues, original annual charcoal exploitation quotas were often surpassed with the Forestry Service lacking the manpower or monitoring mechanisms to adequately supervise and enforce them. It is estimated that out of the some 1800 legally registered "*Exploitant Forestiers*" only some 20 traders actually produced charcoal. The remainder registered traders bought charcoal production licenses ("*quota charbon*") and resold them afterwards to the traders that actually produce charcoal. As even the temporary expatriate laborers (Guinean Fulbes, "sourghas") employed in the cutting of the wood and the production of the charcoal were brought in to the rural areas by the urban traders, it is estimated that much less than 5% of the annual turnover of the charcoal trade (US $60 million) remained in the rural areas. The transport of the charcoal, which represented close to 20% of the final cost structure of the charcoal, was provided by independent trucking companies on a cash payment basis. Over the years, the operation of the charcoal industry resulted in: (i) the gradual loss of forest cover (approx. 30,000 ha/year) and thus of the **ecosystem's carbon sequestration capacity and**

biodiversity; (ii) the degradation of the rural environment (particularly of the soils); (iii) the impoverishment of the rural areas; (iv) an acceleration of the rural exodus; and (v) a massive transfer of wealth from the rural areas to the urban areas. In addition to these negative impacts, it was anticipated that the **Niokolo-Koba National Park** ("International Biosphere Reserve Patrimony", 9,130 km^2), which is located in the south-eastern corner of the Tambacounda and Kolda regions and which is a declared national and international biodiversity patrimony and "Biosphere Reserve", would come under threat of encroachment within the next decade, with irreparable biodiversity and ecological consequences at the national and global levels.

4. The organization of the urban and peri-urban fuelwood trade (520,000 tons/year) resembled that of the charcoal trade but posed considerable smaller environmental and social conflicts. The consumption of fuelwood in the rural areas (1.5 million tons/year) was largely satisfied through sustainable subsistence practices (cutting of branches, selective felling of small trees and collection of dead branches). **Women** and **children** played a significant role in the collection of fuelwood. Rural consumption of charcoal was mostly limited to the areas where it is produced and is normally traded by the producers for food and lodging at the local communities.

5. While PROGEDE radically transformed the charcoal production system at the "producer level" within the project implementation zone (300,000+ ha) -- which represents about 50 percent of the traditional charcoal producing zones of the country -- and introduced a series of policy, regulatory and operational improvements in the industry as a whole (see Section 4 Achievement of Objectives and Outputs) the rest of the charcoal production zones in the country continue to be managed in an environmentally unsustainable and socially inequitable manner.

6. Project Objectives. The objective of the project was to meet an important part of the rapidly growing urban demand for household fuels, without the loss of forest cover and the ecosystem's carbon sequestration potential and biodiversity. This objective was to be met through: (i) the implementation and monitoring of 300,000 hectares of environmentally sustainable community-managed forest resource systems in the Tambacounda and Kolda regions of Senegal, creating a protection zone around the **Niokolo-Koba National Park**; (ii) the promotion of private sector inter-fuel substitution and private sector and NGO-based improved stoves initiatives; and (iii) the strengthening of the institutions involved in the management of the sector, and the promotion of the participation of the civil society (private sector, academic institutions, and NGOs community) in the operation of the sector.

7. Project Description. The project consisted of three components: **Preparatory and Support Activities, Sustainable Woodfuels Supply Management** and **Demand Management and Inter-fuel Substitution Options.** The project design included a series of activities to ensure an effective participation of the rural population ("*measures incitatives")* and thus guarantee the full achievement of the environmental sustainability objectives of the project. The project also included specific monitoring and evaluation activities (forest exploitation and wildlife) designed to evaluate the achievement of its global environmental objectives (maintenance of carbon sequestration capacity, CO_2 emission abatement and biodiversity conservation.

8. Project Benefits. The project was expected to: (i) sustainably produce some **860,000 tons** of fuelwood (equivalent to 258,000 tons of efficiently produced charcoal) over a six year period and to establish a permanent system capable of producing more than 300,000 tons of fuelwood (equivalent to 90,000 tons of efficiently produced charcoal or **27 percent** of total annual national consumption) per year on a sustainable basis; (ii) reduce woodfuels-related deforestation in the Tambacounda and Kolda regions

by some **16,000 to 20,000 ha/year**, and as a consequence of that reduce **net CO_2 emissions** by about **510,000 tons** in 7 years and reduce the loss of biodiversity by the establishment of sustainable forest systems and of a protective buffer zone around the **Niokolo-Koba National Park**; (iii) generate employment and economic development opportunities in 250 rural villages in the Tambacounda and Kolda regions, and include women in the management and marketing of woodfuels and other related income generating activities; (iv) generate during the implementation period more than **US $10 million** in direct revenues to 250 villages from the trade of woodfuels, and generate additional revenues to the communities from related natural resource management and exploitation activities (agro-forestry, livestock keeping, non-fuelwood forest products, etc.); (v) on a sustainable annual basis after the end of the project, generate direct revenues in excess of **US $3 million** to the participating villages from the trade of woodfuels, and generate additional revenues from related natural resource management and exploitation activities; (vi) reduce CO_2 emissions by **420,000 tons/yr.** by the distribution of **225,000** improved charcoal stoves in urban areas; (vii) increase the availability and access of low income households to more reliable and efficient charcoal stoves and to modern fuels; and (viii) strengthen the planning, policy making and implementation supervision capacity of the traditional energy sector institutions, while increasing the participation of the civil society (private sector, academic institutions, and NGO's community) in the management and operation of the sector.

Other Project Options

9. With assistance of the Bank's Africa Regional **Program "Review of Policies in the Traditional Energy Sector - RPTES"**, a national inter-ministerial team conducted a 2-year comprehensive review of the traditional energy sector in Senegal (fuelwood and charcoal), including the evaluation of the principal inter-fuel substitution issues and options (kerosene and LPG). Within that review, the regulatory, legal, pricing and fiscal frameworks of the sector and the evolution of its structure and functioning were studied in detail. The RPTES review concluded that given the country's present and foreseeable macroeconomic and socio-economic conditions, Senegal would continue to depend on forest-based traditional fuels to meet the lion's share of the country's urban and rural energy needs for at least the next 3 decades While ongoing demand management (improved stoves programs and consumer education campaigns) and inter-fuel substitution (LPG and kerosene) efforts needed to be continued and improved to incorporate the lessons learned, large increases of petroleum products imports could not be sustained because of budgetary constraints and because current and expected low household income levels severely limited the potential for widespread inter-fuel substitution at non-subsidized market prices. Within that context, and until economic growth allowed for such substitution to take place, the principal challenge of the household energy sector in Senegal would be to transform the existing non-sustainable commercial woodfuels supply system into one capable of supplying woodfuels -- particularly charcoal -- to the rapidly growing urban population in a sustainable manner.

10. Previous Government run efforts at demand management (improved stoves programs and consumer education campaigns) and inter-fuel substitution (LPG and kerosene) had mixed results. Without a significant shift in policy to promote an active involvement of the private sector in the expansion of interfuel substitution and demand management efforts at the massive level required would be neither fiscally sustainable nor sufficient. At close to **US $ 750 per ha**[1] forest plantation schemes had already proven to be economically unfeasible though-out West Africa. The possibility to open additional forest areas for commercial exploitation of woodfuels was evaluated and determined unfeasible due to the fragility of the forest stocks and the economic cost of extraction. The project was therefore supposed to introduce sustainable forest/natural resource management systems in the **Kolda** and **Tambacounda** regions for the

supply of charcoal and to support a shift towards private sector-based production and marketing of improved charcoal stoves and other least-cost interfuel substitution options.

11. Within that context, there was clear consensus between the Borrower and the participating donors that there were no other economically or technically feasible project alternatives capable of delivering the same level of outputs, benefits and developmental impacts that PROGEDE could deliver.

The Evaluation Methodology

12. Within the general and country-specific framework defined above, a deliberate effort was made to construct an economic evaluation methodology that, while remaining simple, would be capable of capturing: (i) the inter-temporal social valuation of the forest resources; (ii) the distributional effects of their exploitation; (iii) the value of the benefits "saved" thought the introduction of sustainable resource management practices and improved end-use energy technology; (iv) the value of income transfers to rural communities; (v) the value of "incremental income to rural communities; and (vi) the principal measurable global environmental benefits.

13. Methodological disclaimer. As the only feasible alternative to the project was to do nothing, i.e., to continue to exploit forest resources in an environmentally unsustainable and socially inequitable manner in the exact same areas where the project would be implemented (Tambacounda and Kolda regions), considerations of transportation or other marketing costs were purposely excluded from the analysis. While the actual production area under a sustainable management system would be necessarily larger and thus it could be assume that there would be a higher transportation cost associated with it, the Forest Service normally spreads out cutting permits across the regions to avoid -- to the extent possible -- over concentration of clear cutting, and thus the difference in transportation costs between the two systems was considered to be sufficiently small to be excluded from the analysis. If production could dislocate to other regions of the country that would change the calculus, but Tambacounda and Kolda were and still are the only two significant charcoal producing regions of the country. Fiscal impacts were also excluded from the analysis because they were estimated to have a negligible net impact. Under the existing woodfuels taxation system, effective collection of "stumpage fees" was less than 40%. On the one hand the project included the strengthening of the control of woodfuel flows and was thus fully expected to increase the actual tax collection rates. furthermore, the very possibility to account and tax 100% of the sustainable production and sales of charcoal at the village level was expected to result in and of itself in a higher collection of taxes than the prevailing system. On the other hand, the project would also introduce a differential taxation (50 percent reduction) favoring the community-based sustainable forest management systems. Hence, it was estimated that the project would be either neutral or would have only a modest positive impact on overall fiscal revenues. The option of maintaining flat taxation rates to increase fiscal revenues was ruled out from the start because: (i) differential taxation was required to provide a price protection from non-managed woodfuel exploitation[2]; and (ii) government collected "stumpage fees" could be justified only under the assumption that the tax collected would be reinvested in the regeneration of the forest stocks. Since this is not the case in Senegal, and through the implementation of the project the rural communities would be responsible for assuring the sustainability of the resource, there was no justification to maintain the same level of taxation for community managed and non-managed areas.

Project Components

14. All three components of the project (Preparatory and support Activities Component; Sustainable

Supply Management Component; and Demand Management and Inter-fuel Substitution Options Component) were included in the economic analysis as they were judged to be necessary and integral elements of the proposed investment. No differential valuation treatment was given to investments for productive (forest management, improved kilns, improved stoves, inter-fuel substitution options, etc.) or nonproductive sub-components (data generation and gathering, institutional development, capacity building, social support services, communication strategy, etc.).[3] While this would tend to penalize the evaluation of the project, the long-term stream of benefits expected to result from those up-front nonproductive investment sub-components was included in the analysis.

Evaluation Horizon and Project costs

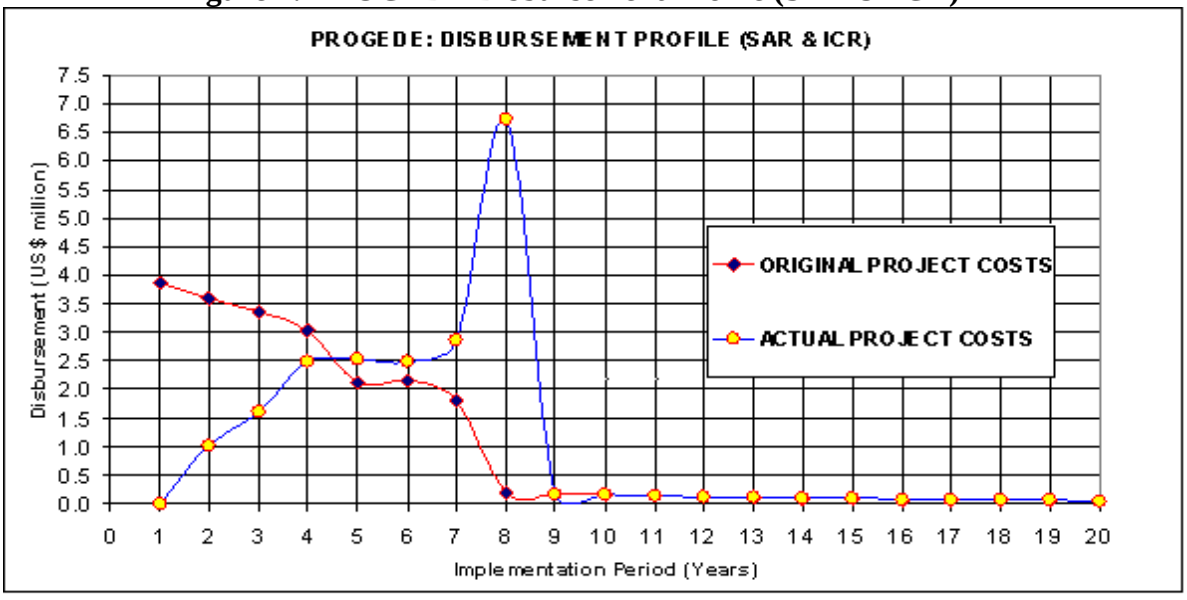
15. Because of the long-term nature of the proposed project objectives and expected impacts, a project evaluation horizon of **20 years** was adopted. All budgeted costs during project implementation (7 years) where included in the economic analysis of the project. From years 8 to 20 continued minimum implementation costs where assumed at approximately **10 percent** of the originally planned year 7 costs, gradually decreasing at a relative rate of 10 percent per year until year 20. That continued but phasing-out cost structure between years 8 and 20 was discussed and agreed upon with the borrower. **Table 1** presents the originally budgeted project costs by component and main sub-components per year for the 20-year project evaluation horizon and the actual total project costs (effective disbursements). Because of the change over on accounting systems from FACT to SAP no detailed breakdown of costs by component was available at the time of preparing the ICR. Therefore the accumulated project cost (disbursement stream) was used to compute the actual project cost and profile. That information was added to the original Table 1 at the bottom of the table. **Figure 1** presents the comparison between the original (SAR) and actual (ICR) disbursement profile of project. As illustrated in Table 1 and Figure 1 the project's actual disbursement profile went from being 70 % front-loaded at Appraisal to 70 % back-loaded at ICR. The impact on the ex-post evaluation of the project of that disbursement shift -- at a discount rate of 12% -- was that both the ERR and the NPV more than doubled. This happened because while the disbursement lag shifted the stream of costs towards the second half of the project, the stream of benefits remained reasonably on schedule and was much higher than originally anticipated. It is important to note that beyond the obvious "technical distortion" on the ex-post ERR and NPV, the disbursement lag underscores the point that a portion of the originally planned investments where not directly related to the materialization in the field of the project's development objectives, as their shift in time did not significantly affect the benefits stream. This does not mean that those investments where not required within the project, but that their sequencing proved to be more flexible than anticipated with respect to the field implementation of the productive sub-components. As discussed in section Project Component, above, all three project components were included in the analysis and no differential weights were given to them in spite of their different nature. Had the original economic analysis only taken into consideration the outcome related investments, the disbursement lag would have had a smaller impact on the ERR and NPV.

Table 1: SPEMP: PROJECT COSTS BY COMPONENT (000' US DOLLARS)

YEARS / PROJECT COMPONENTS/SUBCOMPONENTS	1 1997	2 1998	3 1999	4 2000	5 2001	6 2002	7 2003	8 2,004	9 2,005	10 2,006	11 2,007
A. Component I: Preparatory & Support Activities											
1. Vegetation Cover Inventory (part 1)	1,003	0	0	0	0	0	0	0	0	0	0
2. Participatory Rural Appraisals	70	0	0	0	0	0	0	0	0	0	0
3. Elaboration of Integrated Nat. Res. Managt. Systems	550	0	0	0	0	0	0	0	0	0	0
4. Elaboration of Legislative Framework	160	0	0	0	0	0	0	0	0	0	0
5. Elaboration of Monitoring Systems	90	0	0	0	0	0	0	0	0	0	0
6. Institutional development + Equipment (DE + DEF)	1,985	0	0	0	0	0	0	0	0	0	0
Sub-total Component I:	3,858	0	0	0	0	0	0	0	0	0	0
B. Component II: Sust. & Part. Supply Management											
1. Institutional Development + Equipment DEF	0	1,014	1,280	1,289	821	864	669	100	90	81	73
2. Field Implementation	0	1,011	707	631	535	531	477	50	45	41	36
3. Micro-enterprise Development Promotion	0	108	165	168	171	232	201	0	0	0	0
4. Communication Strategy	0	32	33	34	34	35	0	0	0	0	0
5. Dead Wood Assess./veget. Cover Inventories (Part 2)	0	376	380	384	297	300	256	0	0	0	0
Sub-total Component II:	0	2,542	2,566	2,506	1,859	1,962	1,603	150	135	122	109
C. Component III: Demand Management & Subsitution Options											
1. Institutional Development + Equipment DE	0	310	380	315	140	130	130	40	36	32	29
2. Modernization of Charcoal Industry	0	50	10	10	10	0	0	0	0	0	0
3. Economic Diversification of Charcoal Traders	0	100	100	10	10	10	10	0	0	0	0
4. Kerosene Inter-fuel Substitution	0	38	45	0	0	0	0	0	0	0	0
5. LPG Inter-fuel Substitution	0	85	115	10	10	0	0	0	0	0	0
6. Charcoal Improved Stoves	0	330	10	10	10	10	10	0	0	0	0
7. Communication Strategy		140	140	160	100	50	40	0	0	0	0
Sub-total Component III:	0	1,053	800	515	280	200	190	40	36	32	29
ORIGINAL PROJECT COSTS	3,858	3,594	3,366	3,021	2,139	2,162	1,793	190	171	154	139
ACTUAL PROJECT COSTS	0	1,012	1,606	2,473	2,521	2,491	2,864	6,729	171	154	139
ACTUAL CUMMULATIVE PROJECT COSTS	0	1,012	2,618	5,091	7,612	10,103	12,967	19,696	19,867	20,021	20,159

Table 1: SPEMP: PROJECT COSTS BY COMPONENT (000' US DOLLARS) (Continuation)										
YEARS	12	13	14	15	16	17	18	19	20	TOTAL
PROJECT COMPONENTS/SUBCOMPONENTS	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
A. Component I: Preparatory & Support Activities										
1. Vegetation Cover Inventory (part 1)	0	0	0	0	0	0	0	0	0	1,003
2. Participatory Rural Appraisals	0	0	0	0	0	0	0	0	0	70
3. Elaboration of Integrated Nat. Res. Managt. Systems	0	0	0	0	0	0	0	0	0	550
4. Elaboration of Legislative Framework	0	0	0	0	0	0	0	0	0	160
5. Elaboration of Monitoring Systems	0	0	0	0	0	0	0	0	0	90
6. Institutional development + Equipment (DE + DEF)	0	0	0	0	0	0	0	0	0	1,985
Sub-total Component I:	0	0	0	0	0	0	0	0	0	3,858
B. Component II: Sust. & Part. Supply Management										
1. Institutional Development + Equipment DEF	66	59	53	48	43	39	35	31	28	6,684
2. Field Implementation	33	30	27	24	22	19	17	16	14	4,266
3. Micro-enterprise Development Promotion	0	0	0	0	0	0	0	0	0	1,045
4. Communication Strategy	0	0	0	0	0	0	0	0	0	168
5. Dead Wood Assess./veget. Cover Inventories (Part 2)	0	0	0	0	0	0	0	0	0	1,994
Sub-total Component II:	98	89	80	72	65	58	52	47	42	14,156
C. Component III: Demand Management & Subsitution Options										
1. Institutional Development + Equipment DE	26	24	21	19	17	15	14	13	11	1,703
2. Modernization of Charcoal Industry	0	0	0	0	0	0	0	0	0	80
3. Economic Diversification of Charcoal Traders	0	0	0	0	0	0	0	0	0	240
4. Kerosene Inter-fuel Substitution	0	0	0	0	0	0	0	0	0	83
5. LPG Inter-fuel Substitution	0	0	0	0	0	0	0	0	0	220
6. Charcoal Improved Stoves	0	0	0	0	0	0	0	0	0	380
7. Communication Strategy	0	0	0	0	0	0	0	0	0	630
Sub-total Component III:	26	24	21	19	17	15	14	13	11	3,336
ORIGINAL PROJECT COSTS	125	112	101	91	82	74	66	60	54	21,350
ACTUAL PROJECT COSTS	125	112	101	91	82	74	66	60	54	21,350
ACTUAL CUMMULATIVE PROJECT COSTS	20,284	20,396	20,497	20,588	20,670	20,744	20,810	20,869	20,923	

Figure 1: PROGEDE Disbursement Profile (SAR & ICR)



16. On the other hand, the implication of the original cost structure was that the borrower recognized that the follow-up cost of expanding the PROGEDE model to other regions of the country would be much smaller than that of its original introduction. Once the large up-front costs of institutional development and capacity building (both of governmental and civil society) are met, subsequent investment (follow-up projects) to further expand the total area under community management should be much lower on a unit basis (per hectare cost) than what they were for the first project. The unit cost of the project was of the order of **US $66.6** per hectare (including all project costs).[4] Unless significant model design changes are introduced, subsequent investments for expanding the PROGEDE model should not amount to more than US $35 per hectare at 1997 price equivalence.

Project Benefits and Valuation

17. While the project was expected to result in a large number of quantifiable and non-quantifiable impacts the methodology adopted limited the valuation to the following main expected benefits:

(i) "sustainable" wood production: the benefit of the "sustainable" wood production expected to result from the implementation of the sustainable and participatory forest/natural resource management systems was defined as the net reduction in deforestation (loss of forest standing stocks) in a comparison between an area under sustainable management and an equivalent area under non-sustainable exploitation. A concept of area equivalence was introduced to avoid an overvaluation of benefits as the amount of wood output that would be extracted from a sustainably managed area (1 ton/ha) would not be the same as from an area that is clear-cut (15 ton/ha). The equivalence was thus calculated on the basis of the total expected wood output of the area that was to be placed under sustainable management at every year of the project and that wood volume was converted to hectare under clear-cut rates. As the areas under management increased over time, the equivalent non-sustainable areas were increased. For the areas under non-sustainable management a realistic 20 % natural regeneration rate was assumed. The calculation of the net deforestation impact was computed as being the total deforestation minus the natural regeneration in an area non-sustainably exploited equivalent in wood output to the total area under sustainable management within the project. The effect of that model was that as the total area under management within the project scenario achieved, for instance, the 300,000 ha (sustainably producing an approximate output of 300,000 tons of wood per year) a net deforestation of 16,000 hectares per year would be accrued to the non-project scenario. That 16,000 ha was the result of a total of 20,000 ha deforested minus a natural regrowth allowance of 4,000 ha. In the ex-ante evaluation, over the 20-year project cycle the non-project scenario resulted in a net total deforestation of **248,800 ha**. By making that area equivalent to output it meant that during the period of analysis both scenarios (managed and non-sustainable) resulted in the same amount of wood production but whereas 248,800 ha of forest were lost in the non-sustainable scenario, the sustainably managed scenario conserved intact the original 300,000 hectares of forests. In the ex-post evaluation, over the 20-year project cycle the non-project scenario resulted in a net total deforestation of **295,449 ha**. It is important to note that the approach selected for the valuation of this benefits was extremely conservative as it did not take into account the valuable stream of environmental benefits (soil conservation, water retention, ecosystem protection, land productivity, etc.) or social and economic benefits (quality of life, capacity to cultivate the land, income generation from agricultural activities which would have been gradually lost after deforestation, etc.). Avoiding deforestation was considered a benefit in the sense that the productive capacity of the ecosystem was maintained and, in the very least, a clearly quantifiable sustainable stock of

forest was left intact for other economic and social uses at any point in time.

Table 2.1, 2.2 and 2.3 presents the detailed calculation of the benefit of the "sustainable" wood production including parametric variations ranging from sustainable forest yields of **1.00 tons/ha** to **2.00 tons/ha** and producer price ranging from **US $15/ton** to **US $40/ton.**

Since at the end of the 20-year horizon the total area under management would still have a full stock of 15 tons/ha (300,000 ha at 15 ton/ha = 4.5 million tons of wood) which could be maintained for continued sustainable exploitation or could be clear cut (or otherwise). In the ex-ante and ex-post evaluations the benefit of the sustainable wood production was valued at the producer price of wood of **US $15/ton** (base scenario). While the actual price in local currency has changed over time, due mostly to the devaluation of the local currency and inflation, the US dollar equivalent price of wood has remained relatively constant. The producer price as opposed to the market price of wood was used because the final market price incorporates the value added of transportation and marketing. Also, while the producer prices have remained rather constant over time, the market prices of woodfuels has shown a significant increase. The use of wood prices as opposed to charcoal prices rendered the analysis very conservative by design. Nevertheless, the use of wood more adequately reflected the output of the project's intervention, i.e., "sustainable wood production", and the project's benefits related to charcoal are rather accounted elsewhere as incremental production of charcoal from a give stock of wood as a result of the introduction of improved conversion technologies (Kilns).

Table 2.1: NET DEFORESTATION REDUCTION IMPACT FROM SUSTAINABLE & PARTICIPATORY FOREST MANAGEMENT

	TOTAL HECTARES UNDER MANAGEMENT	0	0	20,000	60,000	100,000	377,071	378,161	378,161	378,161	378,161	378,161
	SUSTAINABLE FOREST YIELDS:	1	2	3	4	5	6	7	8	9	10	11
1.00	ton/hectare/year		0	20,000	60,000	100,000	377,071	378,161	378,161	378,161	378,161	378,161
1.50	ton/hectare/year		0	30,000	90,000	150,000	565,607	567,242	567,242	567,242	567,242	567,242
2.00	ton/hectare/year		0	40,000	120,000	200,000	754,142	756,322	756,322	756,322	756,322	756,322
	NON-SUSTAINABLE EQUIVALENCE CALCULATION:											
	HA CLEAR-CUT TO MATCH SUSTAINABLE PRODUCTION		0	1,333	4,000	6,667	25,138	25,211	25,211	25,211	25,211	25,211
			0	2,000	6,000	10,000	37,707	37,816	37,816	37,816	37,816	37,816
			0	2,667	8,000	13,333	50,276	50,421	50,421	50,421	50,421	50,421
	REGROWTH PERCENTAGE PER LEVEL OF CLEAR-CUT		0	267	800	1,333	5,028	5,042	5,042	5,042	5,042	5,042
			0	400	1,200	2,000	7,541	7,563	7,563	7,563	7,563	7,563
			0	533	1,600	2,667	10,055	10,084	10,084	10,084	10,084	10,084
	NET DEFORESTATION REDUCTION (-CLEAR-CUT + REGROWTH)											
1.00	ton/hectare/year		0	1,067	3,200	5,333	20,110	20,169	20,169	20,169	20,169	20,169
1.50	ton/hectare/year		0	1,600	4,800	8,000	30,166	30,253	30,253	30,253	30,253	30,253
2.00	ton/hectare/year		0	2,133	6,400	10,667	40,221	40,337	40,337	40,337	40,337	40,337
DELTA	ACTUAL ANNUAL INCREMENT AREA UNDER MANAGEMENT:		0	20,000	40,000	40,000	277,071	1,090	229,359	0	0	0
	ACCUMULATED AREAS (HA) UNDER EXPLOITATION:		0	20,000	60,000	100,000	377,071	378,161	607,520	607,520	607,520	607,520

Table 2.2: SENSITIVITY OF EXPECTED DEFORESTATION WITHOUT SUSTAINABLE FOREST MANAGEMENT

		1	2	3	4	5	6	7	8	9	10	11
1.00	ton/hectare/year											
	PREVIOUS AREA UNDER EXPLOITATION (T-1)		0	0	18,933	55,733	90,400	347,361	328,282	537,472	517,304	497,135
	ANNUAL INCREMENT OF AREA ON YEAR T		0	20,000	40,000	40,000	277,071	1,090	229,359	0	0	0
	TOTAL AREA UNDER EXPLOITATION:		0	20,000	58,933	95,733	367,471	348,451	557,641	537,472	517,304	497,135
	NET ANNUAL DEFORESTATION:		0	1,067	3,200	5,333	20,110	20,169	20,169	20,169	20,169	20,169
	NET CARRY FORWARD:		0	18,933	55,733	90,400	347,361	328,282	537,472	517,304	497,135	476,967
1.50	ton/hectare/year											
	PREVIOUS AREA UNDER EXPLOITATION (T-1)		0	0	18,400	53,600	85,600	332,505	303,342	502,449	472,196	441,943
	ANNUAL INCREMENT OF AREA ON YEAR T		0	20,000	40,000	40,000	277,071	1,090	229,359	0	0	0
	TOTAL AREA UNDER EXPLOITATION:		0	20,000	58,400	93,600	362,671	333,595	532,701	502,449	472,196	441,943
	NET ANNUAL DEFORESTATION:		0	1,600	4,800	8,000	30,166	30,253	30,253	30,253	30,253	30,253
	NET CARRY FORWARD:		0	18,400	53,600	85,600	332,505	303,342	502,449	472,196	441,943	411,690
2.00	ton/hectare/year											
	PREVIOUS AREA UNDER EXPLOITATION (T-1)		0	0	17,867	51,467	80,800	317,650	278,403	467,425	427,088	386,750
	ANNUAL INCREMENT OF AREA ON YEAR T		0	20,000	40,000	40,000	277,071	1,090	229,359	0	0	0
	TOTAL AREA UNDER EXPLOITATION:		0	20,000	57,867	91,467	357,871	318,740	507,762	467,425	427,088	386,750
	NET ANNUAL DEFORESTATION:		0	2,133	6,400	10,667	40,221	40,337	40,337	40,337	40,337	40,337
	NET CARRY FORWARD:		0	17,867	51,467	80,800	317,650	278,403	467,425	427,088	386,750	346,413

Table 2.1: NET DEFORESTATION REDUCTION IMPACT FROM SUST.& PART.FOREST MGMNT. (Continuation)

	TOTAL HECTARES UNDER MANAGEMENT	378,161	378,161	378,161	378,161	378,161	378,161	378,161	378,161	378,161	
SUSTAINABLE FOREST YIELDS:		12	13	14	15	16	17	18	19	20	TOTAL
1.00	ton/hectare/year	378,161	378,161	378,161	378,161	378,161	378,161	378,161	378,161	378,161	5,851,326
1.50	ton/hectare/year	567,242	567,242	567,242	567,242	567,242	567,242	567,242	567,242	567,242	8,776,989
2.00	ton/hectare/year	756,322	756,322	756,322	756,322	756,322	756,322	756,322	756,322	756,322	11,702,652
NON-SUSTAINABLE EQUIVALENCE CALCULATION:											
	HA CLEAR-CUT TO MATCH SUSTAINABLE PRODUCTION	25,211	25,211	25,211	25,211	25,211	25,211	25,211	25,211	25,211	390,088
		37,816	37,816	37,816	37,816	37,816	37,816	37,816	37,816	37,816	585,133
		50,421	50,421	50,421	50,421	50,421	50,421	50,421	50,421	50,421	780,177
	REGROWTH PERCENTAGE PER LEVEL OF CLEAR-CUT	5,042	5,042	5,042	5,042	5,042	5,042	5,042	5,042	5,042	78,018
		7,563	7,563	7,563	7,563	7,563	7,563	7,563	7,563	7,563	117,027
		10,084	10,084	10,084	10,084	10,084	10,084	10,084	10,084	10,084	156,035
NET DEFORESTATION REDUCTION (-CLEAR-CUT + REGROWTH)											
1.00	ton/hectare/year	20,169	20,169	20,169	20,169	20,169	20,169	20,169	20,169	20,169	312,072
1.50	ton/hectare/year	30,253	30,253	30,253	30,253	30,253	30,253	30,253	30,253	30,253	468,108
2.00	ton/hectare/year	40,337	40,337	40,337	40,337	40,337	40,337	40,337	40,337	40,337	624,143
	ANNUAL INCREMENT TO AREA UNDER MANAGEMENT:	0	0	0	0	0	0	0	0	0	
	ACCUMULATED AREAS (HA) UNDER EXPLOITATION:	607,520	607,520	607,520	607,520	607,520	607,520	607,520	607,520	607,520	

Table 2.2: SENSITIVITY OF EXPECTED DEFORESTATION WITHOUT SUSTAINABLE FOREST MANAGEMENT (Continuation)

		12	13	14	15	16	17	18	19	20	TOTAL
1.00	ton/hectare/year										
	PREVIOUS AREA UNDER EXPLOITATION (T-1)	476,967	456,798	436,629	416,461	396,292	376,124	355,955	335,787	315,618	N.A.
	ANNUAL INCREMENT OF AREA ON YEAR T	0	0	0	0	0	0	0	0	0	607,520
	TOTAL AREA UNDER EXPLOITATION:	476,967	456,798	436,629	416,461	396,292	376,124	355,955	335,787	315,618	N.A.
	NET ANNUAL DEFORESTATION:	20,169	20,169	20,169	20,169	20,169	20,169	20,169	20,169	20,169	312,071
	NET CARRY FORWARD:	456,798	436,629	416,461	396,292	376,124	355,955	335,787	315,618	295,449	295,449
1.50	ton/hectare/year										
	PREVIOUS AREA UNDER EXPLOITATION (T-1)	411,690	381,437	351,184	320,931	290,678	260,426	230,173	199,920	169,667	N.A.
	ANNUAL INCREMENT OF AREA ON YEAR T	0	0	0	0	0	0	0	0	0	607,520
	TOTAL AREA UNDER EXPLOITATION:	411,690	381,437	351,184	320,931	290,678	260,426	230,173	199,920	169,667	N.A.
	NET ANNUAL DEFORESTATION:	30,253	30,253	30,253	30,253	30,253	30,253	30,253	30,253	30,253	468,106
	NET CARRY FORWARD:	381,437	351,184	320,931	290,678	260,426	230,173	199,920	169,667	139,414	139,414
2.00	ton/hectare/year										
	PREVIOUS AREA UNDER EXPLOITATION (T-1)	346,413	306,076	265,739	225,402	185,065	144,727	104,390	64,053	23,716	N.A.
	ANNUAL INCREMENT OF AREA ON YEAR T	0	0	0	0	0	0	0	0	0	607,520
	TOTAL AREA UNDER EXPLOITATION:	346,413	306,076	265,739	225,402	185,065	144,727	104,390	64,053	23,716	N.A.
	NET ANNUAL DEFORESTATION:	40,337	40,337	40,337	40,337	40,337	40,337	40,337	40,337	40,337	624,141
	NET CARRY FORWARD:	306,076	265,739	225,402	185,065	144,727	104,390	64,053	23,716	-16,621	-16,621

Table 2.3: ECONOMIC VALUE OF AVOIDED NET DEFORESTATION DUE TO SUSTAINABLE FOREST MANAGEMENT

ACCUMULATED NET DEFORESTATION (HA)	1	2	3	4	5	6	7	8	9	10	11
1.00 ton/hectare/year		0	1,067	4,267	9,600	29,710	49,879	70,048	90,216	110,385	130,553
1.50 ton/hectare/year		0	1,600	6,400	14,400	44,566	74,819	105,071	135,324	165,577	195,830
2.00 ton/hectare/year		0	2,133	8,533	19,200	59,421	99,758	140,095	180,432	220,770	261,107
LOSS OF SUSTAINABLE OUTPUT (TONS/YR)											
1.00 ton/hectare/year		0	1,067	4,267	9,600	29,710	49,879	70,048	90,216	110,385	130,553
1.50 ton/hectare/year		0	2,400	9,600	21,600	66,849	112,228	157,607	202,986	248,366	293,745
2.00 ton/hectare/year		0	4,267	17,067	38,400	118,842	199,516	280,191	360,865	441,539	522,214
VALUE OF AVIODED FUELWOOD OUTPUT LOSSES (*)	1	2	3	4	5	6	7	8	9	10	11
1.00 ton/hectare/year @ US$ 20/ton		0	16,000	64,000	144,000	445,657	748,186	1,050,714	1,353,243	1,655,772	1,958,301
1.50 ton/hectare/year @ US$ 20/ton		0	36,000	144,000	324,000	1,002,728	1,683,418	2,364,107	3,044,797	3,725,487	4,406,177
2.00 ton/hectare/year @ US$ 20/ton		0	64,000	256,000	576,000	1,782,627	2,992,742	4,202,858	5,412,973	6,623,088	7,833,203
1.00 ton/hectare/year @ US$ 30/ton		0	32,000	128,000	288,000	891,314	1,496,371	2,101,429	2,706,486	3,311,544	3,916,602
1.50 ton/hectare/year @ US$ 30/ton		0	72,000	288,000	648,000	2,005,456	3,366,835	4,728,215	6,089,594	7,450,974	8,812,354
2.00 ton/hectare/year @ US$ 30/ton		0	128,000	512,000	1,152,000	3,565,254	5,985,485	8,405,715	10,825,946	13,246,176	15,666,406
1.00 ton/hectare/year @ US$ 40/ton		0	42,667	170,667	384,000	1,188,418	1,995,162	2,801,905	3,608,649	4,415,392	5,222,135
1.50 ton/hectare/year @ US$ 40/ton		0	96,000	384,000	864,000	2,673,941	4,489,114	6,304,286	8,119,459	9,934,632	11,749,805
2.00 ton/hectare/year @ US$ 40/ton		0	170,667	682,667	1,536,000	4,753,673	7,980,646	11,207,620	14,434,594	17,661,568	20,888,542

(*) INCORPORATES ALLOWANCE FOR 20% NATURAL REGROWTH AND COUNTS ONLY ACTUAL LOSSES (-CLEARCUT+REGROWTH).

Table 2.3: ECONOMIC VALUE OF AVOIDED NET DEFORESTATION DUE TO SUST. FOREST MGMNT. (Continuation)

ACCUMULATED NET DEFORESTATION (HA)	12	13	14	15	16	17	18	19	20	TOTAL
1.00 ton/hectare/year	150,722	170,891	191,059	211,228	231,396	251,565	271,733	291,902	312,071	312,071
1.50 ton/hectare/year	226,083	256,336	286,589	316,842	347,094	377,347	407,600	437,853	468,106	468,106
2.00 ton/hectare/year	301,444	341,781	382,118	422,455	462,793	503,130	543,467	583,804	624,141	624,141
LOSS OF SUSTAINABLE OUTPUT (TONS/YR)										
1.00 ton/hectare/year	150,722	170,891	191,059	211,228	231,396	251,565	271,733	291,902	312,071	
1.50 ton/hectare/year	339,124	384,504	429,883	475,262	520,642	566,021	611,400	656,780	702,159	
2.00 ton/hectare/year	602,888	683,562	764,237	844,911	925,585	1,006,260	1,086,934	1,167,608	1,248,283	
VALUE OF AVIODED FUELWOOD OUTPUT LOSSES	12	13	14	15	16	17	18	19	20	TOTAL
1.00 ton/hectare/year @ US$ 20/ton	2,260,830	2,563,358	2,865,887	3,168,416	3,470,945	3,773,474	4,076,002	4,378,531	4,681,060	38,674,377
1.50 ton/hectare/year @ US$ 20/ton	5,086,867	5,767,556	6,448,246	7,128,936	7,809,626	8,490,316	9,171,005	9,851,695	10,532,385	87,017,348
2.00 ton/hectare/year @ US$ 20/ton	9,043,318	10,253,434	11,463,549	12,673,664	13,883,779	15,093,894	16,304,010	17,514,125	18,724,240	154,697,506
1.00 ton/hectare/year @ US$ 30/ton	4,521,659	5,126,717	5,731,774	6,336,832	6,941,890	7,546,947	8,152,005	8,757,062	9,362,120	77,348,753
1.50 ton/hectare/year @ US$ 30/ton	10,173,733	11,535,113	12,896,492	14,257,872	15,619,252	16,980,631	18,342,011	19,703,390	21,064,770	174,034,694
2.00 ton/hectare/year @ US$ 30/ton	18,086,637	20,506,867	22,927,098	25,347,328	27,767,558	30,187,789	32,608,019	35,028,250	37,448,480	309,395,010
1.00 ton/hectare/year @ US$ 40/ton	6,028,879	6,835,622	7,642,366	8,449,109	9,255,853	10,062,596	10,869,340	11,676,083	12,482,827	103,131,670
1.50 ton/hectare/year @ US$ 40/ton	13,564,978	15,380,150	17,195,323	19,010,496	20,825,669	22,640,842	24,456,014	26,271,187	28,086,360	232,046,258
2.00 ton/hectare/year @ US$ 40/ton	24,115,516	27,342,490	30,569,463	33,796,437	37,023,411	40,250,385	43,477,359	46,704,333	49,931,307	412,526,679

(*) INCORPORATES ALLOWANCE FOR 20% NATURAL REGROWTH AND COUNTS ONLY ACTUAL LOSSES (-CLEARCUT+REGROWTH).

It is important to note that the main driving parameter of the calculation of the sustainable wood benefits -- and thereto of most other project benefits -- is expected **sustainable forest yield**. Based on the most recent studies[5] it was expected that the average sustainable forest yield in the Tambacounda and Kolda regions of Senegal would be between 1 and 2.5 tons per hectare with a high provability of it being closer to 2.00 tons hectare than to the lower limit. In order to avoid any risk of overestimation of project benefits all base calculation of the evaluation models were done using the lower limit (1.00 ton/ha) as the valid parameter. The implication of this was that if the sustainable yields proved to be higher, all project benefits which are directly related to or pegged to the sustainable wood output will be automatically increased. The actual sustainable yield was indeed confirmed on the field at more than 2.00 tons/hectare, whereby nearly all project benefits should have doubled in the ex-post analysis (see Tables 2.1, 2.2. and 2.3). However, the ex-post analysis was run maintaining the same 1.00 ton/ha, as the Forest Service only authorized the harvesting of 50% of the sustainable yield. It is anticipated that 100% sustainable yield will be authorized within the next two years, but for now, the "effective" sustainable yield being extracted is 1.00 ton/ha.

(ii) Incremental charcoal production: the benefit of the incremental charcoal production expected to result from the promotion of improved kilns was defined as the additional charcoal that was expected to result from a given amount of wood if that was produced with the existing traditional carbonization technology (18%). The improved charcoal kilns that have already been developed and tested in Senegal -- but which were unsuccessfully disseminated in the past for accounted reasons -- was estimated to have a carbonization efficiency of 30 percent. In order to avoid overvaluation of the expected benefits the base calculations were made utilizing only a 25 percent efficiency rate. The economic value of the incremental production in the ex-ante analysis was calculated at the market price of charcoal of **US $190/ton**. It was expected that charcoal prices would rise through time, thus resulting in a higher level of economic benefits for the same level of incremental charcoal production. As of 2004 the market price of charcoal was US $335/ton. However, in the ex-post analysis the incremental production of charcoal was valued, for simplicity, at an averaged market price of **US $285/ton**. The increases in the regulated price was mostly due to a delayed adjustment to account for the devaluation of the FCFA and to account for inflation overtime. Prices used include all relevant taxes. The valuation of this benefits was kept at the market price of charcoal for only the incremental volumes of charcoal produced. No additional "consumer externalities" where added under the understanding that the market price of the charcoal fully reflects consumer valuation for the services imbedded in the product. Also, no environmental externalities were taken into consideration as it would have amounted to double counting of benefits since the environmental benefits of the sustainable wood were already accounted for.

Table 3 presents the detailed ex-post calculation of the benefit of incremental charcoal production for sustainable forest yields of **1.00 tons/ha** to **2.00 tons/ha** and charcoal market prices at **US $285/ton.** The figures presented in Table 3 are the result of model estimates not of actual field data. Actual volumes of charcoal produced by villagers within the project are however fully consistent with the model estimates.

Table 3: VALUE OF INCREMENTAL CHARCOAL PRODUCTION

INCREMENTAL CHARCOAL PRODUCTION (IMPROVED KILNS)	1	2	3	4	5	6	7	8	9	10
Total Wood Output	0	0	20,000	60,000	100,000	377,071	378,161	378,161	378,161	378,161
Charcoal Production @Traditional Convertion Efficiency		0	3,600	10,800	18,000	67,873	68,069	68,069	68,069	68,069
Charcoal Production @Improved Convertion Efficiency		0	5,000	15,000	25,000	94,268	94,540	94,540	94,540	94,540
Incremental Charcoal Production due to Improved Kilns		0	1,400	4,200	7,000	26,395	26,471	26,471	26,471	26,471
VALUE OF INCREMENTAL CHARCOAL PRODUCTION										
$285 US$/ton [DELTA]		0	399,000	1,197,000	1,995,000	7,522,566	7,544,312	7,544,312	7,544,312	7,544,312
$237 US$/ton		0	331,800	995,400	1,659,000	6,255,608	6,273,691	6,273,691	6,273,691	6,273,691
$285 US$/ton		0	399,000	1,197,000	1,995,000	7,522,566	7,544,312	7,544,312	7,544,312	7,544,312

Table 3: VALUE OF INCREMENTAL CHARCOAL PRODUCTION (Continuation)

INCREMENTAL CHARCOAL PRODUCTION (IMPROVED KILNS)	12	13	14	15	16	17	18	19	20	TOTAL
Total Wood Output	378,161	378,161	378,161	378,161	378,161	378,161	378,161	378,161	378,161	5,851,326
Charcoal Production @Traditional Convertion Efficiency	68,069	68,069	68,069	68,069	68,069	68,069	68,069	68,069	68,069	8,776,989
Charcoal Production @Improved Convertion Efficiency	94,540	94,540	94,540	94,540	94,540	94,540	94,540	94,540	94,540	11,702,652
Incremental Charcoal Production due to Improved Kilns	26,471	26,471	26,471	26,471	26,471	26,471	26,471	26,471	26,471	409,593
VALUE OF INCREMENTAL CHARCOAL PRODUCTION										
$285 US$/ton [DELTA]	7,544,312	7,544,312	7,544,312	7,544,312	7,544,312	7,544,312	7,544,312	7,544,312	7,544,312	116,733,934
$237 US$/ton	6,273,691	6,273,691	6,273,691	6,273,691	6,273,691	6,273,691	6,273,691	6,273,691	6,273,691	97,073,482
$285 US$/ton	7,544,312	7,544,312	7,544,312	7,544,312	7,544,312	7,544,312	7,544,312	7,544,312	7,544,312	116,733,934

(iii) <u>global environmental impacts</u>: the benefit of the global environmental impacts expected to result from the implementation of the sustainable and participatory forest/natural resource management systems was defined as the expected net abatement of CO_2 (in tons) and the conservation of bio-diversity in and around the project areas (particularly in the **Niokolo-Koba** National Park) and was valued at the **US $ 1.01/ton** per ton of net CO_2 abated. The rationale for that was the value estimated for the CO_2 abatement utilizing the GEF Incremental Cost and Global Environmental Benefits methodology, and it corresponds to the grant funding provided by GEF for the PROGEDE. The complete Incremental Cost and Global Environmental Benefits assessment of the project at Appraisal is contained in Annex 3 of the SAR. That price is estimated to reflect the global social value of CO_2 abatement. No specific valuation was given to the bio-diversity benefits but their value was assumed to be included in the CO_2 calculations. It is important to note that this was also a very conservative evaluation approach, since it restricted valuation of the benefits to the GEF assessed value at Appraisal. If the ex-post analysis had used rather the current market value of a ton of Co_2 the ex-post value would have been substantially higher. **Table 4** presents the detailed ex-post calculation of the project's achieved global environmental benefits.

(iv) <u>Rural income generation and transfer</u>: the benefit of rural income generation and transfer expected to result from the direct sales of fuelwood by the participating rural communities was valued in the ex-ante evaluation at **US $15/ton**, which was the current estimated "road side" laborer price of woodfuel in the project zone. While that price does not include any valuation for the resource, the economic value of the wood was already accounted within model by the "sustainable wood production" benefit (item **i** above). Also, while it was expected that when the

rural communities took over the "production" of the wood the new producer prices would be higher, the current price at the time was purposely maintained as the base figure to avoid any possible over estimation of the expected benefits. Several higher producer price scenarios were evaluated under the sensitivity analysis. A small **5% income transfer "multiplier"** was added to the calculations. Bank projects that compute income transfers benefits to poor income groups estimate that multiplier value at between 30 to 50 percent. For the ex-post analysis the same **US $15/ton** and **5%** valuation parameters were used.

Table 4: GLOBAL ENVIRONMENTAL BENEFITS

	GLOBAL ENVIRONMENTAL BENEFITS								2004		
	YEARS	1	2	3	4	5	6	7	8	9	10
	WOOD SAVED (TONS)		0	16,000	64,000	144,000	445,657	748,186	1,050,714	1,353,243	1,655,772
	CO2 EQUIVALENT		0	27,200	108,800	244,800	757,617	1,271,916	1,786,214	2,300,513	2,814,812
DELTA	ECONOMIC VALUE OF CO2 ABATEMENT		0	27,472	109,888	247,248	765,193	1,284,635	1,804,077	2,323,519	2,842,961

Table 4: GLOBAL ENVIRONMENTAL BENEFITS (Continuation)

	GLOBAL ENVIRONMENTAL BENEFITS										
	YEARS	12	13	14	15	16	17	18	19	20	TOTAL
	WOOD SAVED (TONS)	2,260,830	2,563,358	2,865,887	3,168,416	3,470,945	3,773,474	4,076,002	4,378,531	4,681,060	38,674,376
	CO2 EQUIVALENT	3,843,410	4,357,709	4,872,008	5,386,307	5,900,606	6,414,905	6,929,204	7,443,503	7,957,802	65,746,439
DELT	ECONOMIC VALUE OF CO2 ABATEMENT	3,881,844	4,401,286	4,920,728	5,440,170	5,959,612	6,479,054	6,998,496	7,517,938	8,037,380	66,403,904

Table 5 presents the detailed calculation of the rural income generation and transfer benefits for sustainable forest yields of **1.00 tons/ha** to **2.00 tons/ha,** producer prices ranging from **US $15/ton** to **US $40/ton,** and **5% income transfer "multiplier".**

Table 5: VALUE OF INCOME TRANSFER TO RURAL COMMUNITIES

	ECONOMIC VALUE OF INCOME TRANSFE	1	2	3	4	5	6	7	8	9	10	11
1.00	ton/hectare/year											
	WOOD SALES COMMUNITY PRODUCERS (TONS)		0	20,000	60,000	100,000	377,071	378,161	378,161	378,161	378,161	378,161
	VALUE OF WOOD SALES AT MARKET PRICE		0	2,800,000	8,400,000	14,000,000	52,789,940	52,942,540	52,942,540	52,942,540	52,942,540	52,942,540
	INCOME TRANSFER TO RURAL COMMUNITIES		0	300,000	900,000	1,500,000	5,656,065	5,672,415	5,672,415	5,672,415	5,672,415	5,672,415
DELTA	ECONOMIC VALUE OF INCOME TRANSFER		0	315,000	945,000	1,575,000	5,938,868	5,956,036	5,956,036	5,956,036	5,956,036	5,956,036
DELTA	VALUE OF "OTHER" EXPECTED REVENUES		0	0	0	0	0	0	0	0	0	0
1.50	ton/hectare/year											
	WOOD SALES COMMUNITY PRODUCERS (TONS)		0	30,000	90,000	150,000	565,607	567,242	567,242	567,242	567,242	567,242
	VALUE OF WOOD SALES AT MARKET PRICE		0	4,200,000	12,600,000	21,000,000	79,184,910	79,413,810	79,413,810	79,413,810	79,413,810	79,413,810
	INCOME TRANSFER TO RURAL COMMUNITIES		0	450,000	1,350,000	2,250,000	8,484,098	8,508,623	8,508,623	8,508,623	8,508,623	8,508,623
	ECONOMIC VALUE OF INCOME TRANSFER		0	472,500	1,417,500	2,362,500	8,908,302	8,934,054	8,934,054	8,934,054	8,934,054	8,934,054
	VALUE OF "OTHER" EXPECTED REVENUES		0	0	0	0	0	0	0	0	0	0
2.00	ton/hectare/year											
	WOOD SALES COMMUNITY PRODUCERS (TONS)		0	40,000	120,000	200,000	754,142	756,322	756,322	756,322	756,322	756,322
	VALUE OF WOOD SALES AT MARKET PRICE		0	5,600,000	16,800,000	28,000,000	105,579,880	105,885,080	105,885,080	105,885,080	105,885,080	105,885,080
	INCOME TRANSFER TO RURAL COMMUNITIES		0	600,000	1,800,000	3,000,000	11,312,130	11,344,830	11,344,830	11,344,830	11,344,830	11,344,830
	ECONOMIC VALUE OF INCOME TRANSFER		0	630,000	1,890,000	3,150,000	11,877,737	11,912,072	11,912,072	11,912,072	11,912,072	11,912,072
	VALUE OF "OTHER" EXPECTED REVENUES		0	0	0	0	0	0	0	0	0	0

Table 5: VALUE OF INCOME TRANSFER TO RURAL COMMUNITIES (Continuation)

	ECONOMIC VALUE OF INCOME TRANS	12	13	14	15	16	17	18	19	20
1.00	ton/hectare/year									
	WOOD SALES COMMUNITY PRODUCERS (TONS)	378,161	378,161	378,161	378,161	378,161	378,161	378,161	378,161	378,161
	VALUE OF WOOD SALES AT MARKET PRICE	52,942,540	52,942,540	52,942,540	52,942,540	52,942,540	52,942,540	52,942,540	52,942,540	52,942,540
	INCOME TRANSFER TO RURAL COMMUNITIES	5,672,415	5,672,415	5,672,415	5,672,415	5,672,415	5,672,415	5,672,415	5,672,415	5,672,415
DELTA	ECONOMIC VALUE OF INCOME TRANSFER	5,956,036	5,956,036	5,956,036	5,956,036	5,956,036	5,956,036	5,956,036	5,956,036	5,956,036
DELTA	VALUE OF "OTHER" EXPECTED REVENUES	0	0	0	0	0	0	0	0	0
1.50	ton/hectare/year									
	WOOD SALES COMMUNITY PRODUCERS (TONS)	567,242	567,242	567,242	567,242	567,242	567,242	567,242	567,242	567,242
	VALUE OF WOOD SALES AT MARKET PRICE	79,413,810	79,413,810	79,413,810	79,413,810	79,413,810	79,413,810	79,413,810	79,413,810	79,413,810
	INCOME TRANSFER TO RURAL COMMUNITIES	8,508,623	8,508,623	8,508,623	8,508,623	8,508,623	8,508,623	8,508,623	8,508,623	8,508,623
	ECONOMIC VALUE OF INCOME TRANSFER	8,934,054	8,934,054	8,934,054	8,934,054	8,934,054	8,934,054	8,934,054	8,934,054	8,934,054
	VALUE OF "OTHER" EXPECTED REVENUES	0	0	0	0	0	0	0	0	0
2.00	ton/hectare/year									
	WOOD SALES COMMUNITY PRODUCERS (TONS)	756,322	756,322	756,322	756,322	756,322	756,322	756,322	756,322	756,322
	VALUE OF WOOD SALES AT MARKET PRICE	105,885,080	105,885,080	105,885,080	105,885,080	105,885,080	105,885,080	105,885,080	105,885,080	105,885,080
	INCOME TRANSFER TO RURAL COMMUNITIES	11,344,830	11,344,830	11,344,830	11,344,830	11,344,830	11,344,830	11,344,830	11,344,830	11,344,830
	ECONOMIC VALUE OF INCOME TRANSFER	11,912,072	11,912,072	11,912,072	11,912,072	11,912,072	11,912,072	11,912,072	11,912,072	11,912,072
DELTA	VALUE OF "OTHER" EXPECTED REVENUES	0	0	0	0	0	0	0	0	0

(v) "Other" rural revenues: In the ex-ante analysis, the benefit of "other" rural revenues expected to result from the development of parallel agro-forestry production activities in the participating communities was valued as a linear function (**20 percent**) of the total revenues expected from the sale of woodfuels by the communities. The rationale for that was that as the rural communities perceive an income from the sale of woodfuels they would have income to invest in other productive activities. The project included support mechanisms and resources to assist communities which were prepare to invest their own resources and labor in other economic activities. As revenues from woodfuels increase through time (or under the different parametric scenarios tested) the availability of community investment funds for other activities would also increase resulting in increased revenues from those activities. In the ex-post evaluation the linear function approach was replaced by **actual incremental incomes** received by the rural communities. Total incremental income to participating villages was calculated at full implementation at **US $12,530,732**. That figure is composed of the sale of woodfuels and of the sale of a broad range of new village products, as such the figures included under "other rural revenues" are not the total annual incremental sales but just that of non-woodfuel products. The income from the sale of woodfuels was already taken into account by the model in the computation of the sustainable wood production and incremental charcoal production. Counting total incremental revenues here would have constituted double counting. The detailed calculation of the benefit from "other" expected rural revenues is included in **Table 5**.

(vi) charcoal saving: the benefit of charcoal saving expected to result from the promotion of 225,000 improved charcoal stoves in the principal urban areas was defined as the net saving expected to result from the use of improved charcoal stoves and was calculated on the basis of the improved stoves disseminated with support from the project and expected to be in actual use at each year during the project. The incremental energy efficiency differential between the traditional and the improve stoves was estimated at **40 percent**. Based on the use of improved charcoal stove a family that today consumes 5 kilograms of charcoal per day would need to consume only 3 kilograms for the same final useful energy service. That calculation took into account actual stove production and a 3-year stove life cycle. In the ex-ante evaluation the actual economic value of the charcoal saved was computed at the market price of charcoal of **US $190/ton**. In the ex-post analysis a price of **US $285/ton** was used. As in the case of the valuation of the improved charcoal kilns it was expected that as charcoal prices rose so would the level of economic benefits from the use of improved charcoal stoves. While charcoal saving might be considered a "cost saving" rather than a benefit, for the purpose of the project charcoal savings were counted as a benefit because the introduction of improved stoves actually resulted in a reduction of household expenditure without a loss in energy end-use service.

Table 6 presents the detailed ex-post calculation of the expected charcoal saving taking into account the **actual** annual stove promotion achievement of the project, and stove life cycles and charcoal market prices at **US $285/ton.**

Table 6: VALUE OF CHARCOAL SAVING DUE TO IMPROVED STOVES USE

		1998	1999	2000	2001	2002	2003	2004				
	Charcoal savings due to Improved Stove Use	1	2	3	4	5	6	7	8	9	10	11
DELTA	Stoves Life cycle (@ 3 years per Stove)		0	0	0				100,000	100,000	100,000	
				0	0	0				90,000	90,000	90,000
					0	0	0				80,000	80,000
						20,000	20,000	20,000				70,000
							63,000	63,000	63,000			
								154,296	154,296	154,296		
DELTA	ACTUAL TOTAL NEW STOVES DISSEMINATED		0	0	0	20,000	63,000	154,296	100,000	90,000	80,000	70,000
	TOTAL OF STOVES IN OPERATION PER YEAR		0	0	0	20,000	83,000	237,296	317,296	344,296	270,000	240,000
	TONS of Charcoal consumption with Traditional Stove (20% efficiency)		50	150	300	450	625	825	975	1,050	1,050	1,050
	TONS of Charcoal consumption with Improved Stove (40% efficiency)		30	90	180	270	375	495	585	630	630	630
	Estimated Charcoal savings (TONS) due to Improved Stoves use:		20	60	120	180	250	330	390	420	420	420
	Economic Value of Charcoal Savings at:											
DELTA	US $335/ton		5,700	17,100	34,200	51,300	71,250	94,050	111,150	119,700	119,700	119,700
	US $237/ton		4,740	14,220	28,440	42,660	59,250	78,210	92,430	99,540	99,540	99,540
	US $285/ton		5,700	17,100	34,200	51,300	71,250	94,050	111,150	119,700	119,700	119,700

Table 6: VALUE OF CHARCOAL SAVING DUE TO IMPROVED STOVES USE (Continuation)

	Charcoal savings due to Improved Stove Use	12	13	14	15	16	17	18	19	20	TOTAL
DELTA	Stoves Life cycle (@ 3 years per Stove)			40,000	40,000	40,000				0	
					30,000	30,000	30,000				
		80,000				20,000	20,000	20,000			
		70,000	70,000				10,000	10,000	10,000		
		60,000	60,000	60,000				0	0	0	
			50,000	50,000	50,000				0	0	
	ACTUAL TOTAL NEW STOVES DISSEMINATED	60,000	50,000	40,000	30,000	20,000	10,000	0	0	0	787,296
	TOTAL OF STOVES IN OPERATION PER YEAR	210,000	180,000	150,000	120,000	90,000	60,000	30,000	10,000	0	2,361,888
	TONS of Charcoal consumption with Traditional Stove (20% efficie	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	15,975
	TONS of Charcoal consumption with Improved Stove (40% efficier	630	630	630	630	630	630	630	630	630	9,585
	Estimated Charcoal savings (TONS) due to Improved Stoves use:	420	420	420	420	420	420	420	420	420	6,390
	Economic Value of Charcoal Savings at:										
DELTA	US $335/ton	119,700	119,700	119,700	119,700	119,700	119,700	119,700	119,700	119,700	1,821,150
	US $237/ton	99,540	99,540	99,540	99,540	99,540	99,540	99,540	99,540	99,540	1,514,430
	US $285/ton	119,700	119,700	119,700	119,700	119,700	119,700	119,700	119,700	119,700	1,821,150

Discount Rate

18. A flat discount rate of **12 percent** was applied to all project components and sub-components for both the ex-ante and ex-post evaluation of the project.

Ex-Post Evaluation Results

19. While the ex-ante 20-year horizon evaluation of the project resulted in an Economic Rate of Return (ERR) of **37.35%** and a net present value (NPV) at 12 percent discount rate of **US $ 34,235 million,** the

ex-post analysis obtained an Economic Rate of Return (ERR) of **137.55%** and a net present value (NPV) at 12 percent discount rate of **US $ 96.1 million**. **Tables 7** and **Figure 2** present the summary of project costs and benefits flows, and **Table 8** presents the economic evaluation of the project. **Figure 3** and **4** present the project's costs and benefits streams and the net cost-benefit flow, respectively. According to these economic evaluation results, PROGEDE was an ***extremely successful*** investment project.

20. The ex-post evaluation resulted in a **substantially higher** return than the one anticipated, even under the high-end variants of the ex-ante sensitivity analysis. The highly successful implementation performance is responsible for a substantive part of that difference, specially: **(i)** substantially higher than expected "**other rural revenues**" (417.7 % over SAR level); **(ii)** significantly higher **Net CO2 emission reductions** (312.3 % over SAR level); and, **(iii)** higher than expected **sustainable woodfuel production** (123.5 % over SAR level). However, there are three non-output factors which contributed to the high ex-post valuation of the project: **(i)** the project's actual disbursement profile went from being 70 % front-loaded at Appraisal to 70 % back-loaded at ICR. The effect of the 12 % discount rate over that disbursement shift more than doubled the ERR and the NPV; **(ii)** the market price of charcoal increased from US $190 per ton at Appraisal to US $335 ton at ICR. The ex-post evaluation used a value of US $285 as average, which corresponded to the highest value considered within the ex-ante sensitivity analysis; **(iii)** the market price of wood also increased from about US $80 per ton at Appraisal to US $140 ton at ICR, which corresponded to the highest value considered within the ex-ante sensitivity analysis.

21. While it is clear that the original calculations and economic valuation were substantially lower than the actual figures, which should not be attributed to an underestimation of expectation. Rather -- after discounting the "distortionary" impact of the shift in the project's disbursement profile -- this project left behind an extremely robust economic return and a valuable lesson as to the **poverty alleviation** value of **multi-sectorial community-based natural resource management** interventions in Senegal, and by extension, in other African countries with similar contexts.

Sensitivity Analysis

22. While a comprehensive sensitivity analysis was done as part of the ex-ante evaluation there was no need for repeating that part of the methodology in the ex-post evaluation.

Table 7: SUMMARY OF PROJECT COSTS AND BENEFITS FLOWS

	PROJECT COSTS & BENEFITS FLOWS											
	YEARS	1	2	3	4	5	6	7	8	9	10	11
A. PROJECT COSTS												
	COMPONENT I (PREPARATION)	3,858										
	COMPONENT II (SUPPLY)		2,542	2,566	2,506	1,859	1,962	1,603	150	135	122	109
	COMPONENT III (DEMAND)		1,053	800	515	280	200	190	40	36	32	29
	ORIGINAL TOTAL COSTS	3,858	3,594	3,366	3,021	2,139	2,162	1,793	190	171	154	139
DELTA	ACTUAL TOTAL COSTS	0	1,012	1,606	2,473	2,521	2,491	2,864	6,729	171	154	139
B. PROJECT BENEFITS												
	VALUE OF SUSTAINABLE WOOD		0	16	64	144	446	748	1,051	1,353	1,656	1,958
	VALUE OF INCREMENTAL CHARCOAL PRODUCTION		0	399	1,197	1,995	7,523	7,544	7,544	7,544	7,544	7,544
	VALUE OF GLOBAL ENV. IMPACTS (CO2 + BIO)		0	27	110	247	765	1,285	1,804	2,324	2,843	3,362
	VALUE OF INCOME GENERATION /TRANSFER		0	315	945	1,575	5,939	5,956	5,956	5,956	5,956	5,956
DELTA	ACTUAL VALUE OF "OTHER" EXPECTED REVENUES		0	0	443	2,647	4,479	7,469	7,500	7,500	7,500	7,500
	VALUE OF CHARCOAL SAVINGS (STOVES)		6	17	34	51	71	94	111	120	120	120
	ACTUAL TOTAL QUANTIFIABLE BENEFITS	0	6	775	2,793	6,660	19,223	23,096	23,966	24,797	25,619	26,441

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Table 7: SUMMARY OF PROJECT COSTS AND BENEFITS FLOWS (Continuation)

	PROJECT COSTS & BENEFITS FLOWS										
	YEARS	12	13	14	15	16	17	18	19	20	TOTAL
A. PROJECT COSTS											
	COMPONENT I (PREPARATION)										3,858
	COMPONENT II (SUPPLY)	98	89	80	72	65	58	52	47	42	14,156
	COMPONENT III (DEMAND)	26	24	21	19	17	15	14	13	11	3,336
	ORIGINAL TOTAL COSTS										
DELTA	ACTUAL TOTAL COSTS	125	112	101	91	82	74	66	60	54	20,923
B. PROJECT BENEFITS											
	VALUE OF SUSTAINABLE WOOD	2,261	2,563	2,866	3,168	3,471	3,773	4,076	4,379	4,681	38,674
	VALUE OF INCREMENTAL CHARCOAL PRODUCTION	7,544	7,544	7,544	7,544	7,544	7,544	7,544	7,544	7,544	116,734
	VALUE OF GLOBAL ENV. IMPACTS (CO2 + BIO)	3,882	4,401	4,921	5,440	5,960	6,479	6,998	7,518	8,037	66,404
	VALUE OF INCOME GENERATION /TRANSFER	5,956	5,956	5,956	5,956	5,956	5,956	5,956	5,956	5,956	92,158
DELTA	ACTUAL VALUE OF "OTHER" EXPECTED REVENUES	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	112,538
	VALUE OF CHARCOAL SAVINGS (STOVES)	120	120	120	120	120	120	120	120	120	1,821
	ACTUAL TOTAL QUANTIFIABLE BENEFITS	27,263	28,085	28,907	29,729	30,551	31,373	32,195	33,017	33,838	428,330

FIGURE 2
PROGEDE / ICR: Quantifiable Project Benefits (20 -Year Horizon)

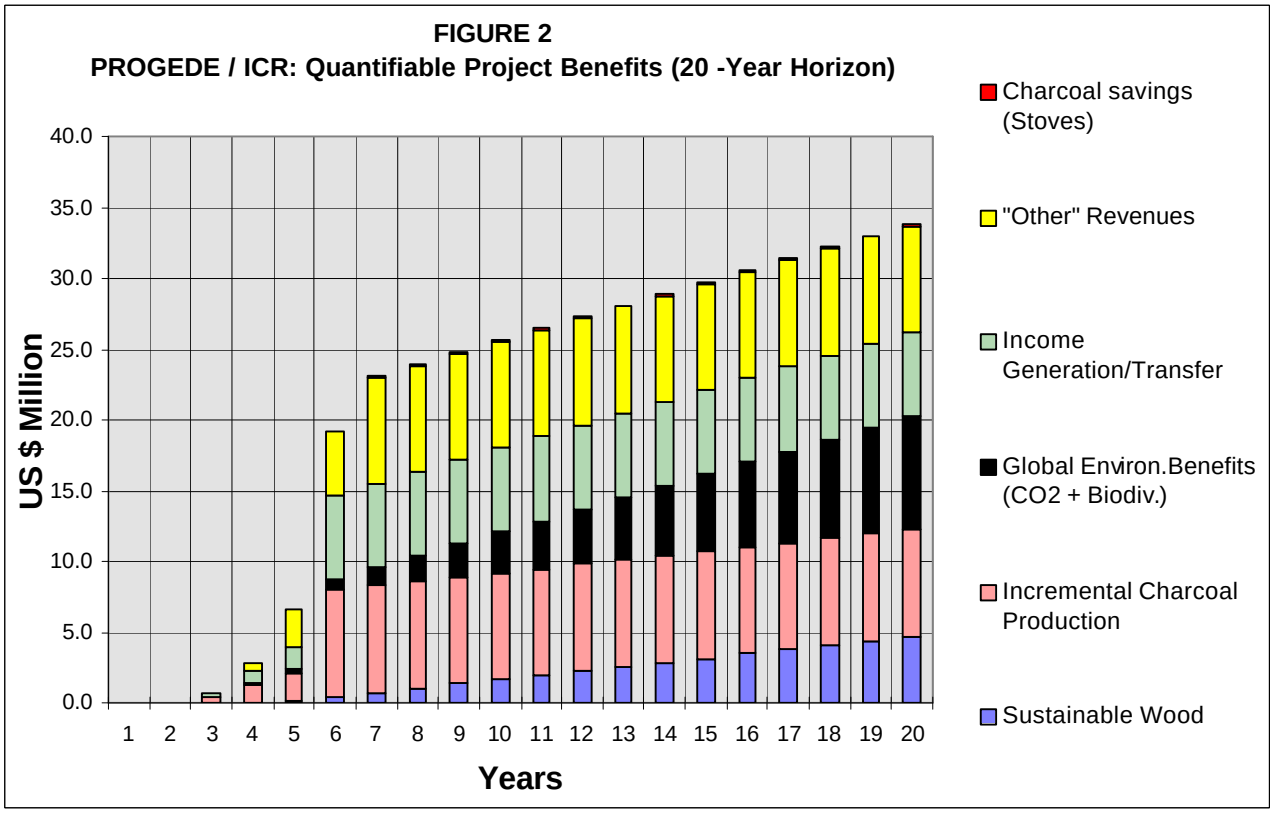


Table 8: ECONOMIC ANALYSIS OF PROJECT (20-YEAR HORIZON)

PRIMARY PARAMETIRC VARIABLES	Actual Value	Alt - 1	Alt - 2
Forest Yield (ton/ha/year):	1.00	1.50	2.00
Fuelwood Sustainable Producer Price (US$/ton):	15.00	30.00	40.00
Improved charcoal kilns efficiency:	0.25		
Ratio of "Other" Income (% of Woodfuel revenue):	0.00		
Market Price of Charcoal (US$/ton):	285.00	237.00	285.00

SECONDARY PARAMETIRC VARIABLES	Actual Value	Alt - 1	Alt - 2
Clear-cut Yield (ton/ha):	15.00		
Natural Regrowth function (annual %):	0.20		
Value of CO2 Abatement+Bio Conserv. (US$/ton):	1.01		
Market Price of Fuelwood (US$/ton):	140.00	120.00	140.00
Economic Value of Income Transfer:	1.05		
Incremental Efficiency of Charcoal Stoves:	0.40		

SENEGAL: PROGEDE / ICR — Basis: US $ MILLION

PROJECT COMPONENTS: I + II + III

	1997	1998	1999	2000	2001	2002	2003	2004			
YEARS	1	2	3	4	5	6	7	8	9	10	11
TOTAL COSTS	0	-1,012	-1,606	-2,473	-2,521	-2,491	-2,864	-6,729	-171	-154	-139
TOTAL BENEFITS	0	6	775	2,793	6,660	19,223	23,096	23,966	24,797	25,619	26,441
NET COST-BENEFIT FLOW	0	-1,006	-831	320	4,139	16,732	20,232	17,237	24,626	25,465	26,302
ACTUAL COST/BENEFITS FLOW:	0	-1,006	-831	320	4,139	16,732	20,232	17,237	24,626	25,465	26,302

YEARS	12	13	14	15	16	17	18	19	20	TOTAL
TOTAL COSTS	-125	-112	-101	-91	-82	-74	-66	-60	-54	-20,923
TOTAL BENEFITS	27,263	28,085	28,907	29,729	30,551	31,373	32,195	33,017	33,838	428,330
NET COST-BENEFIT FLOW	27,138	27,972	28,806	29,638	30,469	31,299	32,128	32,957	33,785	407,407
ACTUAL COST/BENEFITS FLOW:	27,138	27,972	28,806	29,638	30,469	31,299	32,128	32,957	33,785	

Actual Internal Rate of Return:	ERR	137.55%
Actual Net Present value (12%):	NPV	96,109

FIGURE 3
PROGEDE / ICR: PROJECT COSTS & BENEFITS (20-Years Horizon)

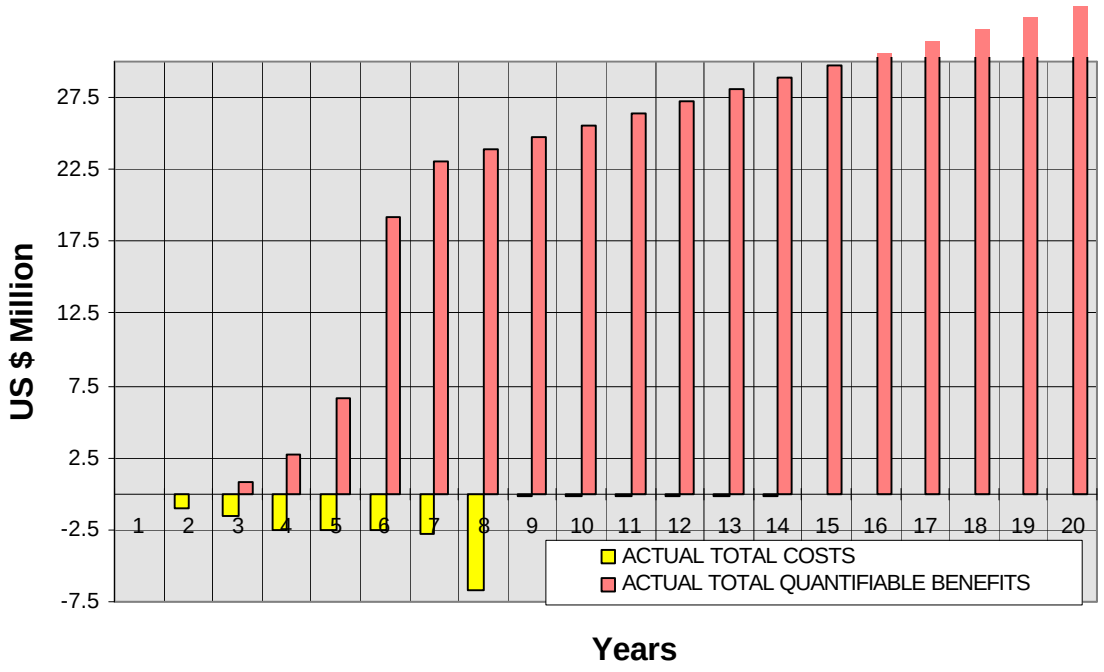
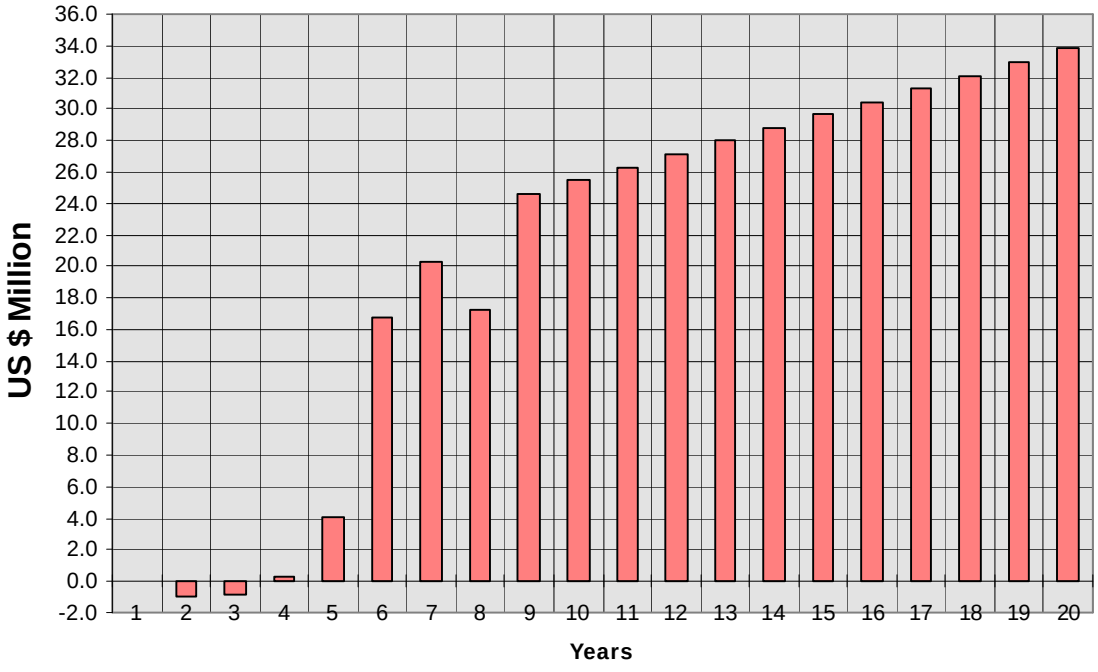


FIGURE 4
PROGEDE / ICR: NET COSTS-BENEFITS FLOW (20-Year Horizon)



[1] Data from plantation projects through-out Africa indicate a total cost range of US $ 450 to US $750 per hectare, where the higher end corresponds to projects within Sahelian edafoclimatic conditions and the lower end to projects in East and Southern Africa.

[2] This has been widely agreed upon and implemented in several forestry/natural resource/energy related Bank projects such as “Niger Energie II” and “ Mali Energie Domestique”.

[3] Although it is normal practice to exclude non-productive components from economic analyses -- as it is difficult to calculate specific economic returns on things such as institutional development, capacity building, etc. -- in the case of the proposed project it was judged that those investments could not be dissociated from the expected project outcomes. If such investments are made and the project does not achieve its proposed objectives, they would amount to an unequivocal misallocation of scarce investment resources. In practical terms, the impact of including all project cost represent an added burden of proof for the overall merits of the project.

[4] If only the costs of the supply side management sub-components are taken into account cost of the implementation of community-based sustainable forest management systems would be of the order of US $ 53/hectare. If only the direct field investment costs are taken into account the cost per hectare would come down to US $ 35/hectare.

[5] Jensen, Axel M., Elements d’economie spatiale des energies traditionnelles, RPTES Discussion Paper Series, World Bank, October 1994.

Annex 4. Bank Inputs

(a) Missions:

Stage of Project Cycle	No. of Persons and Specialty (e.g. 2 Economists, 1 FMS, etc.)		Performance Rating	
Month/Year	Count	Specialty	Implementation Progress	Development Objective
Identification/Preparation				
Multiple RPTES Program missions between 1995 and 1997	*4 - 6*	RPTES PROGRAM MULTI-SECTORIAL / MULTI-DISCIPLINARY TEAM (BANK STAFF + CONSULTANTS)		
Appraisal/Negotiation				
03/17/1997		TEAM LEADER/SR. ECONOMIST (1); SR. LAWYER (1); ECONOMIST (2); PARTICIPATION SP. (1); FINANCIAL SP. (1); PROCUREMENT SP. (1); DISBURSEMENT SP. (1); OPERATIONS ANALYST (1); DUTCH COOPERATION (2); ACS (1).		
Supervision				
03/03/1998	*4*	TTL / SR. ECONOMIST (1); ECONOMIST (1); PARTICIPAT. SP. (1); ACS (1).	S	S
11/21/1998	*4*	TTL / SR. ECONOMIST (1); OPERATIONS ANALYST (1); ACS (1).	S	S
01/24/2000	*9*	TTL / SR. ECONOMIST (1); ECONOMIST (1); FINANCIAL SP. (1);PARTICIPATION SP. (1); PROCUREMENT SP. (1); DISBURSEMENT SP. (1); OPERATIONS ANALYST (1); FORESTRY SP. / DUTCH EMBASSY (1); ACS (1).	S	S
04/04 /2001	*4*	ECONOMIST (1); PARTICIPATION SP. (1); SR. OPERATIONS ANALYST (1); ACS (1).	S	S
05/06/2002	*8*	TTL / SR. ECONOMIST (1); ECONOMIST (1); ENERGY ECONOMIST (1); PARTICIPATION SP. (1);	S	S

			FORESTRY/NRM SPEC (1); FINANCIAL MNGT. (1); PROCUREMENT SP.(1); ACS (1).		
	06/02/2003	*10*	TTL / SR. ECONOMIST (1); COUNTRY DIRECTOR (1); LEAD ENVIRONMENTAL SP. (1); ENERGY ECONOMIST (1); SOCIAL DEVELOPMENT SP. (1); 1ST.SECRET.DUTCH EMB. (1); DECENTRALIZATION SP./DGIS CONSULTANT) (1); PROCUREMENT SP. (1); FINANCIAL SP. (1); ACS (1).	S	HS
	03/18/2004	*8*	TTL / SR. ECONOMIST (1); ENERGY ECONOMIST (1); SOCIAL DEVELOPMENT SP. (1); RURAL DEVELOPMENT SP. (1); RURAL TRANSPORT SP. (1) PROCUREMENT SP. (1); ACS (1); FINANCIAL SP. (1)	HS	HS
ICR	04/21/05	*6*	TTL / SR. ECONOMIST (1); ENERGY ECONOMIST (1); SOCIAL DEVELOPMENT SP. (1); PROCUREMENT SP. (1); FINANC. SP. (1); ACS (1).	HS	HS

(b) Staff:

Stage of Project Cycle	Actual/Latest Estimate	
	No. Staff weeks	US$ ('000)
Identification/Preparation	200	200
Appraisal/Negotiation	30	60
Supervision	250	600
ICR	20	40
Total	500	900

Note: More than 50 percent of the project's preparation and supervision costs were funded from trust funds from the RPTES Program as the majority of the project team was externally funded staff until 2004. Fifty percent of the staff time allocated to supervision came from field-based local staff.

Annex 5. Ratings for Achievement of Objectives/Outputs of Components

(H=High, SU=Substantial, M=Modest, N=Negligible, NA=Not Applicable)

	Rating				
☒ *Macro policies*	○ *H*	● *SU*	○ *M*	○ *N*	○ *NA*
☒ *Sector Policies*	○ *H*	○ *SU*	● *M*	○ *N*	○ *NA*
☒ *Physical*	○ *H*	○ *SU*	○ *M*	○ *N*	● *NA*
☒ *Financial*	○ *H*	● *SU*	○ *M*	○ *N*	○ *NA*
☒ *Institutional Development*	● *H*	○ *SU*	○ *M*	○ *N*	○ *NA*
☒ *Environmental*	● *H*	○ *SU*	○ *M*	○ *N*	○ *NA*
Social					
☒ *Poverty Reduction*	● *H*	○ *SU*	○ *M*	○ *N*	○ *NA*
☒ *Gender*	● *H*	○ *SU*	○ *M*	○ *N*	○ *NA*
☐ *Other (Please specify)*	○ *H*	○ *SU*	○ *M*	○ *N*	○ *NA*
☒ *Private sector development*	● *H*	○ *SU*	○ *M*	○ *N*	○ *NA*
☒ *Public sector management*	● *H*	○ *SU*	○ *M*	○ *N*	○ *NA*
☐ *Other (Please specify)*	○ *H*	○ *SU*	○ *M*	○ *N*	○ *NA*

Annex 6. Ratings of Bank and Borrower Performance

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HU=Highly Unsatisfactory)

6.1 Bank performance	*Rating*			
☐ *Lending*	● *HS*	○ *S*	○ *U*	○ *HU*
☐ *Supervision*	● *HS*	○ *S*	○ *U*	○ *HU*
☐ *Overall*	● *HS*	○ *S*	○ *U*	○ *HU*

6.2 Borrower performance	*Rating*			
☐ *Preparation*	● *HS*	○ *S*	○ *U*	○ *HU*
☐ *Government implementation performance*	○ *HS*	● *S*	○ *U*	○ *HU*
☐ *Implementation agency performance*	● *HS*	○ *S*	○ *U*	○ *HU*
☐ *Overall*	● *HS*	○ *S*	○ *U*	○ *HU*

Annex 7. List of Supporting Documents

1. Staff Appraisal Report (SAR), May 23, 1997.

2. Development Credit Agreement No. 2963-SE.

3. Global Environment Facility Trust Fund Grant Agreement No. TF 28365-SE.

4. Lettre de Politique de Developpement du Secteur de l'Energie, 30 Janvier 1997.

5. PROGEDE: Independent Social Impact Assessment, March 2004.

6. Special PROGEDE Supervision Report, May 2004, (including Annex 4 in the PAD for the "Senegal Rural Electrification Project").

7. Special Supervision Report: Notes on the transport situation in the PROGEDE Zone, March 2004.

8. IDA Mission Aide Memoires.

9. IDA Staff Supervision Reports (BTOs).

10. Project/Internal Order Cost Detail Reports.

11. PROGEDE: Progress Reports PCU.

12. AFTEG/RPTES: Special Knowledge Management Report and Presentations.

13. "Programme Pour la Gestion Durable et Participative des Energies Traditionnelles et de Substitution" (SPEMP DRAFT Project Implementation Document), Government of Senegal, Ministry of Environment and Protection of Nature and Ministry of Energy, Mines and Industry. November 1996.

14. Manuel de Procedures pour le Programme Pour la Gestion Durable et Participative des Energies Traditionnelles et de Substitution. (Draft), Gouvernement du Senegal, Mars 1997.

15. Senegal Sustainable and Participatory Energy Management Project: Environmental Discussion Note, Boris E. Utria (AF5IE), 1996.

16. Le Secteur des Energies Traditionnelles: Analyse, Strategie et Programme d'Actions et Fiches-Projects, Republique du Senegal/RPTES Program, Mars 1995.

17. PROGEDE: Amelioration du Systeme de Suivi et Controle des Flux des Combustibles Ligneux Domestiques, Republique du Senegal, decembre 1998.

18. PROGEDE: Repertoire des Equipments et des Actuers du Sous-Secteur des Combustibles Domestiques, Pape-Alassane-DEME, Republique du Senegal, Octobre 2001.

19. PROGEDE: Programme d'Education Environnementale Formelle: Ecole Elementaire, Avril 1999.

20. PROGEDE: Rapport d'Audit Organisationnel, Juillet 1999.

Additional Annex 8. Comments from the Borrower

REPUBLIQUE DU SENEGAL

MINISTERE DE L'ENVIRONNEMENT ET DE LA PROTECTION DE LA NATURE

MINISTERE DE L'ENERGIE ET DES MINES

PROGRAMME DE GESTION DURABLE ET PARTICIPATIVE DES ENERGIES TRADITIONNELLES ET DE SUBSTITUTION

UNITE DE COORDINATION DU PROGRAMME

B.P. 1831 DAKAR SENEGAL Tel : (221) 859 20 51 Fax : (221) 832.47.39 E.Mail: cro@sentoo.sn

Le Gouvernement du Sénégal a donné un avis favorable au financement du Programme de Gestion Durable et Participative des Energies Traditionnelles et de Substitution PROGEDE pour la période allant de 01/12/1998 au 31/12/2004

Dakar, Avril 2005

I. INTRODUCTION

1. Le Programme de Gestion Durable et Participative des Energies Traditionnelles et de Substitution (PROGEDE) a bénéficié du soutien financier de la Banque Mondiale, du Fond pour l'Environnement Mondial (FEM), du Royaume des Pays-Bas et de l'Etat du Sénégal pour un montant total de 19.90 millions de dollars US, dont 1.20 millions de dollars de contribution de l'Etat du Sénégal sous forme de contrepartie.

2. La mise en vigueur du Programme est le résultat d'un long processus de réflexions initié en 1993 dans le cadre du Programme Régional pour le Secteur des Energies Traditionnelles (RPTES) sous l'égide de la Banque Mondiale.

3. Le Programme est placé sous la double tutelle administrative des Ministères en charge de l'Environnement et de l'Energie. ***Il a comme objectif stratégique de contribuer à l'approvisionnement durable des ménages en combustibles domestiques en leur offrant des choix élargis de confort tout en préservant l'environnement.***

4. Cette option procède d'une analyse qui a mis en évidence, dans le sous-secteur des combustibles domestiques, un ensemble de facteurs déterminants et de contraintes tels que :

- la prépondérance structurelle des combustibles ligneux (90% des besoins en énergie domestique des ménages) dans le bilan énergétique du pays occasionnant une dégradation profonde et continue des ressources forestières ;

- le déséquilibre de la filière bois-énergie marqué par de faibles retombées dans les terroirs qui supportent l'exploitation forestière, la valeur ajoutée de la filière étant surtout distribuée entre exploitants, transporteurs et coxeurs ;

- une faible valorisation du bois par des redevances et des prix au consommateur en deçà de la valeur de la ressource ligneuse et adoption de techniques de carbonisation peu efficientes comme la meule traditionnelle ;

- une volonté d'implication des populations dans la gestion des ressources forestières.

5. L'option d'implication et de responsabilisation des populations dans la gestion des ressources forestières s'est approfondie par les lois sur la décentralisation et la régionalisation qui ont consacré le transfert de compétences aux collectivités locales en matière de gestion des ressources naturelles et d'environnement en 1996.

6. Il faut aussi noter que le programme a été approuvé dans un contexte particulier de réformes du secteur de l'énergie et l'adoption d'un code forestier favorisant une meilleure responsabilisation des populations riveraines des forêts dans la gestion de celles-ci afin de mieux matérialiser la politique de décentralisation initié par l'Etat.

7. La particularité du PROGEDE, est d'avoir pu évoluer dans cet environnement de réformes et de convaincre qu'avec l'approche participative et la collaboration de deux Ministères et de plusieurs services déconcentrés de l'Etat, il était possible de travailler en synergie pour un objectif commun et atteindre des

résultats tangibles.

8. La mise en œuvre du programme a permis de transformer les visions et orientations audacieuses et même jugées parfois périlleuses que portaient ces réformes, à des réalités perceptibles aussi bien du point de vue institutionnel, organisationnel, technique et socio-économique.

II. CADRE INSTITUTIONNEL

9. Le cadre institutionnel du projet est marqué par trois entités distinctes mais complémentaires, sur lesquelles il s'est beaucoup appuyé dans sa mise en œuvre :

- La Composante Régulation de l'Offre combustibles ligneux placée sous la tutelle technique de la Direction des Eaux et Forêts, intervient dans la mise en œuvre de schémas d'aménagement forestier, participatif et intégré dans les régions de Tamba et Kolda..

- La Composante Gestion de la Demande et Promotion des Energies de Substitution basée à DAKAR, sous la tutelle technique de la Direction de l'Energie, intervient sur l'ensemble du territoire national dans le cadre de la promotion des énergies de substitution.

- L'Unité de Coordination du Projet logée au sein de la Direction des Eaux et Forêts sert de relais aux deux premières entités et s'occupe des affaires administratives et financières du projet.

10. Le PROGEDE est aussi doté d'un Comité Technique regroupant les Directions de tutelles techniques et financières (DEFFCS, DE, DDI, DCEF), les Bailleurs (IDA, Pays Bas) et la Coordination du projet. d'un Comité de Suivi et d'Orientation (CSO), organe consultatif, chargé de définir les orientations politiques et stratégiques et de deux Comités Régionaux de Suivi et d'Orientation (CRSO), créés par arrêté des Gouverneurs de Tamba et de Kolda.

III. EVOLUTION DU PROGEDE

11. La mise en vigueur du Programme a démarré le 24 décembre 1997, en référence à la date de l'arrêté interministériel n° 10291 portant création, organisation et fonctionnement du Programme.

12. Les trois premières années du projet (1998 – 2000) qui correspondent à la phase préparatoire ont été mises à profit pour conduire un certain nombre d'opérations telles que la mise en place des équipes, des moyens logistiques, la réalisation des appels d'offre pour l'acquisition de véhicules, de mobilier et de l'équipement, les travaux de génie civil, les études et recherche, et enfin, la mise en place de systèmes comptables.

13. La phase préparatoire du projet a duré jusqu'en février 2000, moment de son évaluation par une mission de la Banque Mondiale qui a donné un satisfecit sur les résultats atteints et a donné un avis favorable pour la poursuite des activités dans le cadre d'une phase opérationnelle pour la période 2001 – 2004.

14. L'année 2000 a été un moment important de restructuration du PROGEDE avec comme décisions majeures, l'intégration des équipes techniques de terrain au sein des Inspections Régionales des Eaux et Forêts de Tamba et de Kolda, la responsabilisation de ces dernières dans l'exécution des activités de terrain et la nomination d'un conseiller en aménagement auprès de chaque Inspecteur.

15. La période 2001 – 2004 a consacré la mise en œuvre intensive des activités de développement, la finalisation et le début d'exécution de quatre plans d'aménagement forestiers, participatifs et intégrés (Nétéboulou, Missirah/Kothiary, Thiéwal et Saré Gardi).

16. A partir de la fin de 2004, le Projet connaît une phase de transition surtout marquée par l'engagement du financement du Royaume des Pays Bas dans une réforme des dépenses publiques dans laquelle sera expérimentée une nouvelle politique d'appui budgétaire dans le cadre de la décentralisation.

17. Cette phase de transition est importante tant pour le projet, que pour les populations qui sont à la fois les acteurs et les bénéficiaires. Elle ouvre des perspectives pour la consolidation des acquis en matière de responsabilisation des collectivités dans la gestion des ressources naturelles.

IV. OBJECTIFS SPECIFIQUES DU PROJET

18. Pour atteindre son objectif global, deux objectifs spécifiques ont été retenus : (i) Mettre en oeuvre un système de gestion durable des formations forestières des régions de Tamba et de Kolda pour la production de bois-énergie destiné à l'approvisionnement des principaux centres urbains du Sénégal ; (ii) Maîtriser la demande en combustibles domestiques en favorisant les économies de bois-énergie et la promotion d'énergies de substitution ;

19. Les principales activités prévues pour atteindre ces objectifs reflètent par ailleurs l'application des engagements du Gouvernement définis dans la Lettre de Politique de Développement du Secteur de l'Energie (LPDE) et plus particulièrement dans le domaine des combustibles domestiques :

20. En amont de la filière, en particulier au niveau de la Composante Gestion Durable et Participative des Ressources Forestières (Composante Offre), le plan d'actions prévoyait les activités phares de photographie et cartographie de 1 000 000 ha de formations forestières, l'inventaire de 600 000 ha, l'aménagement de 300 000 ha de forêts communautaires sur une base participative et intégrée et la mise en œuvre d'un programme de conservation de la diversité dans la périphérie du Parc National du Niokolo Koba.

21. En aval de la filière, au niveau de la Composante Gestion de la Demande et Promotion des Energies de Substitution, les principales activités prévues sont la modernisation de la filière charbon, la promotion et la diffusion de réchauds à pétrole et la valorisation de résidus industriels comme combustibles alternatifs au charbon.

V. RESULTATS DU PROJET

Rappel des Résultats de la Phase Préparatoire

22. Malgré le retard de 6 mois concédé dans le démarrage du projet, l'exécution de la phase préparatoire a été achevée d'une manière satisfaisante en décembre 2000 avec un large dépassement des objectifs assignés.

23. Ce retard était dû à des erreurs de procédures qui s'étaient répercutées sur la passation des marchés des gros contrats (photographie et inventaire forestier) et d'acquisition des équipements essentiels (véhicules, camions citernes et matériels de luttes contre les feux de brousse).

24. Une photographie aérienne a été effectuée sur une superficie de 1 280 000 ha, 100 cartes des peuplements (1 :30 000) de base, 100 cartes thématiques ont été élaborées. La prise de vue additionnelle réalisée en 2001 a permis de couvrir une superficie globale de 1.305.000 ha.

25. Un inventaire forestier a été conduit sur 840 000 ha de formations ligneuses des zones d'inter-vention du PROGEDE, dans le but d'acquérir des informations fiables sur les valeurs moyennes et la varia-bilité des caractéristiques stationnelles, écologiques et dendro-métriques de chacune des strates délimitées dans le cadre de la photo-inter-prétation et de la cartographie.

26. Un inventaire pastoral statistique par échantil-lon-nage stratifié *a priori* a été réalisé au sein des 890.000 ha de formations ligneuses, dans le but d'acquérir des informations fiables sur les caractéristiques qualitatives et quantitatives moyennes des pâturages.

27. Un volet formation et renforcement des capacités a été mis en place tout au long du processus pour 130 agents du projet et de la Direction des Eaux et Forêts qui leur a permis de maîtriser parfaitement les techniques d'inventaires, de cartographie, de traitement, d'analyse et d'interprétation des données.

28. Renforcement de capacités des populations et des collectivités pour mieux les outiller dans la prise en charge des aménagements et de la gestion des ressources de leurs terroirs. La formation a ciblé un total de 1075 personnes et touche plus de 10 thèmes.

29. Elaboration d'un manuel et d'un système de suivi évaluation définissant le système de planification, de rapportage et de circulation de l'information. Le projet a ainsi mis en place une dynamique de planification opérationnelle et participative pour mieux prendre en compte les préoccupations de l'ensemble des partenaires.

30. Durant la phase préparatoire, la Composante Demande a eu à conduire un certain nombre d'études dont les plus pertinentes sont : (i) Etude de la stratégie et des actions de modernisation et d'ouverture de la commercialisation du bois – énergie aux groupements de jeunes et de femmes ; (ii) Etude sur l'évaluation des expériences et des coûts d'approvisionnement, de conditionnement et de distribution des foyers améliorés ; (iii) Etude sur les coûts d'approvisionnement, de conditionnement, de transport et de distribution du gaz butane.

VI. RESULTATS TECHNIQUES DU PROJET

Résultats de la Composante Offre

31. Dans le souci de mettre en œuvre un système de gestion durable et participatif des formations forestières naturelles un certain nombre d'études ont été réalisées par le projet tout au début de son démarrage touchant des domaines variés (feux de brousse, MARP, étude socio-économique, étude flux et modernisation de la filière bois énergie.

32. La mise en place d'un Système d'Information Ecologique Forestier et Pastoral (SIEF) a fortement contribué à pallier l'absence de données fiables sur la ressource forestière, permettant aux techniciens de disposer des données techniques nécessaires à l'élaboration de plans d'aménagement et de gestion des formations forestières. Au total 20 agents du projet et de la DEFCCS ont été formés, tandis que l'inventaire a directement impliqué 56 agents des brigades forestières de terrain, 26 agents directement recrutés par le bureau d'étude pour la supervision et la conduite des opérations de terrain. Le traitement des données a été

fait par 3 femmes ITEF, recrutées et formées localement par le projet et les experts du bureau d'études.

33. La phase II du SIEF s'est consacrée essentiellement à la conduite d'un inventaire national pour caractériser les différents bassins d'approvisionnement sur la base de 1 300 unités d'échantillonnage réparties à travers le pays. Les résultats obtenus ont servi à l'élaboration d'une carte du potentiel en bois – énergie et de plans directeurs d'approvisionnement des principaux centres urbains du pays.

34. L'élaboration des plans d'aménagement des massifs de Nétéboulou, Missirah/Kothiary, Thiéwal et Saré Gardi s'est achevée en fin 2004 couvrant une superficie totale de **381.074 ha** de formations forestières, dont 233 064 ha à Kolda et 148 010 ha à Tamba. Conformément à l'approche participative du projet, l'ensemble des plans d'aménagement a fait l'objet de restitution, d'approbation et d'appropriation par les populations et les collectivités.

35. Le découpage en blocs des massifs de Thiéwal, Koar, Missira/Kothiary a été fait sur carte et leur matérialisation effectuée sur le terrain. Le parcellaire est réalisé dans l'ensemble des massifs avec une subdivision correspondant à la durée de la rotation fixée à 8 ans.

36. La mise en œuvre des plans d'aménagement finalisés a démarré en fin 2004. Les opérations de martelage des parcelles à exploiter ont été achevées. Les coupes de bois vert
sont en cours. Une production escomptée de 160 000 qx de charbon intégré dans le quota national est attendue des premières opérations d'exploitation.

37. Durant la première phase du projet, 317 villages ont été organisés en Comités Villageois de Gestion et de Développement (CVGD). Ces organes qui constituent le réceptacle du projet en matière de conduite d'activités et de vulgarisation sont tous dotés d'un statut juridique. Des actions de renforcement de capacités techniques, institutionnelles et organisationnelles ont été menées au profit des populations par l'entremise de ces CVGD, plus de 1000 représentants villageois ont été touchés par la formation formelle.

38. Le projet a procédé à l'ouverture de 381,7 km de pare feux autour des massifs en aménagement. Il met aussi un accent particulier sur la lutte passive par la communication, la sensibilisation et l'appui en petits matériels aux comités.

39. Le projet a développé la stratégie qui consiste à planter ces pare-feux (pare-feu verts) et à les emblaver en cultures nettoyantes comme l'arachide, niébé et sorgho fourrager. Au total, 128,5 km de pare feu ont été emblavés sur les 381,7 km ouverts. Aujourd'hui, ce paquet technique a fortement contribué à réduire les feux de brousse et leurs impacts négatifs sur les formations forestières et l'environnement (réduction des émissions des gaz à effet de serre).

40. Pour la restauration des zones dégradées et l'élargissement des puits à carbone, le projet a entrepris avec les populations des actions de production de 1 200 000 plants dans plus de 800 pépinières individuelles et communautaires. Cette production a été utilisée pour réaliser, 384 ha de plantation massive, 276 ha de verger, 173 km de pare feu vert, 132 km de brise vent et la pose de 28 500 greffons dans les vergers de plus de 10 ans en vue d'amélioration de la production fruitière par le surgreffage. Par ailleurs, dans le cadre du programme de production de biodiesel une plantation de 25 ha en Jatropha curcas a été réalisée. A ces réalisations physiques, s'ajoutent les opérations de mise en défens dans les massifs en aménagement et les réserves communautaires où il est noté une bonne régénération naturelle des espèces endémiques.

41. Le projet a fait le pari de mettre en place un système de gestion durable de production de bois énergie qui suppose des prélèvements basés sur une connaissance du potentiel forestier. C'est pourquoi, l'exploitation du bois vert sur les parcelles n'a démarré qu'en fin 2004, lorsque le SIEF finalisé a permis de prendre des décisions d'aménagement rationnelles.

42. Dans la conduite des activités de pré-aménagement, une production participative de bois-énergie a été réalisée par les CVGD dans des opérations sanitaires telles que le ramassage et de valorisation du bois mort et sa vente soit en l'état, mais surtout après carbonisation. Ces opérations ont permis de produire de 1999 à fin 2004 un total de 90 495 qx de charbon et 21 900 stères de bois avec des recettes générées de 228 591 000 FCFA, dont 162 891 000 FCFA provenant du charbon et 65 700 000 FCFA de la vente directe du bois.

43. Ces opérations constituent un moyen de nettoyage qui soustrait la forêt d'une grande quantité de combustibles qui alimentait les feux de brousse. De même, les produits issus de l'ouverture des pare-feux sont aussi valorisés en bois-énergie (charbon de bois, bois de chauffe) ou en bois d'œuvre au profit des populations. Les opérations de préaménagement ont servi de tests importants pour cerner toutes les contraintes liées à une entrée réussie des populations dans la filière du bois-énergie.

44. Aujourd'hui, des populations, jusqu'ici réticentes pour s'engager dans la production de charbon, sont motivées par les revenus qu'elles peuvent tirer de cette activité sans compromettre la ressource forestière qui constitue la base de l'économie des terroirs villageois.

45. L'aménagement des ressources forestières visé par le projet s'intègre harmonieusement dans les systèmes de production agricole et pastorale. La mise en œuvre d'un programme de développement agricole et pastoral conséquent a permis de développer des itinéraires techniques conservateurs des ressources forestières et capables de renforcer les interactions écologiques et économiques positives entre la production agricole et pastorale et la préservation des ressources naturelles.

46. Les actions menées par le projet s'articulent autour d'une panoplie d'activités ayant un impact réel sur l'amélioration du niveau de vie des populations et de la conservation des ressources :

- l'intensification céréalière et fourragère de 2015,75 ha pour des prévisions de 600 ha. On estime à plus de 2741 tonnes de céréales produites annuellement qui permet d'assurer les besoins alimentaires pour toute l'année de 14 816 personnes. Les gains de rendements obtenus ont stabilisé le front de défrichement dans les zones d'interventions du projet.

- le développement d'activités maraîchères dans les zones d'intervention a généré au total 128 820 350 FCFA et intéresse au total 9511 femmes.

- Le programme hydraulique a réalisé : (i) le curage de 16 puits traditionnels ; (ii) le forage de 15 puits hydrauliques ; (iii) la construction de 60 bassins de stockage d'eau dans les parcelles de maraîchage ; (iv) la construction de 4 ouvrages de franchissement pour désenclaver les villages du massif de Thiéwal et de la zone de biodiversité.

47. Le programme de productions pastorales a permis une intensification fourragère sur 82, 9 ha (61,65 ha de niébé et 11,25 ha de sorgho) avec un rendement de 05T/ha de matière sèche, pour une production de 415 tonnes de ms capables de nourrir au total 880 UBT.

48. Une intensification de la production animale par l'embouche a accompagné ce programme, 1303 bovins et 40 béliers ont été embouchés pour la viande, 954 vaches pour la production de lait. Un accroissement de plus de 10.000 litres/an de lait a été obtenu à partir de l'année 2003, ainsi que des recettes de 325 750 000 FCFA provenant de la seule vente des bovins embouchés. Des campagnes de vaccination ont été conduites avec 70 650 petits ruminants vaccinés dont 55% à Tamba et 45% à Kolda.

49. L'aviculture traditionnelle a été améliorée par l'introduction de 4 000 coqs raceurs qui ont permis d'améliorer le format de la race locale, d'augmenter la capacité de ponte dont le rendement moyen annuel par poule est de 180 œufs, comparé à la productivité de la race locale qui donne une moyenne annuelle de 60 oeufs. Des campagnes de lutte contre la peste aviaire ont été conduites par le projet de 1999 à 2004 sur une population totale évaluée à 41 092 sujets. Dans le cadre de l'exécution du programme de conservation de la biodiversité, un élevage de pintades a été effectué par l'introduction entre 2001 et 2004 de 2000 sujets qui ont engendré une population entre 2002 et 2004 de 21 000 sujets. Ces opérations ont permis, outre les protéines qu'elles procurent, d'accroître les revenus des femmes et des jeunes au fil du temps.

50. L'apiculture a été développée par la pose de 4.202 ruches traditionnelles améliorées et 2.224 ruches kenyanes. Une production annuelle moyenne de 10 000 kg a été atteinte avec l'adoption de techniques de récoltes qui ont permis de diminuer les feux de brousse, de préserver le peuplement d'abeilles et la diversité biologique et en même temps d'augmenter les revenus des populations. L'apiculture moderne introduite par le projet, qui avait au départ une motivation écologique en tant qu'alternative à l'utilisation du feu pour la récolte de miel, s'est transformée en véritable moteur de développement économique, du fait des revenus importants que les populations en tirent par la vente du miel et la valorisation de la cire.

51. La dégradation des ressources forestières, en dehors de l'amenuisement du potentiel ligneux, s'accompagne de la disparition de certaines espèces animales et végétales. Compte tenu de la proximité des chantiers d'exploitation forestière avec le Parc National du Niokolo Koba, un important programme de conservation de la diversité biologique a été initié dans la zone périphérique. Ce programme couvre une superficie totale de 173 000 ha ainsi répartis, 53 700 ha à Tamba et de 119 300 ha à Kolda. Il concerne particulièrement les communautés rurales de Dialakoto et Linkéring. Une réserve communautaire de biodiversité a été érigée dans chaque communauté rurale, la réserve de Wadiatoulaye (12 686 ha), située dans la CR de Linkéring et celle de Dialamahan (12 863 ha) située dans la CR de Dialakoto. Les chartes de gestion de ces entités ont été approuvées par les autorités et les délibérations faites par les communautés rurales concernées.

52. Une extension du programme sur une aire de 54 000 ha a été réalisée tout au début de l'année 2004 dans le département de Kédougou. Les opérations préliminaires de diagnostic participatif et d'organisations des populations ont été déjà menées dans les 11 villages bénéficiaires du programme dans la communauté rurale de Tomboronkoto.

53. La pauvreté des populations riveraines ayant été identifiée comme une cause importante du braconnage, des activités génératrices de revenus ont été développées dans ces trois communautés rurales pour desserrer la pression sur les ressources. C'est ainsi que ces zones ont aussi bénéficié des programmes d'intensification céréalière, de maraîchage, d'arboriculture, d'amélioration de la volaille locale, d'apiculture, d'embouche et d'élevage de pintades.

54. En outre, un programme d'Education Environnementale est mis en œuvre pour développer la sensibilité et la conscience environnementale des plus jeunes. Plus de 185 enseignants répartis dans 220 établissements scolaires ont été touchés pour une population de 8.000 élèves.

Les Résultats de la Composante Demande :

55. La mise en œuvre de cette Composante a fortement souffert des carences constatées dans le choix d'une structure d'intermédiation financière devant administrer les fonds d'appui. Néanmoins, au mois de juillet 2004, un contrat d'un montant de 200 millions a été finalement signé avec PAMECAS pour la gestion des fonds. Un lot d'une trentaine de projets proposés par des promoteurs est en cours d'évaluation et de financement.

56. La modernisation de la commercialisation du charbon de bois en zone urbaine est un des résultats de la Composante intimement lié à la mobilisation des fonds d'appui pour surtout appuyer l'implantation de petites d'unités de conditionnement, de boutique énergie et la valorisation du poussier de charbon. Suite aux études réalisées par le projet, deux opérateurs économiques ont manifesté l'intérêt pour l'implantation d'unités de conditionnement du charbon à Dakar.

57. Le concept de boutique-énergie a été développé par le projet pour promouvoir la distribution des combustibles domestiques et des équipements de cuisson. Les prototypes installés à Kaolack, Kolda et Guédiawaye ont impulsé l'intérêt de 18 promoteurs privés qui ont été financés par le projet. Le remboursement des prêts consentis s'effectue d'une manière satisfaisante.

58. Les actions pour la diversification des activités des exploitants ont aussi été limitées par les difficultés de mobilisation des fonds d'appui. Néanmoins, un séminaire a été tenu avec les exploitants forestiers pour les informer des opportunités offertes par le projet pour diversifier leurs activités. En prélude du démarrage des coupes dans les zones en aménagement, des contrats ont été signés avec les organismes d'exploitants forestiers sous l'égide du service forestier pour l'achat et la commercialisation des produits issus des aménagements.

59. Pour la promotion du kérosène comme combustible de cuisson, à la lumière des résultats des tests d'acceptabilité technique et social, une promotion portant sur 700 réchauds de type Amul a été faite par des opérateurs de Kaolack et Fatick.

60. Pour la promotion du gaz butane, une étude de base a été réalisée. Des recommandations ont été fournies aux autorités pour améliorer la distribution du gaz à l'intérieur du pays. Mais depuis l'extinction progressive de la subvention sur le gaz butane, celui-ci est de plus en plus inaccessible suite au renchérissement du produit et les actions devront s'inscrire dans une logique de pallier ces difficultés.

61. L'opération pilote de valorisation des sous – produits agro-industriels a été impulsée avec la Coopération tripartite, Région Wallonne de Belgique, la SAED et le PROGEDE par le démarrage du projet «**Bio-terre.** Un agglomérateur a été installé à Ross Béthio afin de permettre la production de boulets de combustible à partir de la biomasse agglomérée. Des tests d'acceptabilité technique et sociale ont été menés et le projet transféré à des privés sénégalais. La commercialisation des produits est en cours.

62. La promotion des foyers améliorés pour la réduction de la demande de bois-énergie constitue la principale composante du programme de rationalisation de la consommation du bois énergie. L'intense activité de sensibilisation menée avec l'appui en communication des artisans auprès des populations et du secteur privé a permis de vendre dans le marché 125 900 foyers dont 900 dans des opérations pilotes (FIARA, FIDAK). Par ailleurs le projet a eu à former 20 artisans en Ergonomie et Gestion à Dakar, Tamba et Kolda.

63. La mise en place du SIEP par la Composante procède du souci d'appuyer la Direction de l'Energie et des structures partenaires en matière de planification du sous secteur des combustibles domestiques. Le système constitué de sept modules a été finalisé, restitué et validé par les autorités et les utilisateurs potentiels. Une base de données est déjà réalisée sur l'exploitation forestière, les combustibles de substitution et sur les prix des combustibles.

64. Dans le but d'alimenter le module, «flux de combustibles ligneux», une enquête nationale a été réalisée dans les dix régions du pays dans la période du 10 au 20 Décembre 1998. Une seconde enquête flux de bois-énergie a été réalisée durant la même année.

65. L'enquête nationale sur la consommation des combustibles domestiques a été réalisée auprès de plus de 6.000 ménages. Plus de trois variables ont été enregistrées et traitées pour fournir des informations sur les déterminants de la consommation des combustibles domestiques.

66. L'intégration de l'ensemble de ces données du sous secteur permet de fournir aux décideurs les tableaux de bord requis pour la planification et la gestion du sous secteur des combustibles domestiques.

VII. PERSPECTIVES POUR LA CONSOLIDATION DES ACQUIS

67. La dernière mission de supervision du projet, ayant apprécié le travail accompli a proposé la prolongation du projet de deux (2) ans sous forme de phase transitoire. Cette décision importante pour l'avenir du projet est soutenue par plusieurs raisons :

- La mise en place du SIEF et du SIEP constitue une avancée significative pour une meilleure connaissance, une maîtrise des ressources forestières et une bonne planification énergétique. Ces outils de planification doivent être institutionnalisés afin que le Service Forestier, la Direction et les autres utilisateurs potentiels puissent en tirer meilleur profit et les soutenir.

- En matière d'aménagement des ressources forestières, le projet a mis en place un modèle de conception basé sur le potentiel en bois d'énergie. Il importe que le service forestier et les populations s'en approprient pour généraliser les aménagements à l'échelle nationale. En plus, les acquis en matière d'aménagement intégré participatif doivent être soutenus et consolidés, voire même étendus à l'échelle nationale.

- Le soutien à la décentralisation et la lutte contre la pauvreté méritent la mise en place d'une formule assortie de moyens financiers, matériels et humains permettant aux collectivités locales de jouer leurs véritables rôles dans la gestion des ressources forestières de leurs terroirs. ***Pour se faire, l'option de l'Etat de mettre en place un vaste Programme National de Biomasse-Energie reste pertinente eu égard à sa préoccupation d'accompagner les collectivités locales dans la gestion des ressources de leurs terroirs.***

VIII. ANALYSE CRITIQUE DE LA COLLABORATION ENTRE LA BANQUE , LE GOUVERNEMENT ET LE PROGRAMME .

68. L'Etat du Sénégal a beaucoup apprécié le concours financier et technique de l'ensemble des bailleurs, en particulier de l'IDA, tête de file, pour la contribution substantielle qu'ils ont apporté pour le succès et la bonne exécution du Programme de Gestion Durable et Participative des Energies

Traditionnelles et de Substitution (PROGEDE). Le renforcement des capacités des agents et structures impliqués ainsi que les bénéfices énormes que les populations bénéficiaires ont directement tirés de cette expérience sont des résultats tangibles que l'Etat apprécie à leur juste valeur.

69. La collaboration avec la Banque s'est en particulier distinguée dans : (i) la familiarité des agents du projet avec les procédures administratives et financières de l'IDA ; (ii) la diligence dans le traitement des dossiers (demande de non objection, paiement des DRF, etc); (iii) la formation permanente des agents sur les nouvelles directives ; (iv) la mise à disposition d'une expertise appropriée pour toutes les études et les questions techniques, administratives et financières soulevées durant la mise en œuvre du projet ; (v) la disponibilité, la confiance et le souci d'aider les populations à vaincre le spectre de la pauvreté manifestés par le Task Manager et l'équipe de la mission résidente chargée du suivi du projet, qui constituent par ailleurs la clé du succès du projet, sont des qualités hautement appréciées par l'ensemble du personnel et les populations bénéficiaires du projet.

70. La mise en œuvre du projet a été aussi un moment d'échanges d'expériences dans le cadre du Programme RPTES et des différentes rencontres internationaux sur les combustibles domestiques sous l'égide de la Banque.

71. Les principales décisions ayant influencées la naissance du projet sont :

- La conférence de Rio sur le Développement Durable, où les organismes internationaux, les bailleurs et les Etats se sont accordés à reconnaître la nécessaire implication des citoyens concernés dans la gestion de leur environnement.

- Le processus de réflexions initié entre 1993 et 1995 dans le cadre du Programme Régional pour le Secteur des Energies Traditionnelles (RPTES) sous l'égide de la Banque Mondiale.

- La loi sur la décentralisation promulguée par le Sénégal en 1996 et la ratification des différentes conventions invitant le service forestier à adapter sa mission aux problématiques de la lutte contre la désertification, la décentralisation, la participation des citoyens à la gestion de l'environnement et la lutte contre la pauvreté.

- Les accords de crédits et de dons signés

- L'arrêté interministériel n° 10291 en date du 24 décembre 1997 portant création, organisation et fonctionnement du projet.

72. La vie du projet a été aussi marquée par plusieurs missions de supervision qui ont démontré l'intérêt de la Banque à la bonne exécution du projet. Les conclusions et recommandations les plus pertinentes sont résumées ci-après :

- Du 30 juin 1998 au 3 juillet 1998, mission de la Banque, Aide – Mémoire en date du 4 juillet 1998 avec comme principale recommandation la tenue de séances d'information à l'endroit du personnel du projet pour leur donner une idée précise de leurs rôles et responsabilités afin de parvenir à une harmonisation de niveau par rapport aux objectifs principaux du projet. ;

- Du 27 janvier au 11 Février 2000, Aide – Mémoire n°056/DB/sn du 14 /03/2000 avec comme principales recommandations (i) un besoin de réorganiser la structure institutionnelle du

projet ; (ii) la nécessité de mieux intégrer les activités des antennes dans celles des inspections régionales de Tamba et de Kolda ;

- Du 06/05 au 25/05/2002, Aide – Mémoire n° 167.02/DB du 11/07/2002 qui a jugé satisfaisante les performances accomplies dans le processus de mise en œuvre des activités et résultats atteints en terme de réduction de la pauvreté et de l'impact sur l'environnement et a suggéré, au vue des résultats les nouvelles opportunités à saisir en terme de développement socio-économique et de réduction de la pauvreté (vergers, apiculture et élevage de pintades). ;

- Du 02/06 au 11/06/2003, Aide – Mémoire du 12/08/2003 avec comme principales recommandation (i) la libéralisation du charbon pour enrayer les problèmes de mévente de charbon relevés dans les zones de production de charbon du PROGEDE et (ii) la reconnaissance juridique des CVGD pour leur permettre d'écouler leurs productions dans les grands centres de consommations ;

- Du 18/03 au 26/03/2004, Aide – Mémoire du 21 juillet 2004 avec comme principale recommandation la continuation des activités en cours dans le cadre d'une deuxième phase du Programme.

VIII. PRINCIPAUX ENSEIGNEMENTS TIRES DE LA COLLABORATION ET PERSPECTIVES REQUISES

73. Les années de collaboration avec la Banque dans le cadre de la mise en œuvre du PROGEDE ont permis à l'équipe de tirer les enseignements suivants :

- La parfaite appropriation par les populations et les collectivités des enjeux de la gestion des ressources naturelles dans les zones couvertes par le projet.

- L'intérêt manifeste du gouvernement du Sénégal sur les systèmes communautaires de production combustibles à partir de la biomasse eu égard aux résultats accomplis.

- La flexibilité de la Banque sur les différentes propositions de l'Etat pour une optimisation de l'utilisation des ressources (réallocation budgétaire et réaménagements techniques).

- La disponibilité des experts de la Banque dans la recherche de solutions aux problèmes rencontrés durant la vie du projet.

- L'excellente expertise fournie par la Banque durant les différentes missions de supervision et la pertinence des décisions prises pour la réussite de la mission.

- L'engagement pris par la Banque à poursuivre cette expérience dans le cadre d'une phase transitoire de deux ans pour consolider les acquis, trouver une solution heureuse à l'enclavement des zones de production, promouvoir l'accès aux services énergétiques modernes et faciliter le transport des personnes et des biens.

- Ces options sont certes en parfaite phase avec le souhait actuel des populations bénéficiaires. Mais, il reste évident que pour l'Etat, la poursuite de cette expérience à l'échelle nationale, dans le cadre d'un vaste programme de Biomasse-Energie, demeure une option majeure,

suite aux résultats forts encourageants obtenus par le PROGEDE sur le terrain.. Ce programme, qui prendrait en charge l'ensemble de la problématique énergie domestique du Sénégal, est le seul gage pour contenir les nombreuses questions soulevées par les changements apportés dans la gestion des ressources forestières par la responsabilisation directe des populations.

IX. EVALUATION ECONOMIQUE ET FINANCIERE DU PROJET (cf. annexes)

74. En ce qui concerne les décaissements des fonds IDA et GEF, aucune difficulté majeure n'a été notée. Par contre pour les fonds liés aux accords financés par le Royaume des Pays Bas, le financement prévu (8,8 Millions USD) a été mis à la disposition du programme en deux étapes. L'accord (21581-SE) signé au début du projet, d'un montant de 3.058.762,53 USD a pratiquement été épuisé à la fin du premier semestre 2001. L'accord (50269-SE) d'un montant de USD 5.734.755 est entré en vigueur en Janvier 2002 et a permis la poursuite des travaux d'inventaire suspendus suite à la rupture de financement. Les montants décaissés s'élèvent à :

(i) Pays Bas : 8 637 398, 15 US Dollar ;
(ii) GEF 4 684 618, 60 US Dollar;
(iii) IDA : 5 135 725, 90 US Dollar.

Les taux de décaissements pour les différentes sources de financement s'élèvent au 31 Décembre 2004 à : (i) Pays Bas : 98, 64 % ; (ii) GEF : 99, 67 % ; (iii) IDA : 98,76 %. Ce qui donne un taux de décaissement global de 98 % à la même date .

75. L' Etat du SENEGAL a mis à la disposition du Programme un montant de : F Cfa 751 000 000 soit (1,2 million de dollar US) correspondant à l' équivalent de son engagement vis à vis des bailleurs.

76. Concernant la situation comptable, Les états financiers ont été audités pour les premiers exercices (1998, 1999 et 2000) par le Cabinet Mariama Ba et depuis l'exercice 2001 par le Cabinet Auditex Ces états financiers ont été certifiés sincères et réguliers par les différents cabinets d'expertise Comptable chargés de l'audit. Ils comprennent :

- le bilan
- le compte de résultat
- le tableau financier des ressources et emplois (TAFIRE)
- les tableaux des ressources et emplois du projet suivant les différentes catégories de dépenses ont été établies et audités.
- Les rapports d'audit des comptes ont toujours été transmis à la Mission Résidente de la Banque mondiale dans les délais en vue de respecter le délai de transmission fixé au 30 Juin .

ANNEXES

Annexe 1 A
Project Costs by Components (in US$ milliers equivalent)

A Composante Phase Preparatoire	Appraisal Estimate (S.A.R.)	Actual/Latest Estimate	Percentage of Appraisal
1 Inventaire des format.forestiéres	948, 2	974, 77	102,8
2 Evaluation rurale Participative	66 , 0	51, 917 22	78,7
3 Système integré de gestion des R.N.	85,8	116, 085	136,2
4 Développement Institutionnel	1 878,8	2 058, 746	109,6
5 Etudes Préparatoires	530,7	612,171	115,4
Total	**3 509,5**	**3814,221**	**108,7**

Annexe 1 B

Project Costs by Components (in US$ milliers equivalent)

B Composante Offre	Appraisal Estimate (S.A.R.)	Actual/Latest Estimate	Percentage of Appraisal
1 Dévelopement Institutionnel	5 235 ,2	6 275,013	120
2 Micro – Entreprises rurales	3 573, 8	2227,715	62, 3
3 Fonds d' Appui	920, 0	705,438	76,7
4 Stratégie de Communication	168, 0	170,00	101, 2
5 Aménagement/ Inventaire	1 863, 2	2 148,800	115
Total	**11 760, 2**	**11 526, 96**	**98, 0**

Annexe 1 C

Project Costs by Components (in US$ milliers equivalent)

C Composante Demande	Appraisal Estimate (S.A.R).	Actual/Latest Estimate	Percentage of Appraisal
1 Développement Institutionnel	1 475, 9	1759,00	119, 3
2 Modernisation filiére bois	64, 0	161,33	252, 1
3 Reconversion des exploitants	236, 0	285,434	120, 9
4 Promotion du kérosene	72, 0	125,494	174 ,3
5 Promotion du Gaz butane &	174, 0	142, 717	80, 0
6 Foyers améliorés	164, 0	180, 8	110, 2
7 Autres initiatives privées	120, 0	200, 5	167, 1
Total	**2 305, 9**	**2 855, 275**	**123, 8**

Annexe 2

Tableau des Coûts par méthodes de passation (en US $)

Catégories de dépenses	Appel d ' offres International A .O. I.	Appel d' Offres national A.O.N.	Cotations	Autres *	Total
1 Génie Civil	440 763	540 837	79 675 (73 493)	0	1 061 275
2 Matériels & Véhicules	2 469 007 (604 260)		1 019 375 (169 662)		3 488 382
3 Services de Consultants		0	0	2 214 833 (228 018)	2 214 833
4 Biens			779 600 (375 628)		779 600
5 Fonds d' appui	0	0	500 000	970 900 (970 900)	1 470 900
6 Formation	0	0	1 283 176 (675 789)	0	1283 176
Total	2 909 770	540 837	2 882 226	3 965 333	10 298 166 (3 097750)

Annexe 2

Tableau des Coûts par méthodes de passation (en US $)

Catégories de dépenses	Appel d ' offres International A .O. I.	Appel d' Offres national A.O.N.	Cotations	Autres *	Total
1 Génie Civil	440 763	540 837	79 675 (73 493)	0	1 061 275
2 Matériels & Véhicules	2 469 007 (604 260)		1 019 375 (169 662)		3 488 382
3 Services de Consultants		0	0	2 214 833 (228 018)	2 214 833
4 Biens			779 600 (375 628)		779 600
5 Fonds d' appui	0	0	500 000	970 900 (970 900)	1 470 900
6 Formation	0	0	1 283 176 (675 789)	0	1283 176
Total	2 909 770	540 837	2 882 226	3 965 333	10 298 166 (3 097750)

N.B. Les montants entre parenthèses constituent les paiements effectués par l'IDA.

*** Il s'agit des services de consultants (SBQC, SBQ,…) et les Fonds d' appui de la composante Demande (entente directe avec le PAMECAS suite à la non objection de la Banque).**

Additional Annex 9. Illustration of PROGEDE's Outcomes and Achievements

Figures 1 to 10 provide illustrations of the ***Sustainable Woodfuels Supply Management Component*** implementation work and of its developmental and poverty alleviation outcomes.

Figure 1: *Community-based Sustainable Forest Management Systems*

Figure 2: *Sustainable Woodfuel Production*

Figure 3: *Community-based Improved Charbonization Methods*

Figure 4: *Sustainable Charcoal: Energy, Envi Social Outcomes (Bank Staff Demba Balde PROGEDE's Sustainable Origin, Quality a Charcoal).*

Figure 5: *Women Vegetable Gardens: Economic Diversification,Nutrition and Gender Outcomes*

Figure 6: *Apiculture: Forest Fire Reduction Strategy, Plus Economic Diversification and Nutrition Outcomes*

Figure 7: *Village Access to Moder Energy Services (Crop Grinding)*

Figure 8: *Village Access to Potable and Process Water*

Figure 9: *Environmental and Energy Education Modules*

Figure 10: *Village Access to Improved Health Services*

Figures 11 to 14 provide illustrations of the ***Demand Management and Inter-fuel Substitution Options Component*** implementation work and of its developmental and poverty alleviation outcomes.

Figure 11: *Support to Private Sector-based Improve Stove Production*

Figure 12: *Village Access to Inter-fuel Substitution Option*

Figure 13: *Urban and Peri-urban Energy Boutiques*

Figure 14: *Energy Boutiques / Certified Household Energy Equipment and Supplies*

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SENEGAL
SUSTAINABLE AND PARTICIPATORY ENERGY MANAGEMENT PROJECT (SPEMP)
PROJECT LOCATION AND CURRENT CHARCOAL PRODUCTION AREA

SPEMP PROJECT AREAS (WOODFUELS SUPPLY MANAGEMENT)

CURRENT COMMERCIAL CHARCOAL EXPLOITATION ZONES

PRIMARY ROADS

SECONDARY ROADS

SELECTED CITIES AND TOWNS

DEPARTMENT CAPITALS

REGION CAPITALS

NATIONAL CAPITAL

DEPARTMENT BOUNDARIES

KOLDA REGION BOUNDARIES AND NAMES

INTERNATIONAL BOUNDARIES

0 50 100

KILOMETERS

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