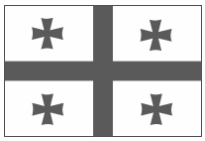
ENVIRONMENTAL FINANCE



Debt-for-Environment Swap in Georgia: Potential Project Pipelines for the Expenditure Programme

PART TWO

OECD

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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The Task Force for the Implementation of the Environmental Action Programme for Central and Eastern Europe (EAP Task Force) was established in 1993 at the "Environment for Europe" Ministerial Conference in Lucern, Switzerland. Its Secretariat was established at the OECD as part of the Centre for Co-operation with Non-Members. Since its creation, the EAP Task Force has proven to be a flexible and practical tool for providing support to political and institutional reforms in the countries of the region. After the Aarhus Ministerial Conference in 1999, its efforts were refocused on the countries of Eastern Europe, Caucasus and Central Asia (EECCA). More detailed information about Task Force activities can be found on its website at: www.oecd.org/env/eap

This report is also available in Russian:

Обмен долгов на охрану окружающей среды Грузии: потенциальные направления программы для финансирования

FOREWARD

This report was prepared in the framework of the Task Force for the Implementation of the Environmental Action Programme for Central and Eastern Europe (EAP Task Force), whose Secretariat is located in the OECD's Environment Directorate. It complements the first part, Pre-feasibility Study and Institutional Options, which analyses opportunities for and challenges to swapping part of Georgia's external debt for domestic financing of priority environmental projects.

This report was prepared by a team of consultants under the guidance and supervision of the EAP Task Force Secretariat, Grzegorz Peszko supported by Nelly Petkova. Gabriel Labbate was responsible for the overall management and implementation of the project. He also prepared the chapter on biodiversity. Paata Janelidze did the work on small and mini-hydropower plants and the production of biogas from animal waste. Grigol Lazriev and Gabriel Labbate prepared the report on waste management in coastal cities of Georgia. Nino Partskhaladze and Gabriel Labbate did the work on improving the collection and treatment of sewage affecting international waters.

The Dutch Government, through its Ministry of Housing, Spatial Planning and the Environment, has provided financial support for this project. Special thanks go to Xavier Leflaive (Manager of the Environmental Finance Programme at the EAP Task Force) for his support and guidance during the last phases of work on this project and to Brendan Gillespie (Head of the Non-member Countries Division at the OECD's Environment Directorate) for reviewing the report. All these contributions are gratefully acknowledged.

The views expressed in this report are those of the authors and do not necessarily reflect those of the OECD or its member countries.

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Exchange Rates

In the conversion of financial data presented in this report, i.e. Georgian Lari into US dollars (USD) and Euros (EUR), the following annual average exchange rates were used:

Table: Exchange Rates, Lari/USD, and Lari/EUR, Yearly Average

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Lari/USD	1.26	1.3	1.39	2.02	1.98	2.07	2.2	2.15	1.90	1.82
Lari/EUR	..	..	..	2.16	1.83	1.86	2.07	2.43	2.36	2.27

Source: Transition Report Update, May 2005, EBRD, London and the National Bank of Georgia.

Map of Georgia

EXECUTIVE SUMMARY

The Task Force for the Implementation of the Environmental Action Programme for Central and Eastern Europe (EAP Task Force) (OECD), in co-operation with the Georgian Ministry of Environmental Protection and Natural Resources Protection, has conducted a pre-feasibility analysis of implementing a debt-for-environment swap (DFES) in Georgia. The main conclusion from this study is that a debt-for-environment swap between Georgia and creditors of the Paris Club is feasible and could generate benefits for both, Georgia and the international community.

The main recommendation to Georgia is to focus on bilateral swaps (no third party involved) but to keep the institutional structure open for accommodating possible private swaps or even direct domestic and international grants.

This report builds on a complementary pre-feasibility study which, amongst other things, stresses that establishing a credible expenditure programme is an essential element to gain support for a DFES. This expenditure programme should focus on a few priorities for both creditors and the Georgian government. This report identifies potential environmental project pipelines for the DFES programme in Georgia. This work was implemented in two stages: a **scoping phase** and an **assessment phase**.

During the scoping phase, a group of local and international experts identified the three potential priority areas and project opportunities for the DFES programme in Georgia (Scoping Phase Report)[1]. These areas were: reducing greenhouse gases, reducing pollution of international waters, and protecting biological diversity. In each of these areas, various types of projects have been screened against general eligibility requirements agreed upon with the Georgian government. The requirements for the pipelines were:

- To achieve environmental benefits together with poverty reduction;
- To facilitate local sustainable growth and job creation;
- To provide regional or global environmental benefits and to facilitate fulfillment of international environmental agreements by Georgia (including the environment-related Millennium Development Goals and the objectives of the Johannesburg Summit Agenda: WEHAB **W**ater Supply and Sanitation, **E**nergy, **H**ealth and Environment, **A**griculture and **B**iodiversity;
- To contribute to peace and security in the Caucasus region by alleviating regional and cross-border conflicts related to the management of shared and trans-boundary natural resources;
- To be consistent with Georgia's environmental policy priorities;
- To take into account the size of the swap, including a reasonable assumption about long-term revenue streams generated by the swap, and the financial leverage that can be achieved with matching grants;
- To demonstrate "additionality" of DFES financing in relation to existing or planned financing sources;
- To attract co-financing from other sources, including the private financial sector, IFIs and foreign grants.

[1] See Labbate, G., Janelidze, P., Partskhaladze N., and Peszko G. (2003). *Potential Project Pipelines for the Expenditure Programme Financed by the Debt-for-Environment Swap in Georgia – Scoping Phase*. Report Financed by OECD/ENV. Tbilisi, Georgia.

During the assessment phase, solid, realistic and "bankable" project pipelines were identified within these priority areas, and analysed in detail. The methodology used to identify and assess potential project pipelines in the DFES expenditure programme included the following steps:

1. Familiarisation with current and expected projects of international agencies, government and NGOs in the three thematic areas in Georgia. Thus, this report builds on and complements existing and expected work of other partners in Georgia.
2. Identification of "entry points", i.e. national priorities that currently receive no, or insufficient, funding. This step comprised an analysis of existing portfolios and project pipelines against priorities set by strategy documents in the thematic areas of biodiversity, international waters and climate change, and poverty reduction.
3. Identification of the most promising pipeline opportunities. Within the strategic entry points, various types of projects were screened against the general eligibility requirements defined above. This work formed the basis for the identification of the potential pipelines in each of the three thematic areas. Then, these pipelines were analysed in terms of:
   - geographical location of eligible projects;
   - types of projects, including size;
   - project owners (e.g. municipalities, municipal enterprises, private enterprises, individuals, communities, etc.); and
   - justification of DFES financing of the pipeline.
4. Selection of the five most promising project pipelines. The five most promising pipelines were identified in consultations with the OECD and the Georgian authorities.
5. Detailed assessment of the five project pipelines. During this stage, the proposed pipelines were analysed in detail, including a description of the respective sector, analysis of the institutional and regulatory framework, economic analysis and financial viability of the proposed project pipelines, sensitivity analysis, and risks and risk mitigation measures.

The five most promising pipelines are identified in Table 1 below.

Table 1. Priority Areas and Project Pipelines for DFES in Georgia

Three Priority Areas	Five Project Pipelines
Reducing greenhouse gases	1. Rehabilitation of existing and construction of new mini hydropower plants; 2. Production of biogas from animal waste;
Reducing pollution of international waters	3. Improvement of collection and treatment of sewage affecting international waters; 4. Waste management in coastal cities;
Protecting biological diversity	5. Strengthening buffer zones of protected areas and strategic corridors.

Assuming a flow of revenue of EURO 42 mln (about USD 50 mln) to be generated by DFES in Georgia under the most optimistic scenario (with the participation of the six most likely creditors[2]) and about USD

[2] These creditors include: Austria, Germany, the European Union, Russia, Turkey and the USA.

35 mln under the more realistic scenario (with the participation of four of the creditors only) over the period 2006 – 2023, most of the pipelines could realistically be financed within the DFES scheme. Calculations of the capital investment needs made as part of this work show that the estimated financial envelopes for each of the pipelines are of the following magnitudes:

- Biodiversity protection – USD 3.7 mln;
- Biogas production – USD 300 000;
- Municipal waste management – USD 3.6 mln;
- Wastewater management – USD 8 mln; and
- Small and mini hydropower generation – USD 15 mln.

For the larger project pipelines, or any large individual capital investments, additional resources would be needed, including from private and foreign sources. It is recommended that DFES resources should be used primarily to support investment project costs.

In this context and in order to make a real difference in any of the priority areas listed above, careful selection of the most cost-effective projects, and requirements to co-finance projects from other sources, will need to be a cornerstone of project selection. This is also a prerequisite for creditors to be convinced that Georgia has the capacity and commitment to manage their funds effectively.

What the final expenditure programme would look like would depend on the actual agreements with individual creditors. However, going to the negotiating table prepared with a well-designed and focused expenditure programme can only facilitate the discussions. Even if the DFES do not materialise, the project pipelines prepared as part of this work could still be used by Georgia in discussions with donors when developing technical cooperation programmes.

BIODIVERSITY PROTECTION

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ACRONYMS

ACDI/VOCA	Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance
BSAP	Biodiversity Conservation and Action Plan
CIG	Community interest group
DFES	Debt-for-Environment Swap
GCCW	Georgian Center for Conservation of Wildlife
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GEL	Georgian Currency Lari
GO	Governmental Organisation
GoG	Government of Georgia
GORBI	Georgian Opinion Research Business International
ha	Hectare
IBA	Important bird area
IUCN	The World Conservation Union
KfW	Bank Kreditanstalt für Wiederaufbau (German Bank for Reconstruction)
km	Kilometre
NGO	Non-Governmental Organisation
NR	Nature Reserve
PA	Protected Areas
PADP	Protected Areas Development Project
PCZCSC	Priority Conservation Zones and Corridors of the South Caucasus
UNDP	United Nations Development Programme
USAID	US Agency for International Development
USD	US Dollar
WB	World Bank
WWF	World Wildlife Fund

SYNTHESIS

This report is a continuation of the work performed in 2003 by a group of local and international experts that identified potential project pipelines for the debt-for-environment swap (DFES) programme in Georgia (the Scoping Phase Report).[3] One of the identified potential pipelines was the *strengthening of buffer zones of protected areas and biodiversity corridors*. The Scoping Phase Report recommended the pipeline to finance projects with the dual objectives of making buffer zones and strategic corridor areas biodiversity-friendly productive landscapes and improving local living standards. The type of projects preliminary identified included capital investment support, technical assistance and public awareness. This Assessment Phase Report explores the feasibility of the biodiversity pipeline in detail. First, it presents an overview of the most biodiversity significant areas in Georgia. Second, it proposes a ranking of priority areas and identifies 1st, 2nd and 3rd priority groups. Third, this report describes the main threats affecting priority sites. Fourth, it describes the type of projects recommended for DFES support, and finally provides an estimation of the size of the pipeline.

This report proposes that the **main objective** of the DFES programme in buffer/support zones be the promotion of biodiversity protection among local communities that live around protected areas. A **secondary objective** would be to test and replicate successful projects and initiatives from and for other areas of Georgia. As a main **strategy**, this report proposes that DFES resources be directed towards increasing living standards of the population living around protected areas, particularly increasing livelihood security as measured by access to food, energy and basic social services (e.g. education). Support for increased living standards would be complemented with investment in raising public awareness.

This report proposes investing DFES resources in priority areas using the following criteria:

- Global and national biodiversity value. This is a crucial criterion for evaluation in view of the objectives of DFES, which should support projects that provide benefits to both national and international stakeholders.
- Value added in relation to existing or expected activities of other donors. The resources from DFES are to be invested in buffer and support zones of protected areas. At present, there are several projects from donors aimed at increasing the management capacities of selected reserves. DFES contributions will have the greatest effect when invested in protected areas that are functional and their management has at least minimum operational capabilities.
- Degree of threat. There can be situations in which DFES resources will fall short of achieving demonstrable impact because of the magnitude of the threat at hand. Conversely, there can be situations in which DFES resources will not be critically necessary as other donors may already be on

[3] See Labbate, G., Janelidze, P., Partskhaladze, N. and Peszko, G. (2003). *Potential Project Pipelines for the Expenditure Programme Financed by the Debt-for-Environment Swap in Georgia – Scoping Phase*. Report financed by the OECD/ENV, Tbilisi, Georgia.

track to demonstrate achievable impact. DFES should avoid investing its limited resources in either of these two situations.

Based on these three criteria, the 1st, 2nd and 3rd priority groups are defined as follows:

1st Priority Group. These areas contain biodiversity of high global significance. They can comprise protected areas that are already receiving support from donors/government. They can also comprise areas in which national parks are likely to be established and whose boundaries have already been defined. Their level of threat is considered as manageable and within the financial possibilities of DFES.

2nd Priority Group. These areas contain biodiversity of global significance and receive limited donor support. They are not considered as protected areas (PA). Even though there may be plans to do so, borders have not yet been defined. These are areas that can receive DFES support once protected areas have been established and buffers/support zones have been clearly identified.

3rd Priority Group. These areas may (i) be situated in conflict zones; (ii) receive substantial support from donors already; (iii) have no PAs established and no donor activity; and/or (iv) have biodiversity of lesser global significance.

The following 14 areas have been identified and distributed according to the definitions of the 1st, 2nd and 3rd priority groups:

First Priority Group

- Adjara
- Vashlovani
- Lagodekhi
- Tusheti

Second Priority Group

- Racha
- Svaneti
- Southern Javakheti

Third Priority Group

- Abkhazia[4]
- Kolkheti
- Trialeti
- Kura
- Manglisi (Algeti)
- Kvernaki
- Askhi-Karst Massif

The main threats to biodiversity are deforestation, grazing and hunting. These threats affect areas in all three priority groups. Exceptions are few; these include the oil infrastructure in the Kolkheti National Park and water management in Southern Javakheti.[5]

[4] However, should the security situation improve and Georgian sovereignty be restored, Abkhazia would be included in the 1st priority group.

This report proposes the following areas for DFES assistance:

1. Increasing the productivity and volume of agricultural activities in the villages neighbouring protected areas;
2. Supporting non-traditional income generation activities;
3. Facilitating access to local markets;
4. Sustainable forest management;
5. Pasture management;
6. Social infrastructure; and
7. Environmental awareness and education.

The target groups that may access DFES resources include:

1. *Non-governmental organisations (NGOs)*. The term NGO is used here in the wide sense, and includes not only Tbilisi-based donor-supported organisations, but also local unaccredited organisations, such as a local hunting union, a shepherd association, and others.
2. *Governmental organisations (GOs)*. This group could involve the administration of nature reserves, local representations of the Department of Forestry and the Department of Protected Areas, and local enforcement bodies. Such institutions may apply for support to improve resource management, monitoring and enforcement capacities in and around buffer zones.
3. *Common interest groups (CIG)*. The concept of "common interest group" refers to a small number of people who share an activity, common concerns or problems.[6] CIGs are not NGOs as they do not have an established management structure. CIGs are likely to include people who are conducting joint or individual household or economic activities and who are willing to contribute toward solving social or ecologic problems through common efforts.

These groups may be found in target communities with the following characteristics:

1. Villages whose inhabitants' daily activities are naturally connected to, and/or have an impact on, the targeted protected area since they are located either within or in the immediate surroundings of the targeted protected area and there is no natural or clear separating border; and
2. Villages whose inhabitants are active users of the targeted protected area. These villages would be located not far from the targeted protected area (e.g. 5 km).

The two main types of support are (i) microcredit and (ii) grants.

Microcredit. This would be used primarily to provide support for increasing farming productivity and alternative income generation projects. Experience with microcredit in Georgia indicates that most loans are in the range of USD 500 - 3 000 and that they rarely exceed this amount. Bigger amounts are given either to families who are well off or to credit groups.[7] Collateral would be required to access credit.

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[5] There is a half-built oil terminal within the Kolkheti National Park. Construction has been stopped due to financial problems. The presence of the oil terminal represents a pending threat because of disturbance (during construction and operation), pollution and the risk of spills. In southern Javakheti, lakes have been dried up for agricultural purposes. This happened during Soviet times, and it is not clear that work of this magnitude would have a positive return today.

[6] The idea of CIG is also part of the Small Grant Programme of the WB/GEF PADP.

[7] This is a group of people linked by family ties or profession who apply collectively for a loan.

Grants. They would be used primarily for technical support in income generation projects, support to access local markets, sustainable forest management, pasture management, social infrastructure projects and environmental awareness campaigns. Experience in Georgia indicates that the maximum size of the grant would be USD 25 000, with the exception of social infrastructure projects, which can easily go beyond this ceiling.[8] There would be co-financing requirements.

Based on previous experience, the total DFES allocation has been estimated at **USD 3.7 million, with 3.1 million distributed as grants and 0.6 million as microcredit**. This USD 3.7 million would constitute the first phase of a DFES programme and would be invested in the areas of Vashlovani, Lagodekhi, Tusheti and Adjara, with an estimated distribution of 20%, 30%, 15% and 35%, respectively.

The **period for disbursement of this first phase has been estimated between 3 and 4 years**. After this period, DFES would carry out an impact evaluation to define additional expenditure needs in areas of the 1st priority group. DFES expenditures in the areas of the 2nd priority group would depend on a clear definition of nature reserve boundaries since these will determine the target communities. This information is expected to be available before the completion of the 1st phase of the DFES programme.

[8] An example could be improving the access road to communities in Tusheti. This single measure would perhaps have the greatest impact on living standards of the community. The access road is often closed and its poor state precludes regular connections with Kakheti. This project would require resources above the USD 25 000 ceiling.

1. INTRODUCTION

The Caucasus region is recognised as holding an important reservoir of biodiversity. It is considered a globally significant "biodiversity hotspot" because of its richness of species and the level of endemism.[9] The reason for this diversity may be explained by its location (at a juncture of two major biogeographic regions), the land shape (the peninsula between the Black and the Caspian seas provides an important migration route and flyway), the topography of the landscape (with great variations in altitudes, and opportunities for isolation) and the climate (which varies significantly across the country, resulting in very varied habitats – from sub-tropical drylands and dry forests, to mountain tundra). Georgia is located at the heart of the Caucasian hot spot. The country has a diverse climate and landscape. With only 69 700 km^2, the country presents 23 soil-climatic zones and harbours a unique plant and fauna diversity.

Map 1: The Caucasus Biodiversity Hot Spot

Source: Conservation International.

This report is a continuation of the work performed in 2003 by a group of local and international experts that identified potential project pipelines for the DFES programme in Georgia (Scoping Phase Report).[10] One of the identified potential pipelines was the *strengthening of buffer zones of protected areas and biodiversity corridors*. The Scoping Phase Report recommended the pipeline to finance projects with the dual objectives of making buffer zones and strategic corridor areas biodiversity-friendly productive landscapes and improving local living standards. The type of projects identified included capital investment support, technical assistance and public awareness. The Scoping Phase Report also recommended to concentrate resources primarily around protected areas whose management capacities are being, or have already been, strengthened. Specifically, the report indicated that the areas targeted by the World Bank (WB)/Global Environmental Facility (GEF) Protected Areas Development Project (PADP)

[9] For further information about the characteristics of the Caucasian hot spot see: http://biodiversityhotspots.org/xp/hotspots/caucasus

[10] See Labbate, G., Janelidze, P., Partskhaladze, N. and Peszko, G. (2003). *Potential Project Pipelines for the Expenditure Programme Financed by the Debt-for-Environment Swap in Georgia – Scoping Phase*. Report financed by the OECD/ENV, Tbilisi, Georgia.

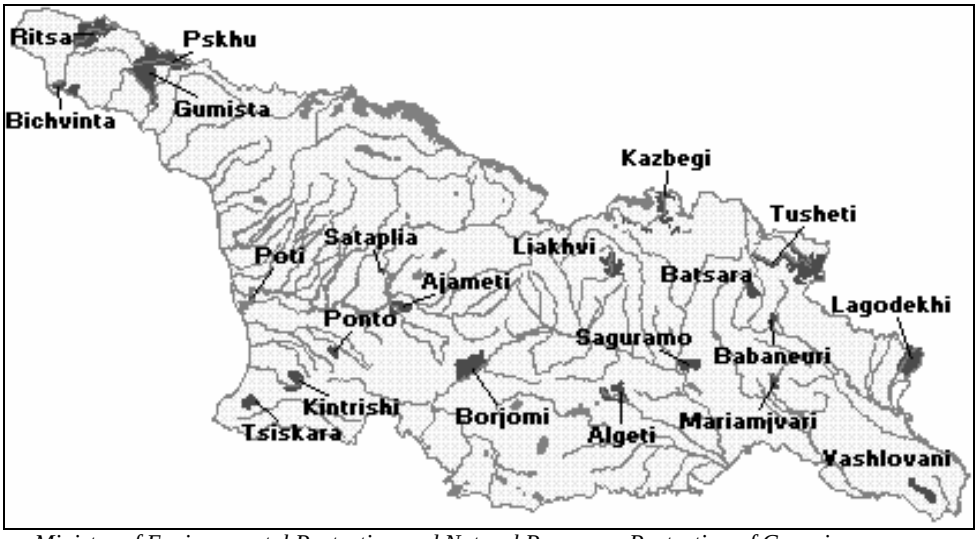
would be eligible candidates: Kolkheti National Park, the Borjomi-Kharagauli National Park and other areas recently identified by the Caucasus Network of Protected Sites (World Wildlife Fund).

The present report explores the feasibility of the biodiversity pipeline in detail. First, the report presents an overview of the Georgian system of protected areas. Second, it introduces the recent work of the World Wildlife Fund (WWF) on priority conservation areas in the Caucasus. This work stands as one of the most comprehensive studies for ranking priority areas in Georgia and the Caucasus. Third, the report presents the criteria for selecting priority areas for DFES. These criteria differ from those of the WWF and, therefore, the resulting ranking of areas is not the same. Fourth, the report describes the main threats affecting the priority sites. Then, the threat analysis is followed by a description of recommended areas for DFES assistance. The report closes with an estimation of the size of the proposed project pipeline.

2. AN OVERVIEW OF THE SYSTEM OF PROTECTED AREAS IN GEORGIA

Map 2 below presents the system of protected areas that Georgia inherited from the Soviet Union.

Map 2: Nature Reserves in Georgia



Source: Ministry of Environmental Protection and Natural Resources Protection of Georgia.

In the mid-1990s, this list of nature reserves grew with the establishment of the Kolkheti National Park and the Borjomi-Kharagauli National Park. The Kolkheti National Park incorporated the former Kolkheti Nature Reserve, the Paliastomi Lake Nature Reserve and the Kolkheti National Marine Reserve (indicated as "Poti" in Map 2). The Borjomi-Kharagauli National Park incorporated the Borjomi Nature Reserve.

Below is a brief description of the nature reserves and national parks on Georgian territory.

Table 1: Nature Reserves - Georgia

Name	Category	Size and Location	Main Characteristics
Ajameti	Nature Reserve	4 845 ha (Bagdati and Zestaponi districts)	The reserve is located on the Kolkheti lowland. Forests occupy 4 700 ha (97%), of which 95% is covered by oak forest. Fauna diversity is limited.
Algeti	Nature Reserve	6 822 ha (Tetritskaro district)	The flora and fauna are rich and diverse. Botanists call the Southern slopes of the Trialeti range a "florist junction", since one could find here flora of Kolkhic, Hircanic, Iberian, Caucasian, Middle Eastern, Persian and other origin. There is substantial impact of human activities on the reserve.
Babaneuri	Nature Reserve	770 ha (Akhmeta district)	Babaneuri reserve, together with the Batsara and Tusheti reserves, form the Akhmeta Nature Reserve. The objective of the reserve is to protect the remnant tree - *zelkova carpinifolia*.
Batsara	Nature Reserve	3 042 ha (Akhmeta district)	The objective of the reserve is to preserve the virgin massifs of yew trees (*taxus*).
Bichvinta-Miusera	Nature Reserve	27 334 ha (Gagra and Gudauta districts)	The objective of the reserve is to preserve rare species: Bichvinta pine tree, strawberry tree, manna, box tree, pterocaria pterocarpa, etc.
Borjomi	National Park	76 000 ha (Borjomi and Kharagauli districts)	This reserve protects the forest massifs of the Borjomi gorge which are important for Caucasian deer.
Gumista	Nature Reserve	400 ha (Sokhumi district)	The objective of the reserve is to protect the chestnut (*castanea*) and other endemic plant species.
Kazbegi	Nature Reserve	8 707 ha (Kazbegi district)	The reserve controls all forests of the Kazbegi district (3 % of the territory).
Kintrishi	Nature Reserve	13 893 ha (Kobuleti district)	The objective of the reserve is to protect the flora and fauna of the middle Kolkhic mountains, particularly the chestnut and beech forests with evergreen elements.
Kolkheti	National Park	28 940 ha, including 15 742 ha of marine area.	This is the most important wetland of Georgia and an important bird area.
Lagodekhi	Nature Reserve	17 932 ha (Lagodekhi district)	The objective of the reserve is to protect the main Caucasian south-east slope's rare endemic flora and fauna.
Liakhvi	Nature Reserve	6 388 ha (Gori district)	The objective of the reserve is to protect and study the southern micro steppes' natural landscapes of the Caucasian range.
Mariamjvari	Nature Reserve	1 040 ha (Sagarejo district)	The Mariamjvari reserve and the Saguramo reserve are jointly administered (see below). The Mariamjvari reserve protects the Caucasian pine tree.
Pskhu	Nature Reserve	27 334 ha (Sokhumi district)	This is jointly administered with the Gumista and Skurcha reserves. The reserve protects the natural tracks of Abkhazian flora and associated fauna.
Ritsa	Nature Reserve	16 289 ha (Gudauta district)	The objective of the reserve is to protect and study the high mountain Kolkhic and sea forests.
Saguramo	Nature Reserve	5 359 ha (Mtskheta district)	This is jointly administred with the Mariamjvari reserve. The objective of the reserve is to protect broadleaf forests, third period remnant of Kolkhic flora and the rare animals of the Transcaucasus.
Sataplia	Nature Reserve	354 ha (Tskaltubo district)	The objective of the reserve is to protect the karstral cave places, where dinosaur footprints can be found. Almost the whole territory of the reserve (98%) presents young Kolkhic forests (cast hornbeam, hornbeam, alder, box, chestnut, beech, ilex, ivy, rhododendron, bilberry, blackberry, etc.).

Skurcha	Nature Reserve	85 ha (Ochamchire district)	This reserve is jointly administred with the Gumista and Pskhu reserves. Its aim is to protect the tertiary period remnant flora: box tree, fig tree, Kolkhic oak, pterocaria pterocarpa, staphylea colchica, rhododendron ponticum, etc.).
Tusheti	Nature Reserve	12 485 ha (Akhmeta district)	This reserve is jointly administred with the Batsara and Babaneuri reserves. Its objective is to protect virgin pine and birch forests.
Vashlovani	Nature Reserve	8 034 ha (Dedoplistskaro district)	The objective of the reserve is to protect and study East Georgia "savannah" light forests.

Source: Ministry of Environmental Protection and Natural Resources Protection of Georgia.

In addition to this list of nature reserves and national parks, the protected area system in Georgia includes several hunting reserves, which are described in Table 2 below.

Table 2: Hunting Reserves - Georgia

Name of Reserve	Area (ha)	Year When Established
Gardabani	3 315	1957
Korugi	2 068	1958
Iori	1 336	1965
Chachuna	5 200	1965
Katsoburi	295	1964

Source: Biodiversity Conservation and Action Plan.

3. IDENTIFYING PRIORITY CONSERVATION ZONES IN GEORGIA

3.1. The WWF Identification of Priority Areas

The protected areas system in Georgia has come under close scrutiny because of two main issues. The first is its capacity to cover a representative sample of the Georgian fauna and flora. The second is to identify priority areas for receiving assistance.

During the 1990s, Georgia received assistance from the World Bank/Global Environmental Facility (GEF) to produce a Biodiversity Strategy and Action Plan (BSAP). Unfortunately, the BSAP does not contain a prioritisation of protected areas or guidelines that could indicate which area should come first in terms of receiving donor assistance. This task, however, was recently completed by the WWF for the whole region of the Caucasus. At present, the work of WWF is the most authoritative and complete assessment of priority conservation zones in Georgia and the Caucasus. The list of areas, which are classified as “highest”, “high” and “medium” priority, includes some existing nature reserves (NR), but not all of them. Because of its comprehensiveness, the work of the WWF will be used in this report as a starting point for the selection of priority areas for DFES assistance.

The complete list of priority conservation zones is presented below.

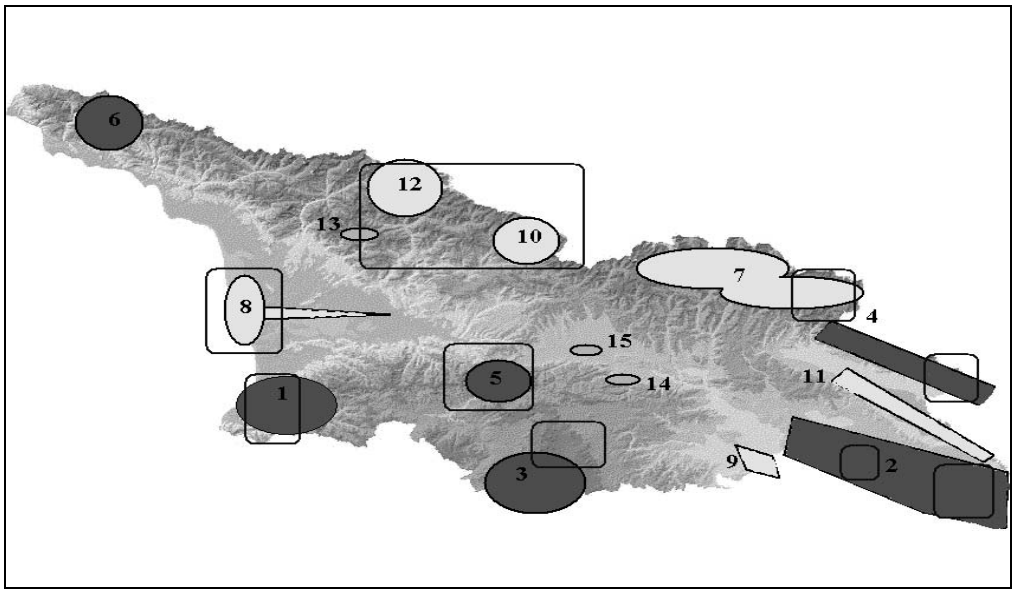
Table 3: Characteristics of the WWF Priority Sites for Georgia

#	Area/Corridor	Presence of NR	WWF Priority Assessment	Donors Active in the Area
1	Adjara	Kintrishi NR and the former Tsiskara NR (no longer operational)	Highest	UNDP/GEF project (under preparation)
2	Iori and Vashlovani	Vashlovani NR	Highest	WB/GEF PADP site Project site of UNDP/GEF project (completed)
3	Southern Javakheti	Does not include existing NR	Highest	UNDP and NGOs, such as CARE, World Vision and others, are active in development and conflict prevention in Javakheti
4	Lagodekhi-Zakatala	Lagodekhi NR	Highest	WB/GEF PADP site
5	Trialeti	Borjomi-Kharagauli National Park	Highest	KfW supports the operation of the National Park and its buffer zone
6	Abkhazia	Includes Ritsa and Bichvinta NR, and partly Pskhu-Gumista NR	Highest	Abkhazia is still considered a conflict zone and there is no work of donors on environmental issues
7	Khevi-Tusheti	Tusheti and Kazbegi NR	High	UNDP/GEF PADP site
8	Rioni	Includes Kolkheti National Park	High	WB/GEF project site The area also recently received assistance from the Japanese Social Development Fund
9	Kura-Jandari	Gardabani Hunting Area	High	UNDP, UNDP/GEF and USAID are active in the management of the Kura River, a trans-boundary river. These initiatives partly include the protection of biodiversity important sites
10	Racha	No	High	WB/GEF PADP site
11	Alazani	No	High	This is an area of interest to the WB/GEF PADP since it bridges the work in the Vashlovani and Tusheti sites. However, the area is not officially included under the project
12	Svaneti	No	High	WB/GEF PADP site
13	Askhi-Karst Massif	No	Medium	N/A
14	Manglisi	It borders Algeti NR	Medium	N/A
15	Kvernaki	No	Medium	N/A

Source: WWF; WB/GEF PADP; UNDP.
Note: N/A – Non applicable.

There is a common understanding of what the most important areas are for conservation purposes in Georgia. The priority areas identified by the WWF is an expanded list of sites identified by other agencies and NGOs. As can be seen from Maps 2, 3 and 4, the list of existing protected areas, the WWF priority sites, important bird areas, and the project target sites of major donors and agencies share similar sections of the country.

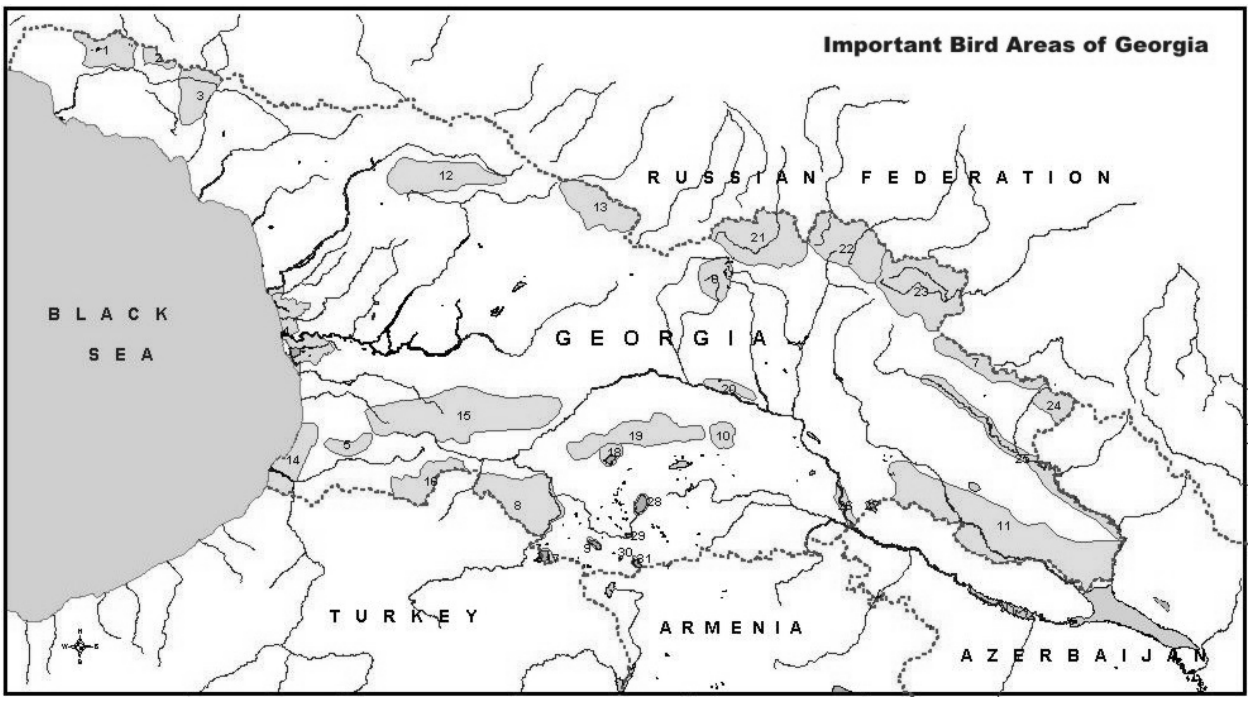
Map 3: WWF Priority Sites and Location of Donor Support



Source: WWF; UNDP; WB.

Map 3 shows the priority areas of the WWF (highest, high and medium). The areas in Map 3 are numbered according to Table 3 above. The rectangles (in blue) show the areas receiving the most substantive donor support for strengthening nature reserves or protecting agro-biodiversity. Finally, Map 4 shows the list of important bird areas of Georgia. It can be seen that priority areas in Maps 2, 3 and 4 overlap.

Map 4: Important Bird Areas of Georgia



Source: Georgian Center for Conservation of Wildlife.

3.2. Criteria for Evaluation of Priority Sites for DFES Financing

The evaluation of priority sites for DFES financing will build upon the work of the WWF on the Priority Conservation Zones and Corridors of the South Caucasus (PCZCSC) project. There are two main reasons for that. The first is that the Biodiversity Conservation and Action Plan (BSAP), as it stands today, does not provide guidance as to which reserves should receive priority attention. While it is true that almost all of them are valuable for one reason or another, in an environment of scarce government and donor resources, some NRs may deserve greater priority than others. Second, the PCZCSC does not fundamentally depart from the common understanding in the Georgian environmental community about the location of the most important areas with regard to biodiversity. In fact, the PCZCSC shows a high degree of overlapping with existing reserves, important bird areas (IBAs) and areas receiving donors' support.

However, the PCZCSC covers 15 areas and this is beyond the number of sites that can expect support from DFES. A further prioritisation is needed. Consequently, this report will depart from the WWF ranking in that it will use modified criteria to select candidate sites. The criteria for identification of priority sites are based on the following:

1. Global and national biodiversity value. This is a basic criterion for evaluation in view of the objectives of DFES, which require the support of projects that provide benefits to both national and international stakeholders.
2. Value added in relation to existing or expected activities of other donors. The resources from DFES are to be invested in buffer and support zones of protected areas. At present, there are several projects from donors aimed at increasing the management capacities of selected reserves. DFES contributions will have the greatest effect when invested in protected areas that are functional and their management has at least minimum operational capabilities.
3. Degree of threat. There can be situations where DFES resources will fall short of achieving demonstrable impact because of the magnitude of the threat at hand. Conversely, there can be situations where DFES resources will not be critically necessary, as other donors may already be on track to demonstrate achievable impact. DFES should avoid investing its limited resources in either of these two situations.

Table 4 below provides a description of each area in relation to these three criteria.

3.3. Identification of the Highest, High and Medium Priority Sites for DFES Financing

Biodiversity criterion

Table 4 shows that the biodiversity in the majority of areas is of global significance. The top-ranked sites are:

- Adjara
- Iori and Vashlovani
- Southern Javakheti
- Lagodekhi-Zakatala
- Trialeti
- Abkhazia.

Table 4: Correlation of WWF Priority Areas with DFES Selection Criteria

Area	Biodiversity Value	Complementarity with Work of Other Donors	Degree of Threats
Adjara	Biologically most diverse section of the western Caucasus	UNDP/GEF and WWF likely to support the establishment of the Mtirala National Park. Candidate area for the WWF/CI Trust Fund	Woodcutting, grazing and hunting of a low to medium intensity
Iori and Vashlovani	Remnant historical woodland and floodplain forests. Ten species listed in the IUCN as endangered or threatened. IBA	WB/GEF PADP supports the operations of the Vashlovani Reserve	Grazing and hunting of a moderate to high intensity. Shepherds usually set fires to dry grass causing habitat damage to threatened species
Southern Javakheti	Unique mountain lakes and bird areas. Also shows agro-biodiversity of global significance	Priority area for WWF and the GCCW, though there is no PA at the moment	Grazing of low and medium intensity; water management
Lagodekhi-Zakatala	Deciduous mountain forests and alpine grasslands. IBA	WB/GEF supports the operations of the Lagodekhi Reserve	Woodcutting and hunting of high intensity. Grazing of medium intensity
Trialeti	Encompasses the border of eastern, western and southern geo-climatic areas of Georgia, with a rich combination of flora and fauna. IBA	Major ongoing support for the park and buffer operations financed by KfW	Habitat fragmentation, forest cutting, pollution, grazing, and hunting of medium to high intensity
Abkhazia	Comprises subtropical and alpine environments with significant endemic flora and fauna. IBA	There is no work of donors. The area is still a conflict zone	N/A
Khevi-Tusheti	As a result of its isolation, the vegetation, and especially the forests, is of an extraordinary diversity. The fauna includes bearded vulture, eagle, griffin, Caucasian tur, roe and red deer, brown bear, wolf, fox, badger, and marten. IBA	The WB/GEF supports the operations of the Tusheti National Park	Hunting is the most important threat. Woodcutting and grazing of medium intensity
Rioni	The most important wetland ecosystem in Georgia and a habitat for species of global significance. IBA	The WB/GEF and WWF supported the establishment of the Kolkheti National Park, while the Government of Japan supports the strengthening of the buffer zone	Woodcutting of medium intensity and potential development of an oil terminal
Kura-Jandari	Riverine forests. Small IBA	UNDP, UNDP/GEF and USAID have projects on international waters management (Kura basin)	Grazing, woodcutting and hunting of medium to high intensity
Racha	Part of the Central Caucasus system with several endemic species, fragile forest and alpine habitats. IBA	Receives assistance from the WB/GEF PADP, though there is no PA at the moment	Woodcutting and hunting of medium to high intensity, depending on section
Alazani	Floodplain forests of global significance. Importance as a corridor between areas in Lagodekhi and Vashlovani. IBA	A priority area for the WB/GEF PADP	Woodcutting, grazing and hunting of medium intensity. Intensive illegal fishing

Svaneti	Part of the Central Caucasus system with several endemic species, and fragile forest and alpine habitats. It also shows agro-biodiversity of global significance. Sections of it contain IBA	A priority area for the WB/GEF PADP, though there is no PA at the moment	Woodcutting of moderate to high intensity depending on section; grazing and hunting of low intensity
Askhi-Karst Massif	Sections of it contain an IBA	No work of donors	Isolated area. Low degree of human impact
Manglisi	Because of its location, it is sometimes called a "florist junction", since one could find flora of a Kolkhic, Hircanic, Iberian, Caucasian, Middle Eastern, and Persian origin	No work of donors	Human impact is substantial. Woodcutting of high intensity. There are no longer any virgin forests in the Algeti reserve. Hunting and grazing of moderate to high intensity
Kvernaki	IBA	No work of donors	Hunting of low intensity

Source: Own compilation.

Of the rest, only Kvernaki, Manglisi and the Askhi-Karst Massif are ranked as medium priority areas, while the remaining areas are in between these two groups.

Value-added criterion

Running the list of areas through the-value added criterion highlights important differences. Because DFES invests its resources in buffer zones of functional protected areas, those receiving donor support come up first. These are:

- Vashlovani
- Lagodekhi
- Tusheti
- Rioni (Kolkheti National Park)
- Trialeti (Borjomi-Kharagauli National Park).

All 5 areas contain nature reserves with management receiving support from donors. However, two of the areas in the list above, Rioni and Trialeti, are already receiving substantial assistance from international organisations. Rioni, which includes the Kolkheti National Park, receives assistance from the World Bank (WB)/GEF for strengthening the park's management, and recently has also secured support from the Japanese Social Development Fund for strengthening the buffer zone. The latter is a programme for assisting communities in improving their livelihoods. In turn, Borjomi-Kharagauli receives considerable assistance from the German Bank for Reconstruction (KfW) and from the WWF for supporting both its management and buffer zone. The level of support going to these two areas creates doubts about the value added of investing DFES resources there.

Adjara, a high value biodiversity area, is a nature reserve (Kintrishi) that is not receiving support from donor organisations at the moment. However, this is likely to change, as the United Nations Development Programme (UNDP) and the WWF are working on an application for GEF resources, which should not encounter serious difficulties in being approved. Investment plans for Adjara are also likely to receive strong backing from the central authorities (Tbilisi), in view of recent development in that region.

Racha and Svaneti do not count yet as established protected areas, although they are part of the Central Caucasus system targeted by the WB-PADP project. The situation in southern Javakheti is similar. There are no protected areas at the moment, though there are several initiatives by the WWF and the Georgian Center for Conservation of Wildlife (GCCW) to establish them. It is expected that considerable resources will flow to this area because of its high ranking in the WWF list of priorities (see Table 3). All other areas are not covered through current or expected (operational) reserve management.

Using the value-added criterion, Vashlovani, Lagodekhi and Tusheti come up at the top of the ranking, followed by Adjara, Racha, Svaneti and Southern Javakheti. Kolkheti and Borjomi-Kharagauli are not in critical need of additional support and therefore the value-added of DFES resources is low. All other areas identified in Table 4 do not yet have functional protected area management, which poses major barriers for investing DFES resources in buffer zones.

Degree of threat criterion

The areas identified as priorities in Section 3.3.2 above (Iori-Vashlovani-Alazani, Lagodekhi, and Tusheti) are affected by a combination of woodcutting, grazing, hunting and agriculture. The intensity and relative importance of these activities vary from site to site. However, none of them stands as a threat that could not be controlled with support from DFES.

Adjara, which is the most biologically diverse part of western Georgia, shows threats that are of medium and low intensity and therefore manageable within DFES resources. Racha and Svaneti face woodcutting as the main threat but its impact is concentrated along the main roads. Preventing the activity from damaging other sections should be a feasible goal. Southern Javakheti presents a low intensity of threats as the most important sectors are almost uninhabited.

Ranking results

This report will rank target areas in terms of the 1st, 2nd and 3rd priority groups defined as follows:

1st Priority Group. These areas contain biodiversity of high global significance. They can comprise protected areas that are already receiving support from donors/government. They can also comprise areas in which national parks are likely to be established and whose boundaries have already been defined. Their level of threat is considered as manageable and within the financial possibilities of DFES.

2nd Priority Group. These areas contain biodiversity of global significance and receive limited donor support. However, they are not considered as an established protected area. Given that DFES resources are expected to be limited, these areas can receive support after PAs have been established and buffers zones have been clearly identified.

3rd Priority Group. These areas may (i) be situated in conflict zones; or (ii) receive substantial support from donors already; (iii) have no PAs established and no donor activity yet; and/or (iv) have biodiversity of lesser global significance.

The list of areas, distributed according to the priority groups, is as follows:

First Priority Group

- Vashlovani. This nature reserve is receiving support from the WB/GEF PADP. The area contains riverine forests of global significance. The threats to biodiversity have been well researched and

necessary actions identified. DFES would also extend support to cover the eastern section of the Alazani river, which acts as a corridor between this nature reserve and Lagodekhi (see below).

- Lagodekhi. The area is currently receiving support from the WB/GEF for strengthening protected area management. Lagodekhi contains forests of global significance. The threats to biodiversity have been well researched and necessary actions identified.
- Tusheti. This area receives support from the WB/GEF for strengthening protected area management. Tusheti contains alpine biodiversity of global significance. Threats to biodiversity have been identified, although further fine-tuning of required actions is still needed. This work is currently underway and should be completed by the time DFES is established.
- Adjara. This is indisputably the area with the highest biodiversity value of western Georgia. There are advanced discussions between the UNDP and the WWF to strengthen the Kintrishi State Nature Reserve through the establishment of the Mtirala National Park. Threats to biodiversity have been well identified and are manageable within the expected scope of DFES resources.

Second Priority Group

- Racha. This is part of the Central Caucasus and receives limited assistance from the WB/GEF for establishing a protected area system. Threats to biodiversity have been identified, although further fine-tuning of required actions is still needed. This work is currently underway and should be completed by the time DFES is established.
- Svaneti. This is part of the Central Caucasus and receives limited assistance from the WB/GEF for establishing a protected area system. Until recently, the area was almost inaccessible for the work of donors due to the poor security situation. Security, however, appears to have improved recently following the change in government in Georgia.
- Southern Javakheti. While this is an important bird area, it is not a protected area. Threats to biodiversity are at present of a low intensity (large parts of the area are uninhabited) and the situation is unlikely to change in the short or medium term. Further, the area is likely to receive WWF support. Under the present conditions, it is recommended to wait with regard to DFES until the boundaries of the expected protected area have been established and the subsequent specific challenges in the buffer zones have become clear.

Third Priority Group

- Abkhazia. This would have been in the list of the highest priorities because of its biodiversity value. Unfortunately, the area is still a conflict zone. If the political conflict with Abkhazia is resolved and Georgian sovereignty restored, the area should join the 1st Priority Group of sites for DFES.
- Kolkheti. This is the most important wetland of Georgia and a Ramsar site. Kolkheti, which includes the national park of the same name, is receiving substantial support for its protected area and buffer zones. It does not critically need DFES resources at this time.
- Trialeti. This area comprises the Borjomi-Kharagauli National Park, which is receiving substantial support from the WWF and the KfW, for both its protected area and buffer zones. It does not critically need DFES resources at this time.
- Kura. Its biodiversity value is less than that of other areas in the list of highest and high priorities. In addition, the whole of the Kura River will undergo a Strategic Action Plan (SAP) exercise that will identify hot spots and best strategies to address threats. It is also expected that the Kura River will receive support from the GEF and other donors. It is recommended to wait for SAP results and the confirmation of donor support before investing DFES resources in the area.

- Manglisi (Algeti). Human influence over the reserve territories is substantial. Due to uncontrolled tree cutting, cattle grazing and hunting activities, there are no virgin forests left within the reserve. The reserve has been partitioned into agricultural areas and settlements, and maintenance of the protection regime is a complicated task. The biodiversity significance of the area is ranked as "medium". It is recommended to direct DFES resources to this area once the operational capacities of the reserve (e.g. enforcement) have been improved.
- Kvernaki. Biodiversity in the area is considered of less importance than in other areas (i.e. of highest and high priority). There is no established protected area. It is recommended to invest DFES resources in Kvernaki once areas of highest and high priority have been properly covered.
- Askhi-Karst Massif. Threats to biodiversity in the area are low. No protected area has been established there. It does not critically need DFES resources at this time.

The compatibility of this analysis with the WWF ranking should be noted. All but one area of the First Priority Group described here are identified by WWF as highest priorities.

4. THREATS TO BIODIVERSITY: MAIN PROBLEMS TO BE TACKLED

This section contains a summary of threats affecting areas in the 1st priority group. The threats comprise deforestation, grazing and hunting. Even though the description of threats for areas in the 2nd and 3rd priority groups has been omitted for reasons of space, basically the same type of threat affects these areas as those in the 1st priority group. Exceptions are few; these include the proposed oil infrastructure in the Kolkheti National Park and water management in Southern Javakheti.[11]

The objective of describing threats to biodiversity is to familiarise policy makers with the main characteristics of these activities. Tackling the negative impacts of activities that threaten biodiversity will require strengthening the buffer functions of areas around nature reserves. This report therefore proposes to use DFES resources to help improve living standards of communities around protected areas and to combine these efforts with public awareness campaigns and better enforcement capacities.

4.1. Deforestation

The overall status of forests in Georgia is still a matter of controversy and opinions are divided. On the one hand, there are claims that forests are being depleted at an alarming rate and that the impact of illegal cutting for commercial purposes is already visible in the greater frequency of landslides. On the other hand, there are estimations that total forest resources have actually increased in the last decade, following the collapse of the Soviet wood processing industry.

[11] There is a half-built oil terminal within the Kolkheti National Park. Construction has been stopped due to financial problems. The presence of the oil terminal represents a pending threat because of disturbance (during construction and operation), pollution and the risk of spills. In southern Javakheti, lakes have been dried up for agricultural purposes. This happened during Soviet times, and it is not clear if work of this magnitude would have a positive return today.

There appears to be some truth in both claims. Even a casual inspection of some regions, such as Samtskhe-Javakheti, Racha or Svaneti, will show clear signs of logging activities. Deforestation is most visible along roads, because these facilitate the transportation of wood, and around rural settlements, because of their heavy reliance on fuel wood. It is also possible that the collapse of the Soviet wood processing industry counterbalanced the increased reliance on fuel wood that followed the collapse in central heating systems and electricity distribution.[12]

The intent of DFES, however, is not to ensure sustainable forest extraction at a national level. This is a local responsibility, and dealing with it is in the long-term best interest of Georgia. In addition, the country has taken out a USD 21 million credit from the World Bank to ensure sustainable forest extraction. Rather, the objective of DFES is to ensure that woodcutting around protected areas does not threaten these areas. DFES resources should therefore ensure that woodcutting is carried out in a sustainable manner and results in an increased fuel security for the local population. If this type of support is to be effective, it is necessary to understand the main characteristics and purposes of the activity ("who does it?", "why?"). These characteristics are presented below.

Most people cut wood because of need and because there is no other fuel source

Wood is cut for three purposes: wood as fire material, wood as building material, and wood for commercial selling. In the communities around protected areas, the bulk of logging is done to obtain fuel wood.

Almost 15 years after independence, the country still faces an acute energy crisis. With too little cash to afford the rehabilitation and operation of its thermal plants, the country relies significantly on hydro-electrical sources of power. With rains coming mainly during the summer period and peak demand taking place in winter, the result is widespread blackouts. A regime of 8 hours/day of electricity is considered a "good" one by the rural population and in many urban settlements. For years, many parts of Georgia have only received a couple of hours of electricity per day, at best.[13] Some have received none for days at a time. With the new government, the situation is beginning to change for the better, but solving the energy crisis will remain one of the greatest challenges for the development of Georgia.

With electricity in short supply, central heating systems out of order, natural gas distribution restricted to a few districts, and diesel beyond the purchasing power of the majority of the population, wood fuel has become the main energy source for most people in Georgia.

[12] The district (central) heating system collapsed after independence due to lack of maintenance. Later, it was looted and the material was sold as scrap metal. Electricity supply also collapsed after independence, and the majority of the population receives less than 8 hours of electricity a day, with large parts of the country receiving less than 4-5 hours/day in winter. Some villages have no electricity for days at a time.

[13] For example, on average, Guria received electricity for 1 hour a day during the winter of 2001. Several parts of Kakheti received none for months. See *National Human Development Report 2001-2002*. United Nations Development Programme. Tbilisi, Georgia.

Table 5: Wood Fuel Reliance - Share of the Population Using Wood Fuel in Selected Districts

	What % of your cooking fuel needs are met by wood?					What % of your heating fuel needs are met by wood?				
	100%	**> 50%**	**50%**	**< 50%**	**0%**	**100%**	**> 50%**	**50%**	**< 50%**	**0%**
Akhmeta	23.0	48.0	22.0	3.0	4.0	99.0	0.0	0.5	0.0	0.5
Lagodekhi	36.0	22.0	20.0	16.0	6.0	68.0	26.0	2.0	3.0	2.0
Dedoplistkaro	12.0	20.0	28.0	25.0	15.0	92.0	0.0	2.0	2.0	5.0
Oni	58.7	8.7	28.0	3.3	1.3	70.7	24.0	4.7	0.7	0.0
Ambrolauri	16.0	53.3	26.0	4.0	0.7	74.7	16.7	8.0	0.7	0.0
Tsageri	30.7	40.7	25.3	3.3	0.0	82.7	13.3	4.0	0.0	0.0
Lentekhi	28.7	49.3	19.3	2.0	0.7	76.1	17.7	5.5	0.5	0.2

Source: WB/GEF PADP; Forestry Development Project (reports produced by GORBI); 2000.

Table 5 shows the reliance on fuel wood for selected districts within the 1st and 2nd priority groups of areas. It is clear that reliance on fuel wood is very significant. For example, full reliance (100%) for heating purposes is at its lowest in Lagodekhi, but still 68% of the families have no other energy option. Full reliance peaks in Akhmeta, where almost all families (99%) depend on wood to heat up their houses. Table 5 shows that, on average, more than 90% of families either depend totally (100%) or heavily (>50%) on fuel wood for heating. The situation concerning cooking is less dramatic. This is because families often resort to the use of bottled gas[14] or electricity (if available)[15] when it is economically unjustified to light up the wooden stove only for light meals, such as boiled eggs or hot drinks, such as tea.

The results of Table 5 are similar to those obtained in the vicinity of Kolkheti National Park (Guria and Samegrelo).[16] There, almost 100% of households reported wood as the main energy source for heating. For cooking, firewood was also predominant, although bottled gas and electricity were used to some extent. Adjara, the site of the 1st priority group area, also shows wood as the primary fuel for heating and cooking for 81% and 56% of families, respectively. These results are also in line with those for the population of Georgia as a whole. More than 80% of households in the country, with the exception of Tbilisi (25.2%) and Rustavi (40.2%), use wood as the primary fuel for heating. For cooking, wood is the predominant source of energy in Svaneti (92.7%), Racha-Lechkhumi (79.7%), and Guria (74%), while families in other regions have a greater use of bottled gas or electricity[17].

The data clearly indicate that people consume wood primarily out of necessity and because they have few other choices. The vast majority of the rural population cuts wood because other types of energy sources for heating, which were available under the Soviet regime, are no longer functional (e.g. electricity) or affordable (e.g. diesel). The majority of households (90.2%) that relies exclusively on wood for heating and cooking declared that non-wood forms of fuel were too expensive.

[14] Bottled gas is expensive for most families, with the full charge at about 15 GEL. If used for all cooking needs, a bottle can last up to two weeks for a monthly expense of 30 GEL. For the purpose of comparison, the poverty line is about 114 GEL. In other words, using gas for cooking purposes can take about a quarter of the subsistence income in Georgia.

[15] In addition to irregular electricity supply, there is the problem of low voltage. For example, Svaneti receives a relatively good supply in terms of hours/day, but electricity is often of low voltage (e.g. 140-160 V). This makes it inappropriate for cooking or heating purposes.

[16] See Nadareishvili, M., Pkhakadze, V., and Kapanadze, N. (2001). *Kolkheti Wetlands Community Household Survey*.

[17] *The Status of Households in Georgia – 2002*. Save The Children, Tbilisi, Georgia.

These data allow two conclusions that are relevant for the work on DFES. The first is that woodcutting will continue in the foreseeable future. Measures can be taken to stop illegal logging and to ensure that the logging pressure is sustainable and distributed among Georgian forests (so that there are no severe localised impacts). However, it is unrealistic to expect a massive substitution of wood with other energy sources.

The second conclusion is that communities need to be provided with access to a forest area big enough to allow sustainable extraction rates in view of current consumption needs. This area can combine sections inside and outside of buffer zones. Protocols of extraction should be agreed with the reserve management authorities and the Department of Forestry. In principle, areas in the 1st and 2nd priority groups should be able to allocate enough forest resources to meet local needs.

Family consumption of wood varies between 5-20 m^3/year depending on location

Both urban and rural households depend on wood for heating and cooking purposes. The level of consumption depends on whether the area is urban or rural and, not surprisingly, on the severity of winter.

Table 6: Consumption of Wood for Heating (m^3/winter) (*)

Region	Wood Consumption
Samegrelo	9.05
Imereti	6.32
Guria	8.88
Tbilisi	4.53
Rustavi	6.46
Mtskheta-Mtianeti	7.24
Kvemo Kartli	7.11
Kakheti	8.60
Shida Kartli	5.29
Samtskhe-Javakheti	10.10
Racha-Lechkhumi	8.30
Svaneti	14.66
Adjara	4.82

(*) Average amount of wood used by household over the winter period (3 months) for heating.
Source: The Status of Households of Georgia 2002. Save the Children.

Table 6 shows wood consumption for heating during the three months of winter. It also shows averages for the regions, plus the cities of Tbilisi and Rustavi. However, the consumption of wood in communities around targeted protected areas is greater than the averages shown in Table 6. This is because these communities are mainly rural and heating needs are usually greater than the 3 months of winter. A Social Assessment carried out under the World Bank Forestry Project has found that families in the districts of Oni and Tsageri, which are located within the 2nd priority group of areas, consume approximately between 8 to 18 cubic metres of firewood a year. The households surveyed in rural Racha reported using a total annual average of 10.2 cubic metres of wood for fuel. In the neighbourhood of the Kolkheti National Park, where fuel wood is the only energy source available, people consume between 15-20 m^3 per year. In Svaneti, where winters are long and harsh, the annual consumption is rarely lower than 20 m^3.

The data show that there is already enough information to estimate family fuel needs. These data, in combination with the size of targeted communities, will indicate the estimated forest areas that need to be secured to meet local fuel wood requirements.

Most families purchase wood rather than cutting it themselves

Table 7 below shows the origin of wood consumed for heating in different regions and in the cities of Tbilisi and Rustavi.

Table 7: Consumption and Origin of Wood for Heating – Regional Averages in Percent (Combined Urban and Rural)

Region	Source of Wood for Heating		
	Purchased	Cut by Family	Other
Samegrelo	79.7	17.2	3.2
Imereti	68.3	24.4	7.3
Guria	57.2	39.8	3
Tbilisi	74.9	14.9	10.3
Rustavi	71	4.1	24.8
Mtskheta-Mtianeti	72.2	24.7	3.1
Kvemo Kartli	83.6	8.15	8.25
Kakheti	77.7	17.8	4.5
Shida Kartli	85.4	12.3	2.3
Samtskhe-Javakheti	85.8	9.4	4.9
Racha-Lechkhumi	47.3	49.3	3.3
Svaneti	19.5	77.9	2.7
Adjara	80.7	12.3	7.0

Source: The Status of Households of Georgia 2002. Save the Children.

The data indicate that most families purchase their wood rather than cut it themselves. In cities and rural towns, the proportion of families that purchase wood is much greater than in rural villages. Table 7 indicates that the countryside generates wood to meet its consumption needs plus the needs of urban families. The result is a woodcutting sector of significant proportions that goes mostly unregulated.

Most families cut wood for their own consumption

Table 8 below shows the share of families engaged in woodcutting for a selected number of districts.

Table 8: Is Your Household Engaged in Woodcutting? (Share in Percent)

	Oni	Ambrolauri	Tsageri	Lentekhi	Total
Yes	56.0	68.7	58.0	74.7	64.3
No	44.0	31.3	42.0	25.3	35.7

Source: GORBI, 2000.

Table 8 shows that on average over 2/3 of families are engaged in woodcutting in the districts of Oni, Ambrolauri, Tsageri, and Lentekhi. These figures are higher than those reported for Akhmeta, Lagodekhi and Dedoplistkaro (11%), and similar to those reported for the vicinity of the Kolkheti National Park (approximately 50%).

Unfortunately, information about the main reason for woodcutting is only available for selected districts. The available data, combined with information from interviews and personal observations, nonetheless suggest that usually only a minority of families engages in woodcutting for commercial purposes.

Table 9: If Your Family Cuts Wood, What Is the Main Purpose of This Activity? (In Percentage)

	Region				Total
	Oni	Ambrolauri	Tsageri	Lentekhi	
Commercial	3.6	0.0	25.6	3.6	7.6
Fuel	96.4	100.0	72.1	96.4	91.9
Building materials	0.0	0.0	2.3	0.0	0.5

Source: GORBI, 2000.

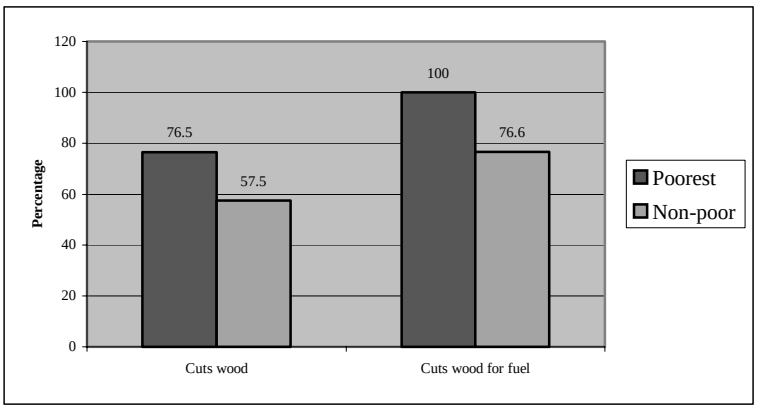
Except for Tsageri, where commercial woodcutting involved 25.6% of local families, all other districts show that only a minority cuts trees to sell. This result is in line with those reported for the vicinity of the Kolkheti National Park, where the percentage of households engaged in wood selling is only 4.4%.

The implication for a DFES programme is that, on average, DFES projects will deal with communities that cut wood mainly for their own consumption needs. This will simplify project design and implementation. First, fuel needs for local consumption are going to be lower than when commercial felling is also present. This will diminish the forest area required to meet local needs. Second, woodcutting for commercial purposes often involves illegal logging and it is not unusual to find local authorities, including police, benefiting from the activity. This can be a difficult constituency to deal with.[18] The lower the frequency of commercial logging, the easier it will be to secure sustainable forest use around priority target areas.

The poorer the household, the likelier it is to cut wood; the better off the household, the likelier it is to cut wood for commercial purposes

A good determinant for identifying households that cut wood is their economic status. Basically, the poorer the household, the likelier it is to cut wood. On average, 57.5% of non-poor households surveyed in Racha, Svaneti and Lechkhumi cut wood, but this figure goes up to 76.5% for those that reported being unable to afford food.

Figure 1: Woodcutting Among Poorest and Non-Poor Households in Svaneti, Racha and Lechkhumi (in Percent)



Source: GORBI, 2000.

[18] For the purposes of illustration, a regular truck can load 10 m^3 of wood, which at a price of 25 GEL/m^3 gives a gross revenue of 250 GEL per truck (approximately USD 130). A truck can be easily loaded and its contents sold in a day of work. A person with access to a few trucks and the right connections can earn a gross revenue of about USD 4 000/month, not a trivial amount in Georgia.

Figure 1 shows data for the regions of Svaneti, Racha and Lechkhumi. The percentage of households engaged in woodcutting steadily declined as the reported economic conditions improved. Among the poorest households, 100 % cut wood for the sole purpose of obtaining fuel. In contrast, 23.4% of all households able to afford both food and clothes engaged in woodcutting also for commercial purposes. In general, this does not involve large-scale operations but rather supplying a limited number of other families.

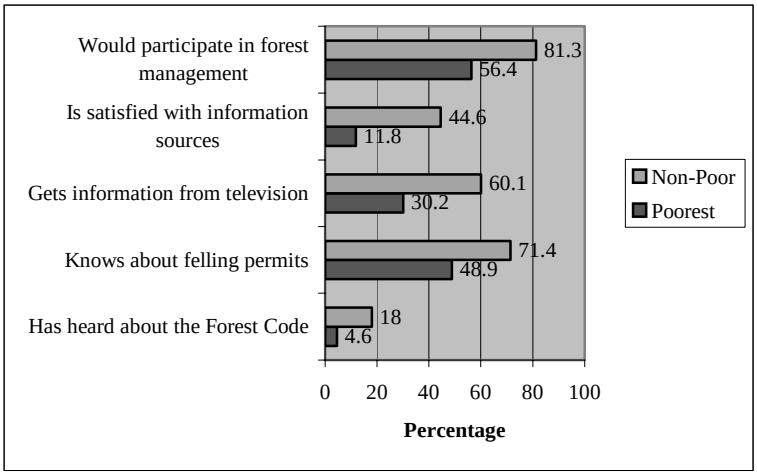
While these findings are strictly relevant for Racha, Svaneti and Lechkhumi, it is safe to assume that in general the poorest households will be involved in woodcutting mostly to satisfy their own consumption needs. The poorest households (e.g. those unable to afford food) cited unemployment as one of their most serious problems, and were most likely to cite this problem as their single greatest difficulty (57.0%, as compared to 29.9% of the other households). This finding indicates that the poorest households would not support further restrictions on forest access and utilisation simply because they have no means to access other fuel sources.

An important difference between households primarily cutting wood for sale and those cutting to meet their own fuel needs is their willingness to start their own business utilising forest resources. Households cutting wood for commercial purposes seem much more inclined to start a business utilising forest resources (48.3%, compared to 28.4% of households cutting wood for fuel). The majority of these households would start beekeeping activities or forest nurseries. Surprisingly, few, if any, want to initiate woodcutting or wood processing enterprises.

Low income appears to be associated with lower interest in forest management and less access to information

The poorest and non-poor groups shown in Figure 2 are the same as in Figure 1, and the results are strictly valid for Racha, Svaneti and Lechkhumi. However, circumstantial evidence suggests that these findings could be applicable in general. Figure 2 shows that the poorest individuals have less inclination to participate in forest management. Specifically, only 56.6% of them would participate in forest management, even though they completely depend on that resource for their heating and cooking needs. In contrast, 8 out of 10 non-poor households would take part in forestry management activities. The poorest families also know less about felling permits and the forest code. They also have much less access to information than other income groups.

Figure 2: Poorest and Non-Poor – Attitudes and Capabilities (Racha; Svaneti; Lechkhumi)



Source: GORBI, 2000.

These findings are relevant to a DFES programme on several fronts. First, the poorest households will resist attempts to restrict woodcutting. They simply do not have the means to access alternatives energy sources. Second, they are less inclined to participate in forest management and this could reflect a misconception about what "forestry management" means and/or the high opportunity cost of time. DFES projects would have to invest time in clarifying the benefits to the community arising from secure access to forest resources and sustainable extraction rates. Third, the poorest households often spend much energy and time just trying to survive. Their participation rates could still turn out to be lower than other groups even in the presence of awareness campaigns. Fourth, households involved in woodcutting for commercial purposes will likely have a greater income and greater capacity to accommodate to changes in their activities, for example, such as cutting wood in a different area and using different protocols or gradually switching to other forest activities.

The decisions on resource ownership and management might need to be made on a case-by-case basis

Much has been said about the need to transfer the ownership of forest resources to local communities as the ultimate solution to ensure sustainable use and conservation. As the argument goes, local communities are dependent on forests and if they gain legal title to the resource and can exercise this right, it will be in their best interest to ensure the sustainable use of the forest.

In the Georgian context, this argument is not watertight. First, as data show, communities are heavily dependent on fuel wood. Tree-cutting does not take place because of the lack of public awareness about the importance of forests or because of unclear property rights. Most families cut trees because there are no other options available. Second, institutions in rural Georgia, such as the judiciary and the police are weak and still riddled with corruption problems. It is not enough to give a community the legal right to a resource; the community also has to have the means to enforce these rights. If the community perceives that it does not have the capacity to enforce its rights over the resource, for example, if intruders continue to extract wood from the forest and the local police are unwilling to intervene, the result can be the same as in an open access resource setting. Third, rural communities in Georgia are not homogenous groups that will manage resources equitably and sustainably, if only given clear property rights. They are also affected by problems of information on how to manage the resource as well as power asymmetries among community members. It would be an oversimplification of reality to expect sustainable resource use only because of a transfer of ownership from the state to communities.

The definition of formal access rights can be an attractive tool to promote sustainable extraction rates but not the end objective. The implication for DFES is that community ownership of forest resources can be an option among others, and that the arrangement should be made on a case-by-case basis. DFES projects should be flexible in their approach. One should expect to find situations that need state ownership of the forest, while DFES projects support communities in their management and enforcement efforts. In other situations, formal titles may be given to community associations. In any arrangement, the crucial point is not so much the formal ownership of the resource, but rather the existence of mechanisms ensuring the right to use of the resource by communities, as well as internal community mechanisms for enforcing agreed protocols of extraction.

4.2. Grazing

Grazing inside protected areas can have negative effects on the process of natural reforestation because it usually results in the destruction of young saplings of plants. However, grazing outside of protected areas can be an admissible activity as long as the carrying capacity of the area and the rotation patterns are respected.

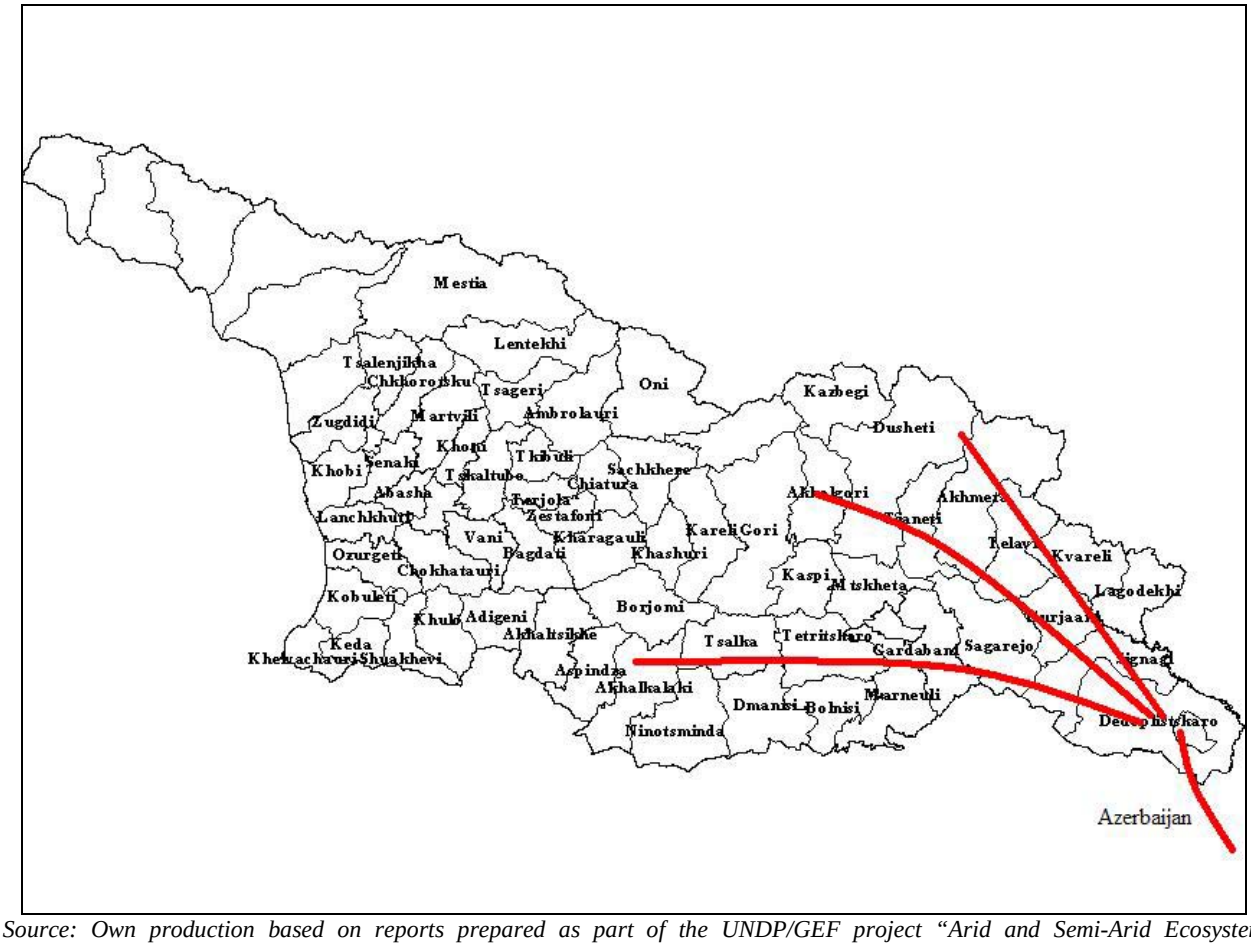
Grazing affects the 1st and 2nd priority groups of areas in quite different ways. Adjara and the Central Caucasus system (Racha and Svaneti) are little affected by overgrazing problems. They also have animal loads that remain more or less constant during the year. In contrast, eastern Georgia is much more affected by land degradation from overgrazing, particularly the Dedoplistkaro district, which includes the Vashlovani reserve. Eastern Georgia also shows a major change in the distribution of grazing pressure from winter to summer.

The remaining sections will describe the main characteristics associated with grazing, with a focus on eastern Georgia, including Tusheti. In this region, tackling overgrazing will require paying attention to migration patterns, institutional issues regarding land use and the introduction of systematic rotation patterns. It will not be easy to deal with these issues. In contrast, dealing with grazing in Adjara, Racha and Svaneti will be much simpler and will require investment in public awareness about park boundaries.

A distinctive migration pattern in eastern and central Georgia

Eastern Georgia, particularly the pastures in the district of Dedoplistkaro and Signagi, has relatively mild winter weather. The area receives sheep from several districts of Georgia, including Kvareli, Dusheti, Telavi, Kazbegi, Tianeti, Akhalgori, Akhmeta and Gurjaani, as well as from the region of Samtskhe-Javakheti and sections of Azerbaijan.

Map 5: Grazing Migration Patterns



Source: Own production based on reports prepared as part of the UNDP/GEF project "Arid and Semi-Arid Ecosystem Conservation in the Caucasus".

Migration takes place primarily in May and September. Sheep leave eastern (winter) pastures in May and stay in summer pastures until September, when they start to return. These months are not exact, and the migration may start a month earlier or a month later, depending on weather. In contrast, Adjara, Racha and Svaneti do not have migration patterns. Livestock mostly stay within these regions all year round.

Owners and shepherds consistently report that moving sheep between winter and summer pastures is a significant problem. The population has narrowed the driving routes and restricted night camps. Many traditional routes are only for cars these days. In order to feed the sheep, shepherds have to buy pastures from the local population. Theft of animals is common and the police impose a heavy "tax" on shepherds by means of multiple bribes.

The overall quality of pastures has decreased

The general perception of people is that the quality of pastures has decreased in the recent past. A survey conducted in the year of 2000 found that 92% of shepherds in Dedoplistkaro declared that the conditions of pastures had worsened over the past 5 years. In Akhmeta and Lagodekhi, 88% and 50% respectively thought that the quality of pastures had declined. None of the shepherds reported that pastures have improved in recent years.[19]

Fortunately, major land degradation problems because of overgrazing have not yet affected the area immediately around the Vashlovani reserve.[20] As one moves away from the Vashlovani reserve, the state of pastures worsens, especially in the southern part that borders the river Iori. The pastures of the Arboshiki zone are rented mainly to shepherds from Iormuganlo in Azerbaijan. Here, the quantity of sheep amounts to approximately 10-15 sheep per hectare. The soil is exhausted and erosion is obvious, even for the non-expert eye, especially on the 500-1000 meters wide area along the left bank of the river Iori.

In summary, while the overall state of pastures appears to have worsened, the situation is still not critical, except for specific places, particularly those that have the best access to water, which are also sectors that contain riverine forests of global biodiversity value. This presents a good opportunity for DFES projects. The fact that pastures around Vashlovani are not fully used at present is of little relief. If other winter pastures become degraded, the pressure will be to occupy those closer to the reserve. Moreover, a programme of support for sustainable pasture use should go beyond the strict vicinity of the Vashlovani reserve. Because pastures are in general not yet severely degraded, promoting sustainable pasture use is still possible without the need for closing major areas. This greatly eliminates the scope for conflicts and increases the likelihood of success.

The current land tenure regime erodes incentives for conservation

Pastures are mostly state owned and are managed by the State Land Management Department, which rents the land to private individuals for a period of 49 years. This period is long enough to allow for internalising the cost of land degradation and, in theory, this arrangement should promote land conservation.

However, the system is riddled with problems and corruption. Pastures are constantly "sub-rented". Indeed, a large part of pastures has already been rented to non-shepherds, including many state officials, who in turn sub-rent the land to sheep owners or shepherds for profit. Individuals, who rent land directly from the state, are not bound by enforceable contract provisions regarding the condition in which the land should be

[19] *Protected Areas Development Project: a Social Assessment*. Prepared by GORBI for the WB/GEF Protected Areas Development Project. Tbilisi, Georgia 2000.

[20] According to employees of the Vashlovani reserve, no more than 2/3 of the pastures are loaded.

given back. Further, as there is no previous assessment of the land's condition at the beginning of the renting period, there is no benchmark for comparison once the land is returned.[21]

The most important consequence of the present regime is a serious erosion of incentives for conservation. First, people who actually shepherd animals on the land plots are not landowners. Second, shepherds pay a fixed amount per hectare (between GEL 1.5-3) and an additional fixed amount per animal head. In other words, the land rent cost per animal head diminishes the greater the herd. Third, because of the little transparency with which land was originally allocated for rent, many individuals have concerns about the long-term viability of their contracts with the state. This helps to increase the discount rate of the renter. Pastures end up being rented to shepherds for periods far shorter than 49 years. Renting periods are usually between 1 and 5 years. Fourth, individuals renting land from the state appear to be unconcerned about the condition of their land as they rarely check the number of animals grazing on their plots.

The data clearly indicate that DFES projects aimed at introducing sustainable pasture use will have to pay considerable attention to land tenure issues, if the negative impact of land degradation is to be internalised into the cost-benefit calculations of shepherds. This is easier said than done. The current pasture renting system is the result of an overall privatisation process that has become famous for its nepotism and unaccountability. Though the new government is undertaking a frontal assault on corruption, one should still expect resistance to change in rural Georgia.

The shepherds are also wary of entering into long-term contracts with the government. The last 15 years saw a general retreat of the state from its basic responsibilities, such as paying pensions, salaries and providing basic services (e.g. electricity; water, security). In several regions, the state apparatus was captured by local elites and put at their own services. Shepherds consider the state as an unreliable partner, and hesitate to enter into contract with it.[22]. Because of these factors, DFES projects will have to work hard to gain back the trust of shepherds.

Traditional rotation methods have been completely abandoned

Traditional methods of pasture rotation have been totally abandoned. In addition, awareness about pasture protection methods, including rotation, is low in eastern Georgia. In Lagodekhi, less than 1% of respondents had heard about methods to preserve pastures. In Akhmeta and Dedoplistkaro, only 14% and 7% of households respectively were aware of rotation methods.

This is most unfortunate because historical records show that before the Soviet revolution, communities had applied a system of rotation based on seasonal and "year-to-year" pasture utilisation. Shepherds involved in the animal migration cycle used to work in co-operative sub-groups. Each sub-group would receive two plots for 10-15 years to utilise as pastures. Each plot consisted of two different types of pastures: hills and plains. At the beginning of the autumn season, each sub-group would first occupy the hilly areas of one of their two land plots. In winter, they would bring their herds down to the plain areas. This seasonal and "year-to-year" scheme resulted in leaving one plot of pasture untouched throughout the whole year. In the following year, the same method was repeated in the area that had been left idle the year before. In addition, there was a full rotation of plots among shepherds after 10-15 years.[23] Mutual

[21] See "Social Problems of Grazing on Arid and Semi-Arid Grazing Plots of Eastern Georgia. A Social Evaluation". Report prepared by GORBI for the UNDP/GEF project "Arid and Semi Arid Ecosystem Conservation in the Caucasus". Tbilisi, 2001.

[22] Surveys show that shepherds are unwilling to enter into 49-year contracts with the State. Specifically, they fear a change in environmental conditions, as well as a lack of capacity of the state to enforce its own contracts (they fear that "the government of someone could take our land back").

[23] As reported by S. Makalatia, 1934.

enforcement appears to have been possible probably due to the size of the groups and the social links among their members.

The re-introduction of rotation methods will be a major step towards ensuring sustainable pasture grazing around protected areas and biologically important zones (e.g. along the river Iori). DFES projects are likely to face major challenges in achieving this. For example, rotation requires a bigger grazing plot per shepherd and, at current renting costs, this does not seem possible. Shepherds should rent land directly from the state, thus avoiding intermediaries, and at prices that make rotation economically feasible. There is also a problem of water availability in expanding the total pasture grazing area. It is not a coincidence that the worst erosion problems are observed along the river Iori and other sources of water.

Rotation does not eliminate the problem of long-term contracts. It is still necessary to have shepherds bound to a piece of land long enough so that they can internalise the costs of land degradation. For that to happen, the shepherds have to perceive the state as a reliable partner with which they can engage in long-term renting contracts. Finally, rotation does not take away the limits imposed by carrying capacity. There is still a role for state agencies to control the number of animals per hectare.

Project strategies will have to vary according to the ethnic origin of the target group

There are Georgian and Azeri shepherds in eastern Georgia, and they tend to show different attitudes and perceptions towards the state of pastures and pasture management. Azeri shepherds and their households, while friendly to Georgians, do not have strong social or emotional ties to Georgia. Surveys have indicated that they show a lower level of interest in the protection of reserves, that they are affected by language and cultural differences, and that they have greater problems in gaining access to information. Surveys have also reported that locals believe Azeris overgraze pastures because it is not “their land”.

Independently of these subjective results, it is clear that DFES projects will have to approach these two groups using different strategies and methods. For example, public awareness campaigns will take a different form, depending on whether the target group is Georgian or Azeri. Also, concerns over entering into long-term contracts with the Georgian state are likely to be higher among Azeri shepherds.

4.3. Hunting

Hunting can be a major limiting factor for the reproduction of species populations. Even single cases of poaching can have a significant impact on species with low reproduction rates. Hunting also affects biodiversity because of its degree of disturbance. Human movements, weapon shots, and hunting dogs are all high disturbance factors. In Georgia, the impact of hunting varies from site to site and from species to species. Hunting is assessed as the biggest threat to targeted species populations in eastern Georgia, particularly bear and deer. In western Georgia, hunting seems to be less of a threat.

Hunting is primarily of an amateur nature. It is less commonly practised now than it was in Soviet times, mainly because of its expense. Bullets, for example, are generally too expensive to make it possible for the majority of the population to hunt regularly. The percentage of households engaged in hunting activities varies. Depending on the district surveyed, between 15% and 33% of households hunt in Racha and Svaneti. In the vicinity of the Kolkheti National Park, the figure is 15%. There are no quantitative figures for eastern Georgia.

There are three main types of hunters: non-local, local and professional

Non-local hunters are becoming more common in eastern Georgia and the Central Caucasus because of the type of game animals present there (e.g. bear; deer). Locals often blame this group for the bulk of

poaching. Non-local hunters are usually wealthier than local ones, and can afford bullets and the cost of transportation. Policemen, government authorities and businessmen are regularly mentioned as participating in non-local hunting groups.[24]

Local amateur hunters constitute the second group. They can include shepherds who shoot wolves, farmers who set traps in their farming fields, and local people shooting birds. Professional hunters form the third group. Their numbers are low and they make a profession of hunting. Shepherds sometimes hire them to kill wolves. They may also provide guidance to other hunters, and the best of them can even have a waiting list.

The relevance of this data for a DFES programme is that non-local hunters seem to be the greatest threat to game species, such as deer (almost extinct) and bear (threatened). This group hunts for pleasure and has the means to afford the activity. Non-local hunters can include wealthy businessmen from Tbilisi as well as authorities, such as members of the local police. Keeping these types of people far from protected areas will require a credible deterrent, rather than simply raising public awareness. Local hunters are likely to be less of a problem and more reachable through public awareness campaigns. Professional hunters are very few in numbers and identifiable. Because of their skills, it may even be possible to include them in projects aimed at running managed hunting grounds.

Hunting is either for food or for pleasure, but rarely for profit

Hunting in Georgia is done mostly for two reasons: for food or pleasure or both. In the vicinities of the Kolkheti National Park, most people hunt during hunting season, and 67% of all hunters hunt to obtain food. Only 19.4% hunt for pleasure. A similar distribution is likely for the expected location of the proposed Mtirala National Park. In eastern Georgia, the situation is reversed. Except for professional hunters and shepherds, people hunt for pleasure. Hunting is perceived as a sport that sometimes may even produce a good dinner. But it is the former, not the latter, that is the main driving force of hunting.

Hunting as business is unprofitable because of the high prices for ammunition and petrol. According to interviews in eastern Georgia, hunting requires about GEL 25 of petrol and at least 10 cartridges per person. Income from hunting is of an occasional nature. The skin of a fox can be sold at GEL 20-30; a pheasant can get a price of GEL 25-30. The exception seems to be the hunting of quails, which can be sold at an average price of 1 GEL a piece. A skilled hunter, using projectors, can kill about 100 a night.

The fact that hunting can be primarily for food does not pose a problem for DFES projects aimed at controlling the activity. Hunting for food appears to take place mostly in coastal (western) Georgia and on a scale that does not pose a serious threat to species. DFES projects can support awareness campaigns to further minimise the impact of hunting (e.g. avoid certain species during reproduction periods), without fears of cutting populations off from crucial sources of food. In contrast, bringing hunting under control in the east of Georgia will require more forceful methods. In addition to public awareness campaigns, there will be a need to increase the deterrence capacities of law enforcement agencies.

Law enforcement agencies are ineffective in controlling hunting activities

While public awareness can go a long way in decreasing hunting activities, it is no substitute for the policing role of law enforcement agencies. Unfortunately, police capacities are low. The last 14 years of Georgian history have been marked by a serious, sometimes almost complete, breakdown of the rule of law. The police became a self-serving institution that failed to provide the most basic services. There is no

[24] *Conservation of Arid and Semi-Arid Ecosystems in the Caucasus - Results of a Sociological Survey*. Report produced by CIVITAS. Tbilisi, Georgia. 2001.

reason why those in charge of policing poaching activities should be an exception. With the change of government in late 2003, the situation is changing for the better. However, major efforts will have to be made before district police units show acceptable levels of efficiency.

There are several reasons for the lack of capacity of law enforcement agencies to fight poaching. The first, of course, is low salaries, which are always below the poverty line and insufficient to meet the basic needs of a family. It is not surprising that policemen engage in income supplementing activities, such as accepting bribes. The second is that those who take poaching seriously lack basic equipment, such as transport and weapons. These officials are unable to patrol open areas and the weapons they have are out of date and/or there are not enough of them. The third problem is the lack of knowledge about current legislation. The people in charge of controlling illegal hunting are ordinary policemen with a poor knowledge about poaching regulations. Finally, the fourth problem is the lack of interest. The combination of low salaries, no equipment and no knowledge results in many instances in general apathy. Why bother about the survival of a few species when one is not able to provide sufficient food for the family? Stopping poachers can also be a dangerous activity. They are also armed and/or could include influential people.

Illegal hunting is not always perceived as socially unacceptable

The public shares some perceptions about what constitutes acceptable and unacceptable forms of hunting. Perceptions depend on the number and type of animals shot. The acceptable type of hunting is when the activity is on a minor scale, for example when the hunter gets meat or fish mostly for his family. Some leftovers could even be sold or exchanged. Shooting a "few birds" or small animals is usually considered acceptable and harmless for the local environment. On the other hand, the public usually disapproves of killing animals in great numbers. This includes fishermen who use electrodes, particularly when connected to high power lines, and explosives.

The public understanding of poaching also depends on the type of animal that is targeted. For example, hunting deer is often recognised as poaching because of the small number of deer left in Georgia. It is also generally considered unacceptable to hunt animals during their reproduction periods or when feeding offspring. On the other hand, killing predators, such as wolves and jackals, is not always considered poaching, as these animals are perceived as "bad ones".

5. OBJECTIVES AND STRATEGY FOR THE USE OF DFES RESOURCES

The **main objective** of the DFES programme in buffer zones is to promote biodiversity protection among local communities around protected areas. A **secondary objective** is to test and replicate successful projects and initiatives from, and for, other areas of Georgia.

As a main **strategy**, this report will propose that DFES resources be invested in income generation, local infrastructure, public awareness and technical support projects. Given the fact that DFES resources are expected to flow for about 10-15 years, there is a possibility of taking a long-term view rather than a piecemeal approach. This section will also explore the type of projects that could be eligible under DFES support and estimate the required expenditures for areas in the 1st priority group.

This report also proposes that DFES resources be directed towards increasing living standards of the population around protected areas, particularly increasing livelihood security as measured by access to

food, energy and basic social services (e.g. education). Support for increased living standards would be complemented with investment in public awareness.

Rural settlements are affected by poverty, lack of electricity, lack of employment opportunities and serious barriers to access basic social services, such as education and health care. With a national average poverty rate of 50%, life has become very difficult for many people in Georgia.[25] Under these conditions, biodiversity conservation and environmental protection may not be priorities for the average person. When the local school is barely operational, the relevance of learning campaigns about the environment can fade. When there is not sufficient income to properly feed a family, illegal hunting is an issue that can lose relevance for many. People tend to invest time and efforts in proportion to their most important priorities. Securing enough income to feed a family and enough wood to warm a house in winter can override biodiversity concerns.

The reverse, however, is not true. A family can still engage in harmful activities from the point of view of biodiversity conservation even after having secured enough food and energy. There is a substantial body of experience that shows that livelihood security is a necessary, though not sufficient, condition for environmental conservation. There is a need for credible enforcement and a need to link livelihood security with conservation of the targeted protected area.

Projects in other settings have established this sort of link through two independent, though complementary, avenues of work. One is to support only those income activities that depend on the conservation of the resource. This explains the attention given to so-called "eco-tourism", conservation of catchment areas for water supply purposes, and harvesting non-timber resources, among other activities. Though promising, this avenue of work is not free of problems. Often these types of activities lack a local market, or their size is insufficient to provide income for a substantial share of the local population.

A second option is to make this link direct and explicit in the form of a partnership between communities and the authorities of the protected areas. In this partnership, communities engage in extractive activities in a form and scale that are not harmful for the reserve. In exchange, the authorities of the reserve support local communities in meeting their stated priorities, for example, by bringing micro-credit services to the villages, providing grants for social infrastructure projects, and offering learning and awareness campaigns. The basis of this partnership can evolve over time. In the short and medium run, it would be based on each party recognising the priorities of the other.

DFES would pursue both avenues of work simultaneously. It would support communities to increase family income through projects of their choice, as long as these are profitable, feasible (in view of the human and capital endowments) and harmless to biodiversity conservation. All other things being equal, preference would, of course, be given to those income generation activities that directly depend on the conservation of the resource, thus strengthening the link between livelihood security and conservation. DFES would also support social infrastructure projects that are deemed critical priorities by local communities, such as repairing a damaged school, for example. This support would be complemented by awareness campaigns that make explicit the link between ongoing support to the community and the conservation needs of the targeted area.

[25] See *National Human Development Report – Georgia 2001-2002*. United Nations Development Programme. Tbilisi, Georgia.

5.1. Areas of DFES Assistance

Increasing the productivity and volume of agricultural activities in the villages neighbouring protected areas

Rural communities prefer support to expand and increase the productivity of their current income generation activities rather than embark on new ones. This choice has a rational basis. The population is already familiar with their present income generation activities, which have provided at least a lifeline throughout one of the worst periods in modern Georgian history.

Traditional activities comprise farming, home gardens and livestock grazing. People expect that family income would increase if there were access to credit and/or grants. A survey among institutions currently engaged in grants and micro-credit suggests the following list of activities as potential candidates for income generation support:

1. Increasing the number of cows and pigs;
2. Beekeeping;
3. Horticulture, including construction of greenhouses;
4. Vine growing, including support to buy land and seedlings;
5. Land preparation in spring, including cultivation and tillage;
6. Irrigation (building, expanding or repairing the farm irrigation system);
7. Mushroom planting and processing;
8. Growing fruit (support to acquire planting material);
9. Floriculture;
10. Purchasing machinery (e.g. mini tractor); and
11. Basic processing of agricultural products (e.g. jam).

Support for income generation activities would include training and capacity development components. This could take the form of stand-alone training or be part of a package of assistance that also includes support for capital expenditures. For example, support for basic processing of agricultural products could be complemented with training in marketing, if a lack of this training is perceived as a barrier for the family or co-operative involved. Examples of training and capacity development activities include:

1. Training in sustainable agricultural practices (e.g. soil conservation);
2. Skill upgrading in small- and medium-scale processing;
3. Skill upgrading in handicraft production;
4. Skill upgrading in non-farming services (e.g. repairing and servicing of foreign made cars); and
5. Small-scale business management and marketing skills.

Support for income generation would be given through both microcredit and micro grants facilities. DFES would not administer the grants directly, but would tender the provision of grants and microcredit support to established institutions with a proven track record in this area.

Support to non-traditional income generation activities

Even though it is expected that the majority of community members will request DFES resources for the expansion of traditional activities, it is nevertheless important to promote and support some diversification of income sources. Non-traditional income alternatives should therefore be supported, but such support should not draw the bulk of attention or interest in a DFES programme. In a village, it is generally those who are better off who can take on greater risks and therefore are able to embark on alternative income generation projects.

Examples of non-traditional income alternatives may include the following:

1. Provision of services to the tourism sector, such as accommodation, food and guiding;
2. Production of traditional handicrafts; and
3. Extraction of non-forest resources, such as medicinal plants.

Support for non-traditional income generation activities would also include training and capacity development components. Support could take the form of stand-alone training, or be part of an assistance package that includes support for capital expenditures. Examples of training and capacity development activities include:

1. Skill upgrading in non-farming services (e.g. medicinal plant extraction and processing);
2. Training in provision of tourism services; and
3. Small-scale business management and marketing skills.

Support for income generation would be given through both credit and grant facilities. For example, requests for improving a private guesthouse would be likely candidates for credit support, while requests for establishing a communal enterprise for extracting non-forest resources would be a likely candidate for a grant. Decisions on the composition of the credits and grants would be analysed based on the expected profitability of the project in question. DFES would not administer the grants directly, but would tender the provision of grants and microcredit support to established institutions with a proven track record in this area.

Support to access local markets

Remote rural areas suffer from the lack of cash. The lack of monetary income is a serious barrier to access some basic services. For example, while a simple visit to the doctor could be paid for with a bag of potatoes, having an x-ray taken at the district hospital requires payment in cash. In a similar vein, the local mechanic might be willing to provide his labour in exchange for farm products, but the spare part needed to repair the tractor cannot be acquired without cash. The lack of money poses a significant hurdle for meeting basic needs even in communities where barter is the predominant mode of exchange.

The more remote the settlement, the less the amount of money in circulation. Large regions of the country have been relying to a great extent on a barter economy. At the heart of the problem is the lack of employment, low productivity in the rural sector and barriers to access bigger markets, for example the district capital.

There are two main difficulties for communities to access bigger markets. The first is that the average family hardly produces enough to cover transportation costs. These costs include petrol, car maintenance and, more often than not, payments at police checkpoints. The second is that having a place to sell in another town demands overcoming formal and informal barriers. These barriers are usually costly for those without knowledge of the law.

As part of its programme to increase livelihood security in settlements around protected areas, DFES would support the establishment of co-operatives or other types of organisations that aim to achieve economies of scale and to facilitate access to local markets. This support may include:

1. Facilitating community meetings;
2. Promoting information exchange with other co-operatives, including visits and training;

3. Establishing links with regional distributors and/or purchasing transportation means for distributing products;
4. Meeting legal requirements to establish a point of sale in other towns;
5. Storage facilities; and
6. Basic office equipment (e.g. typewriter) for the management of a co-operative.

Support for accessing local markets would be given mainly through grants. DFES would not provide direct support for the establishment of co-operatives, but would tender these services to established institutions with a proven track record in this area.

Sustainable forest management

The villages around target areas depend almost completely on wood fuel for meeting their cooking and heating needs. However, the wood needs of these communities rarely constitute a threat to the long-term preservation of forests in the buffer zone. It is the formal and informal commercial woodcutting at an industrial scale (e.g. to supply urban markets) that poses a real threat.

The size of the area and the cutting protocols required to ensure sustainable wood extraction would have to be defined on a case-by-case basis and in full consultation with the local community. This type of assessment, which on average would take 3 months, could be paid for by DFES resources and considered as an integral part of the programme of support. At present, for many households in Georgia, there are no substitutes for wood fuel. Thus, the objective is not to stop woodcutting, but rather to redirect the activity towards designated areas, and to carry it out in ways that minimise habitat damage. The amount of wood extracted should cover community needs. In some cases, sustainable forest management would involve a certain degree of commercial woodcutting. This is so because in some settlements woodcutting may be the primary source of income for a number of local families. Prohibiting this source of income in the absence of feasible income alternatives would result in ongoing illegal cutting.

The management arrangement for community forestry activities, including forest ownership, would be an important, if not critical, factor to ensure the success of DFES support. Unfortunately, there are no experiences that could provide lessons for replication. At a minimum, communities should have the legal right to exploit the resource according to protocols agreed with the management of the nature reserve. This legal right to resource use should extend to an area large enough to meet current fuel wood demand for local purposes. The definition of "local purposes" would include wood for heating, cooking and, in some cases, commercial cutting undertaken by local families. DFES should not allow large-scale logging by non-locals, as communities receive little benefits, if any, from this type of activity.

Providing communities with legal rights to resource use is a significant step in the right direction, but it does not ensure the conservation of forest resources *per se*. Monitoring and supervision of agreed protocols for tree cutting will have to continue to be functions of the state, either through the park management staff or the Forestry Department, or both.

DFES would provide support for the following activities:

1. Estimation of fuel wood needs of communities;
2. Identification of areas required for sustainable forestry and protocols for tree cutting;
3. Support for community consultations and discussions to agree on access to the resource; and
4. Support to increase *local* capacities in monitoring and supervision of forestry utilisation. This includes support to park staff and/or staff of the Forestry Department.

In cases where the extent of the resource allows for commercial woodcutting, DFES would provide support to ensure that the benefits from the activity flow mainly to the village and that the scale of the activity is compatible with the long-term conservation of the resource. The feasibility of commercial woodcutting by local families would be analysed on a case-by-case basis. However, if the resource allows, and communities show interest, in commercial woodcutting, there is *a priori* no reason why it should not be allowed. It can constitute a source of much needed monetary income and strengthen the sense of ownership over the resource. In this case, DFES would support communities to engage in commercial woodcutting, probably through the establishment of a co-operative and activities similar to those listed under *Support to access local markets*.

Support for the establishment of sustainable forestry would be provided through grants. DFES would not provide direct support to communities, but would tender these services to established institutions with a proven track record in this area.

Pasture management

Sustainable pasture management is an important issue in eastern Georgia and, particularly, for the long-term conservation of the Vashlovani Nature Reserve. DFES would provide support for re-introducing rotation systems and ensuring that grazing pressures are compatible with the carrying capacity of local pastures.

Several issues should be solved in order to ensure sustainable grazing. The first is the problem of sub-renting pastures. During the early, and turbulent, years of privatisation of state-owned assets, many non-shepherds managed to rent large sections of pastures, which were then sub-rented to shepherds for short periods of time. DFES would help shepherds to rent directly from the state for periods of at least 10 years. Shepherds should be given the guarantee that they will retain ownership of the pasture for the renting period and that the initial contract conditions will not change.

The second issue is the cost of renting land. Throughout successive surveys, shepherds have declared that the cost of renting a hectare is high and that this precludes the introduction of rotation patterns. The last economic analysis of profitability of shepherding is about 4 years old.[26] DFES would support the State Land Management Department to re-evaluate the cost of renting a hectare. The renting price should make rotation feasible.

The third issue is that contract conditions for renting land should include assurances that the renter will give back the land in similar condition as received. At present, there is no mechanism to ensure that the renter does not exhaust the land in the final years of the contract. DFES would support the State Land Management Department and the Ministry of Environmental Protection and Natural Resources to devise additional contract clauses to ensure that pastures will be returned in acceptable condition.

The fourth issue is monitoring pasture utilisation. One of the concerns of shepherds is that other shepherds that arrive early in the migration process could use plots left idle from the rotation system. This problem has already occurred, as it is not unusual to hear shepherds complain that the plot they have rented was used before their arrival. Finally, there is a need to have a last line of defence against overgrazing in the form of a monitoring system that can detect pasture overload before land degradation reaches an advanced state.

[26] *Conservation of Arid and Semi-Arid Ecosystems in the Caucasus - Results of a Sociological Survey*. Report produced by CIVITAS. Tbilisi, Georgia, 2001.

DFES support for ensuring sustainable pasture use will involve not only shepherds but also state structures in charge of land renting and monitoring of pastures. DFES would re-introduce pasture rotation in the vicinities of the Vashlovani Nature Reserve. This would be done in the form of pilot programmes, which would be gradually extended beyond the boundaries of the reserve. DFES would also make the re-introduction of rotation patterns in pastures along the river Iori a priority, as these contain forest of global significance and are under significant grazing pressures.

The re-introduction of pasture rotation and the subsequent changes to the land renting regime are complex issues that should be tackled simultaneously, probably in the form of a programme. DFES would subcontract this programme to a local organisation with experience in grazing issues and familiarity with the arid and semi-arid zone of Georgia. This organisation would work in a close collaboration with the staff of the Vashlovani Nature Reserve.

Social infrastructure

Infrastructure in rural Georgia in general, and in remote villages in particular, is in a very poor state. This includes crumbling schools, health care centres without minimum supplies and/or equipment, abandoned cultural facilities, access roads in a bad state, and poor water and electricity supply. While the resources at the disposal of DFES would be insufficient to meet the whole range of social infrastructure needs of villages, it can nevertheless make a difference in areas that have been assessed as most critical by communities.

There are two main reasons for investing in social infrastructure. First, it is part of the partnership between protected areas management and local communities, a partnership based on recognising each group's interest and concerns. Surveys have shown that the lack of water, inaccessible health care or an impassable section of road can become top priorities for communities. Second, improved livelihood security and increased levels of human development demand that some minimum social infrastructure be operational.

DFES would provide support for the following types of projects:

1. Rehabilitation or improvement of local school facilities, including provision of textbooks;
2. Rehabilitation or improvement of local primary health care facilities, which are most badly needed for the poorest segments of the population;
3. Rehabilitation or improvement of water supply infrastructure;
4. Establishment, rehabilitation or improvement of facilities for preventing soil erosion (e.g. terraces);
5. Establishment, rehabilitation or improvement of local cultural facilities (e.g. a communal meeting room);
6. Establishment of micro-hydro power facilities;[27]
7. Establishment of biogas facilities;[28] and
8. Improvement of access roads, including bridges.

Support for the rehabilitation or improvement of local infrastructure would be through grants. Communities would be required to formulate a list of priorities before disbursement begins. This consultation process would be facilitated with DFES resources and be considered an integral part of the programme. DFES would provide either direct support to local communities through its representatives (local authorities), and/or through NGOs. This decision would be made on a case-by-case basis.

[27] This would be done in conjunction with the DFES programme on micro- and mini-hydropower.

[28] This would be done in conjunction with the DFES programme on biogas facilities.

Environmental awareness and education

Environmental awareness complements other types of community support. For example, programmes for income generation support should be complemented by public awareness campaigns highlighting links between resource conservation and livelihood security. In parallel, there would be general awareness raising campaigns on the importance of protecting nature reserves and the contributions that the community can make in that respect.[29] Examples of environmental awareness and education activities include:

1. Awareness campaigns for specific target groups, such as woodcutters, shepherds, and hunters. This type of campaign would concentrate on increasing awareness of appropriate protocols for resource use (e.g. do not hunt during the reproductive season);
2. Awareness and training campaigns for local authorities. This type of campaign would concentrate on promoting greater collaboration between local authorities and reserve management on monitoring and enforcement. It would also assist (e.g. train) local authorities in attracting funds from sources other than DFES;
3. Education programmes for children and teenagers. This can include summer camps, environmental education components in local schools, non-paid and paid internships assisting staff of the nature reserve, and youth groups for community work (e.g. community cleanup day); and
4. General environmental awareness programmes (e.g. programmes through the local radio or TV station).

Support for environmental awareness and education campaigns would be done through grants. DFES would tender these services to established local institutions with a proven track record in this area.

5.2. Target Groups

The following target groups may access DFES resources:

- *Non-governmental organisations*. The term NGO is applied here in a wide sense. NGOs would include not only the Tbilisi-based donor-supported organisations, but also local unaccredited organisations, such as a local hunting union, shepherd association, and others. If the local association is not a legal entity, it would have to register with DFES.[30] The purpose of this registration would be to ensure identity and agreed accountability mechanisms. The future management body of DFES would define the procedure for registration and ensuring accountability.
- *Governmental organisations (GO).* These could include administrations of nature reserves, local representations of the Department of Forestry and the Department of Protected Areas, and local enforcement bodies. Applications from this type of institution may be for support to improve resource management, monitoring and enforcement capacities in and around buffer zones.
- *Common interest groups (CIG).* The concept of "common interest group" refers to a small number of people who share an activity, common concerns or problems.[31] CIGs are not NGOs as they do not have an established management structure. CIGs are likely to include people conducting joint or individual household or economic activities, and who are willing to contribute toward solving social or environmental problems through common efforts. An example of a CIG could be a group of

[29] For example, these contributions include ensuring that animals graze in allowed sectors and/or that woodcutting takes place according to protocols agreed between the community and the staff of the nature reserves.

[30] This registration procedure is also required in the Small Grant Programme of the WB/GEF PADP.

[31] The idea of CIG is also part of the Small Grant Programme of the WB/GEF PADP.

individuals willing to organise “village cleanup days”. A given individual may belong to more than one CIG, depending on his or her interests and concerns. CIGs usually have between 5-10 people and are non-legal entities. They would have to register with DFES to ensure identity and accountability mechanisms. The procedure for registration and ensuring accountability will have to be agreed upon by the future management body of DFES.

6. CHARACTERISTICS OF PIPELINE FINANCING

This section describes the characteristics of the biodiversity conservation pipeline with regard to (i) expected location and size of target groups; (ii) type of support and range of DFES financing for projects; and (iii) total expected size of the pipeline.

The results and conclusions of this section are based on field trips to priority areas, interviews with local and international professionals, and available local experiences in supporting buffer zones of protected areas.

6.1. Expected Location and Size of Target Groups

It is recommended that in a first phase DFES concentrate resources on communities around the following areas:

- Adjara (expected location of the Mtirala National Park)
- Vashlovani
- Lagodekhi
- Tusheti.

DFES will focus on communities with the following characteristics:

- Villages whose inhabitants’ daily activities are naturally connected to, and/or have an impact on, the targeted protected area as they are located either within, or in the immediate surroundings of, the targeted protected area with no natural or clear separating border.
- Villages whose inhabitants are active users of the targeted protected area. These villages would be located not far from the targeted protected area (e.g. 5 km).

Based on these characteristics, target groups (by area and by number) are expected to be as follows:

Table 10: Size of Target Groups by Location

Area	Targeted Population
Adjara	30 000
Vashlovani	15 000
Lagodekhi	25 000
Tusheti	10 000
TOTAL	**80 000**

Source: Own estimates based on local census data.

The target group in Adjara has been estimated at 30 000 people and comprises settlements in the vicinity of the proposed natural park. The core zone of the park is free of access roads and human activities. The only settlement inside the proposed park is the village of Chakvistavi. To the west and south-west, the proposed national park is bordered by populated areas.

The target group in Vashlovani has been estimated at about 15 000 people. Vashlovani is distinct from other areas in that villages are not located in the vicinity of the park but about 20-30 km from it. The target group in Vashlovani includes selected areas located along the Iori River. Another distinctive characteristic of Vashlovani and Iori is that shepherds and hunters, who cause the greatest disturbance, are usually not from surrounding villages.

The target group in Lagodekhi comprises the string of villages located at the border of the nature reserve, including the town of Lagodekhi. Altogether about 25 000 people live near the reserve borders, and in some places less than a hundred meters from it. In spite of this close distance, the bordering areas of the reserve do not yet show severe damage. Finally, the target group in Tusheti presents major seasonal variations. In winter, the population may not exceed a thousand while in summer it can go up to 10 000 people.

All targeted areas considered, the total number of DFES beneficiaries would be approximately 80 000.

6.2. Type of Support and Range of DFES Financing for Projects

There will be two types of DFES support: (i) microcredit and (ii) grants.

Microcredit. This would be used primarily to provide support for increasing farming productivity and alternative income generation projects. Experience with microcredit in Georgia indicates that most loans are in the range of USD 500-3 000, and that they rarely exceed this amount. Bigger amounts are extended either to families who are well off or to credit groups.[32] Collateral would be required to access credit.

Grants. These would be used primarily for technical support in income generation projects, support to access local markets, sustainable forest management, pasture management, social infrastructure projects and environmental awareness campaigns. Experience in Georgia indicates that the maximum size of the grant would be USD 25 000, with the exception of social infrastructure projects, which can easily go beyond this ceiling.[33] There would be co-financing requirements. Experience with micro grants in Georgia indicates that recipients in rural Georgia have difficulties meeting co-financing requirements of above 10% of total project costs.

[32] This is a group of people linked by family ties or profession who apply collectively for a loan.

[33] An example could be improving the access road to communities in Tusheti. This single measure would perhaps have the greatest impact on living standards of the community. The access road is often closed and its poor state precludes regular connections with Kakheti. Improving the access road would be a project requiring resources above the USD 25 000 ceiling.

Box1: Microcredit in Georgia – Some Successful Initiatives

ACDI/VOCA supports lending to individuals and companies in the agricultural sector and has offices in several regions of Georgia. ACDI-VOCA's farmer-to-farmer programme supports the Seed Enterprise Enhancement Project and the USAID-funded National Rural Credit System. ACDI/VOCA's work to promote economic expansion, through access to credit and improved agricultural production, has played a significant role in increasing favourable opinion of, and trust in, free markets and democratic processes in Georgia.

World Vision has a successful programme of microcredit aimed at supporting the entrepreneurial poor. The NGO is active in Adjara, Imereti and Samtskhe-Javakheti with resources for microcredit in the amount of USD 200 000. Its individual loans are between USD 50 – 1 500. Business plans are made by applicants and checked by technical staff of WV. Guarantees are difficult to cash so it is important for the sustainability of the program that business plans are sound. Most projects are for establishing green-houses, expanding cattle breeding and expanding current agricultural activities. WV is also supporting one of the first attempts to establish a small private company for the leasing of agricultural machinery.

The ultimate goal of the **Constanta Foundation** is the development of the micro and small business sector through the provision of microfinance services to micro and small entrepreneurs living in Georgia. Currently Constanta offers group and individual loans to Georgian citizens engaged in micro or small businesses. These loans comprise 4 main types. "Group Loans" are provided to a group of entrepreneurs on the basis of group guarantee. Group loans are issued without collateral, with group members collectively responsible for the payments from all members of the group. A group should have 4 to 15 members. "Initial Cycle" loans range from GEL 50 to 500. Subsequent loan amounts can be increased, contingent on the repayment capabilities of the business and the credit history of a borrower. These loans may be disbursed for 3, 4, 5 or 6 months. "Advanced Cycle" loans are for group clients who have considerably developed their businesses, consistently increased their loan amounts and maintained solid credit ratings over a certain period. Constanta offers these group clients loans with flexible terms, disbursed for 4, 5, 6, 7 or 8 months. Finally, "Individual Loans" comprise collateralised loans to Georgian micro and small entrepreneurs. This loan programme serves both the group clients of Constanta who have developed their businesses substantially and are capable of graduating to larger individual loans, and the micro and small entrepreneurs new to Constanta who need working capital for business development purposes.

ZIARI is a NGO that specialises in microcredit for the agricultural poor. Its maximum credit is about USD 1 000, though group credit can go as high as USD 3 000. The annual interest rate is 19%, and most loans are for one year. ZIARI's resources are deposited in a local bank and act as collateral for farmers' credit. ZIARI assists farmers in obtaining credit from the local bank and provides its financial resources as guarantee of repayment. This allows farmers to learn how to operate with banks and lowers the cost of credit for farmers by reducing its risk premium. Most loans are for expansion of current activities, like increased production and increased value added (e.g. processing).

Source: Own research.

DFES will not implement microcredit or microgrant facilities, but would tender these services to local organisations.

6.3. Expected Size of the Project Pipeline

The estimation of the size of the pipeline is based on experience from (i) strengthening the buffer zones of protected areas in Georgia; (ii) microcredit organisations; and (iii) grants for community development and environmental protection in Georgia.

Currently two programmes focus on strengthening the buffer zones of protected areas in Georgia. One is the work of the KfW and the WWF in the Borjomi-Kharagauli National Park. Approximately USD 7.7 million are being invested in the five districts around the National Park. Projects include mainly improvement of social infrastructure, such as roads, schools, water supply, communal cultural buildings and support to local business activities. The programme has been rated as very successful and a further USD 9 million are likely to be invested. The targeted beneficiaries are the people living in the five districts, a total of 200 000 people.

Box 2: Microgrants in Georgia – Examples from CARE, Mercy Corps and the Eurasia Foundation

CARE provides microgrants to communities in the field of social infrastructure and agriculture. The overall goal of its Community Investment Programmeme West (CIP-W) is to secure the sustained socio-economic development of communities affected by the western part of the Baku-Tbilisi-Ceyhan and South Caucasus Pipeline projects. In these communities, poor infrastructure and basic services have led to a decline in public health. Schools are so rundown that they are often forced to close during bad weather. Production in agriculture, which is the main economic activity, has severely declined over the last decade. Local government is widely viewed as being incapable of addressing community needs. The root causes of these problems lie in the poor coordination and use of resources by communities, government and business. Communities are empowered to take control of their own development process in a systematic and planned manner, ensuring that people's lives will continue to improve long after the project has ended.

MERCY CORPS is a leading NGO in the field of microgrants for social investment purposes. It has received substantive resources from USAID and also technically assists the Georgian Social Investment Fund. The selection of investment projects takes place locally and is demand driven, which has resulted in a high impact per unit of dollars invested.

The Eurasia Foundation's grant programme supports innovative projects with the potential to advance significantly one or more of the following goals in the Foundation's three programme areas. The first is "Private Enterprise Development", which aims at supporting accelerated development and growth of private enterprises. The second is "Public Administration and Policy", which aims at supporting more effective, responsive, and accountable local government. The third area is "Civil Society", which aims at increasing citizen participation in the political and economic decision-making process. To achieve these goals, the Foundation supports projects aimed at strengthening human capital, developing locally sustainable forms of financing, and promoting a favourable legal and regulatory environment. The Foundation encourages projects that cross over programmematic areas and geographic boundaries.

Source: Own research.

The second programme was launched at the beginning of 2004 in the Kolkheti National Park. Approximately USD 1.4 million will be invested in the communities located in the surroundings of the National Park. The programme will support income generation activities, social infrastructure projects (e.g. school repairs) and public awareness. The implementation of the support programme will involve park authorities extensively and will be combined with public awareness campaigns in an effort to make the link between park protection and community support clear. The estimated number of beneficiaries is 36 000 people.

The programmes in the Borjomi-Kharagauli and Kolkheti national parks not only share similar objectives, types of eligible projects and disbursement modalities, but are also remarkably similar in terms of expenditure per capita. These programmes invest approximately the equivalent of USD 40 per beneficiary or about USD 160 per family. This number, of course, should not be taken as a golden rule since it is not proven that investments of this magnitude are necessary and sufficient to achieve success. Having said that, these resources have achieved a measurable impact at least in the case of Borjomi-Kharagauli, whose support zone is densely populated and actively used.

For estimating the size of the project pipeline, the figures of average investment per capita in Georgia were used as the starting point for calculations. Based on these figures and the estimated size of the target groups, the following results were obtained:

Table 11: Estimated Expenditures by Areas in the First Priority Group

	Vashlovani	Lagodekhi	Tusheti	Adjara	TOTAL
Population	15 000	25 000	10 000	30 000	80 000
Grant	584 722	974 537	389 815	1 169 444	3 118 518
Grant + Credit	734 722	1 124 537	539 815	1 319 444	**3 718 518**
Allocation to each area (%)	20	30	15	35	100

Source: Own estimates.

Table 11 above shows the estimated target population and the estimated size of the grant component. The total for the 4 areas is USD 3 118 518. An additional USD 600 000 have been allocated for a microcredit component, bringing the total DFES investment in this pipeline to USD 3 718 518. The size of the microcredit component is based on the experience of NGOs and other organisations operating in this area. Microcredit funds of about USD 150 000 show some spare capacity when loans are directed to impoverished communities of a size similar to those targeted by this project and that have little or no experience in dealing with the banking sector. This report makes the assumption that on average funding of USD 150 000 would be made available to each project site for a total of USD 600 000. This would be a one-time investment that should be self-sustainable.

The expected time frame for the disbursement of microcredit is the entire duration of the DFES programme. The resources for a microcredit programme would be tendered in the first year of operation and, if well managed, they should become a self-sufficient fund. The experience with microcredit in Georgia is very positive and most microcredit programmes, though small in size, are sustainable. The expected time frame for the disbursement of grant resources is between 3 and 4 years. This is based on the experience with biodiversity conservation projects in Georgia and the Caucasus. Attempting a faster disbursement rate will probably result in waste. A longer disbursement time most likely indicates that conditions for grant access are stringent and beyond the capacities of the average family. Table 12 below presents the annual resources required for 3 and 4-year disbursement periods.

Table 12: Annual Disbursement for 3 and 4-Year Periods

Disbursement Period	1 Year	2 Year	3 Year	4 Year
3-year	1 639 506	1 039 506	1 039 506	
4-year	1 379 629	779 629	779 629	779 629

Source: Own estimates.

The disbursement in the first year is greater than in all others because it is assumed that the microcredit fund is tendered at the beginning of the programme. This is a one-time expense that is not repeated in the years thereafter. The figures for the 2nd, 3rd, and 4th years assume equal disbursement rates, although this may not be the case and will depend on the absorption capacity of communities.

After the first allocation of USD 3.7 million has been disbursed, there will be two main types of DFES expenditures:

- Follow-up expenditures in areas of the first priority group. Adjara, Vashlovani, Lagodekhi and Tusheti should not be cut off from DFES once the initial allocation is completely disbursed. At least there will be a need to continue supporting public awareness campaigns. In addition, there may be a second phase to the support programme, depending on the absorption capacity of the community and the degree of success achieved. The amount of these follow-up expenditures will be known at the time an impact evaluation of the first phase is completed, which should be conducted at the end of the third year of operation of the programme.

- Expenditures in areas of the second priority group. Areas in the second priority group include Racha, Svaneti and Samtskhe-Javakheti. It is expected that DFES resources will expand their initial coverage to include these biodiversity significant areas. At present, however, it is not possible to estimate the size of the expenditure for these three areas. None have so far defined the boundaries of their nature reserves, and therefore the relevant communities could not yet be identified. The definition of the boundaries of the nature reserves is expected to be approved during the next 3 years.

Summary results for the expected size of the project pipeline

The following summarises findings concerning the size and characteristics of the biodiversity conservation pipeline:

- Based on previous experience, the total DFES allocation will be approximately USD 3.7 million, with 3.1 million distributed as grants and 0.6 million as microcredit.
- The distribution of resources would approximately be 20%, 30%, 15% and 35% for Vashlovani, Lagodekhi, Tusheti and Adjara, respectively.
- The period for disbursement is estimated at between 3 and 4 years.
- After this period, DFES would carry out an impact evaluation to define additional expenditure needs in areas of the first priority group.
- DFES expenditures in areas of the second priority group depend on a clear definition of nature reserve boundaries since these are important for identifying the target communities. Without this information, it is not possible to estimate the size of the pipeline for areas in the second priority group.

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ACRONYMS

BCR	Benefit-cost ratio
CBO	Community-based organisation
CENEF	Energy Efficiency Center of the Russian Federation
DFES	Debt-for-Environment Swap
DG	Direct customer
E&M	Electrical and Mechanical
ERR	Economic Rate of Return
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GEL	Georgian currency Lari
GESI	Georgian Energy Security Initiative
GHG	Greenhouse gases
GNERC	Georgian National Energy Regulatory Commission
GWEM	Georgian Wholesale Electricity Market
HPP	Hydropower Plant
IHA	International Hydropower Association
IRR	Internal Rate of Return
JSC	Joint-Stock Company
KfW	Bank Kreditanstalt für Wiederaufbau (German Bank for Reconstruction)
NPV	Net Present Value
O&M	Operation and Maintenance (costs)
PDF	Project Development Facility
PPA	Power Purchase Agreement
RERF	Renewable Energy Revolving Fund
RNPV	Rate of NPV
SME	Small and Medium Enterprises
Tetri	0.01 GEL
TA	Technical Assistance
TPP	Thermal power plant
UDC	United Distribution Company of Georgia
USAID	US Agency for International Development
USC	US cent
USD	US dollar
VAT	Value Added Tax

PHYSICAL UNITS

g	Gramme
GWh	Gigawatt-hours
km	Kilometre
kt	Kilotonnes
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt-hours
m^3/s	Cubic metre per second
Mm^3	Million cubic metres
MW	Megawatt
tC	Tonnes of carbon
tCO_2	Tonnes of carbon dioxide
TJ	Terajoule

SYNTHESIS

The total installed capacity of power generating facilities in Georgia constitutes about 4 800 megawatt (MW). However, at present, only 2 400 MW are in operational condition. During the winter peak, demand cannot be met by existing facilities because a significant part of the population uses electricity for heating.

About 2 800 MW of Georgia's total installed generation capacity is hydroelectricity, 85% of which is concentrated in the western part of Georgia. Because of the lack of maintenance, most plants are in a poor state and have reduced their output. Hydroelectric generation constitutes about 78% of the electricity balance of the country and will continue to play a major role in Georgia's energy plans for the foreseeable future.

This report briefly describes Georgia's regulatory framework for energy provision. In particular, it focuses on the amendments to the existing laws prepared by the Ministry of Energy in order to include in the legislation the deregulation of power plants below 5 MW capacity. Deregulation will include tariffs and direct contracts. This means that mini hydropower plants will be able to sign direct contracts – including with the Georgian Wholesale Electricity Market (GWEM) – at an agreed tariff and will not need approval by the Georgian National Energy Regulatory Commission (GNERC). It is expected that the new amendments will have come into the force by March 2006 and mini hydropower plants situated near settlements, small enterprises (sawmills, small wineries, tea factories, etc.) should be able to operate outside the network, by-passing the Georgian Wholesale Electricity Market (GWEM).

This report also includes a brief description of donor activities and possible links with the debt-for-environment swap (DFES). In particular:

- The project "Georgia – Promoting the Use of Renewable Energy Resources for Local Energy Supply", which is financed jointly by the Global Environmental Facility (GEF) and the Government of Germany through the German Bank of Reconstruction (KfW), will undertake the pilot rehabilitation of small hydropower plants and geothermal hot water supply systems through the Renewable Energy Revolving Fund (RERF).

- The Georgian Energy Security Initiative (GESI), whose Community Development Component elaborated development plans for communities, including local renewable energy sources. Construction/rehabilitation of mini hydro power plants (HPP) is planned for two communities.

The stakeholder analysis identified as main stakeholders the owners and operators of mini hydropower plants, local businesses and communities, as well as engineering and consulting companies in the field of mini hydropower.

The report provides an economic cost-benefit analysis, as well as a financial analysis. Costs of rehabilitation/construction of mini hydropower plants are estimated on the basis of developed project proposals, and include capital costs and operation and maintenance (O&M) costs.

Economic benefits generated by DFES projects include:

- Improved living conditions of the population, since the electricity supply in rural areas of Georgia is very limited; for cooking, heating and hot water people use mainly firewood, and for lighting - kerosene.

- The promotion of renewable energy is one of the options to reduce dependence on imported fossil fuel and thereby increases the energy security of the country.
- Mini hydro plants will work in an autonomous regime. This will help reduce the load of the energy supply system and avoid the dependence of each region on this system. Besides, electricity will be transmitted over short distances, and subsequently energy losses will be reduced.
- Implementation of DFES projects will reduce greenhouse gas (GHG) emissions by helping to replace electricity produced by thermal power plants with renewable energy sources (e.g. small and mini hydropower units).

This report identifies two main model projects for financing under DFES. The first concerns **rehabilitation projects** and the second **construction of new generating units**. Rehabilitation and construction projects have been categorised in terms of "Expensive", "Medium", "Less Expensive" and "Least Expensive" projects.

The report provides financial calculations using the following values of electricity tariffs in Georgia:

1. 0.015 USD/kWh (actual tariff for most small and mini hydropower plants);
2. 0.020 USD/kWh;
3. 0.025 USD/kWh (current tariff for new plants);
4. 0.030 USD/kWh;
5. 0.035 USD/kWh;
6. 0.040 USD/kWh (tariff used in the TACIS study "Natural Energy Resources in Georgia - 1999").

Projects are assumed to be "feasible" if they show a positive Net Present Value (NPV), an Internal Rate of Return (IRR) $\geq$ 25%, and a payback period $\leq$ 7 years. The analysis was performed for different collection rates. With 100% collection rates, rehabilitation projects are feasible at a tariff of 0.025 USD/kWh. New constructions are feasible at a tariff of 0.035 USD/kWh.

With less than 100% collection rates,[34] only rehabilitation projects at a tariff of 0.035 USD/kWh are feasible. New construction projects do not meet the selection criteria even at tariffs of USD 0.040.

The financial calculations explored different shares of equity, grant and loans. For the first round of financial calculations, it was assumed that 20% of investments would be the responsibility of the plants' owners and the rest would be covered by DFES in the form of a soft loan at an annual interest rate of 6% and a payback period of 7 years. All existing taxes were considered. Projects with a positive NPV and an IRR $\geq$ 15% were considered financially feasible.

The projects considered as financially feasible were the following:

- Expensive full rehabilitation model project at a tariff 0.035 USD/kWh;
- Less expensive full rehabilitation model project at a tariff 0.025 USD/kWh;
- Small-scale rehabilitation model project at a tariff 0.025 USD/kWh; and
- Least expensive new construction model project at a tariff 0.040 USD/kWh.

[34] This implies a collection rate for the first year of the project of 40% (target of the Wholesale Electricity Market for the end of 2004); 60% in the second year and 80% thereafter.

The report presents a second financial analysis assuming financing with a 20% equity share, a 10% grant share and 70% loan share at a 6% interest rate. The projects considered as financially feasible were the following:

- Expensive full rehabilitation model project at a tariff 0.030 USD/kWh;
- Less expensive full rehabilitation model project at a tariff 0.025 USD/kWh;
- Small-scale rehabilitation model project at a tariff 0.025 USD/kWh;
- Less expensive new construction model project at a tariff 0.040 USD/kWh ; and
- Less expensive new construction model project at a tariff 0.035 USD/kWh.

Finally, the report analyses a third financial scenario assuming a reduced equity share (10% instead of 20%) and an increased grant share (25% instead of 10%).

The projects selected were the following:

- Less expensive new construction model project at a tariff 0.035 USD/kWh; and
- Least expensive new construction model project at a tariff 0.030 USD/kWh.

The Table below summarises the marginal conditions (minimum values of equity and grant shares; minimum tariff) that ensure an IRR at a 15%-level.

Model Project	Share in Project Financing			Annual Interest of Loan	Payback Period in Years	Electricity Selling Tariff, USD/KWh
	Equity	Grant	DFES Loan			
Small-scale rehabilitation	20%	-	80%	6%	7	0.02335
Full rehabilitation (Expensive model project)	20%	10%	70%	6%	7	0.03051
New construction (Less expensive model project)	10%	25%	65%	6%	7	0.03330

Source: Own estimates.

Capital needs for the total small and mini hydropower pipeline can be estimated at USD 15 million. This includes USD 7 million for rehabilitation (4-5 full rehabilitation and 8-10 small-scale rehabilitation projects) and USD 8 million for new construction (12-14 hydropower plants). This amount does not include technical assistance (preparation of pre-feasibility studies, consultancy, training, etc.) and monitoring and evaluation components.

The **sensitivity analysis shows that IRR sharply responds to capital costs and tariff variations for all model projects**. The share of the grant component in total investment also has a noticeable impact. The impact of other parameters is relatively minor.

1. TECHNICAL EXPLOITABLE POTENTIAL OF THE MINI HYDROPOWER SECTOR

As a definition, the technical potential is the estimation of the total national capacity that is technically feasible; the economic potential is based on the technical potential constrained by the results obtained through a cost/benefit analysis (profitability requirement). The technical exploitable potential of the small (including mini) hydropower sector has been estimated by a number of different authors. Besides, there are small and mini hydropower development plans elaborated by different energy institutes and energy companies for different regions of Georgia, including the identification of potential sites and projects.

In the 1960s, approximately 300 small, mini and micro hydro plants were functioning in Georgia. These plants provided electricity to regions, villages, small enterprises, and farms. But the establishment of centralised electricity production in the following years superseded the operations of small, mini and micro hydro plants.

Currently, about 30 small and mini hydroelectric plants exist in Georgia and a significant number of these are privatised. Main data on the existing mini hydropower plants are presented in Table 1. These plants need rehabilitation. Some of them work at low efficiency and others are not functioning at all.

Table 1. Mini Hydro Power Plants in Georgia (100 - 1 000 kW)

No	HPP	Region	River	Year of Installation	Capa-city, kW	Projected Output, GWh	Net Head, m	Discharge m^3/s
1*	Achi	Kobuleti	Acharistskali	1958	1 028	8.0	60	1.7
2	Azhara	Gulripshi	Azharistskali	1963	170	1.0	25	0.3
3	Besleti	Sokhumi	Besleta	1949	360	2.0	10	5.6
4	Gagra	Gagra	Zhoekvara	1938	864	4.0	276	0.4
5	Dmanisi	Dmanisi	Mashavera	1935	400	3.0	57	1.0
6	Zvareti	Oni	Kheori	1947	218	1.0	104	-
7	Kekhvi	Tskhinvali	Liakhvi	1941	980	5.0	16	7.6
8*	Kinkisha	Kobuleti	Kinkisha	1954	740	4.0	67	1.4
9	Orbeli	Tsageri	Lajanura	1951	460	3.0	21	2.7
10	Ritsa	Gagra	-	1949	984	5.0	62	2.0
11	Pskhu	Sokhumi	-	1956	500	2.0	117	0.4
12	Goresha	Kharagauli	Kvataura	1937	500	1.0	45	0.1
13*	Sno	Kazbegi	Ruistskali	1954	216	1.0	137	0.2
14	Kazbegi	Kazbegi	Snostskali	1951	304	2.1	96	0.42
15	Shatili	Dusheti	Shatili	1972	500	2.0	-	-
16*	Khertvisi	Aspindza	Tavparavani	1950	294	2.0	13	3.0
17	Sulori	Vani	Sulori	1953	640	4.0	20	4.0
18*	Kurzu	Chkhorotsku	Ochkhamuri	1958	160	1.0	36	0.56
19	Skuri	Tsalenjikha	Chanistskali	1958	1 000	7.0	46	1.33

1*	Is privatised and in operation	1	Is privatised but not in operation	1*	In operation but is not privatised	1	Is not privatised and not in operation

Source: UNDP/GEF (2002).

Among these plants are also a number of mini HPPs, which formerly belonged to the agricultural sector. They are presented in Table 2.

Table 2. Mini Hydro Power Plants in Farming Areas

HPP	River	Capacity, kW	Output, GWh	Net Head, m	Discharge, m^3/s	Number of Units
Ablari	Ablaristskali	730	3 285	50.9	1.8	2
Khando	Khandostskali	104	468	11.0	1.2	1
Ratevani	On canal	640	2 880	50.0	1.6	2
Maiakovski -II	On canal	200	900	18.0	1.4	1
Bakhvi	Bakhvistskali	125	800	65.0	0.3	1
Vakijvari	Natanebi	107	481	19.1	0.7	1
Likhauri	Atchistskali	99	456	7.8	1.5	1
Uchkhoba	Dvabzu	110	495	10.2	0.9	1
Patardzeuli	Iori	147	661	9.3	2.0	1
Khvadabuni	On canal	125	562	12.5	1.3	2
Intsoba	Intsoba	220	990	58.0	0.5	1
Khidistavi	Gubazouli	280	1 260	10.0	3.5	1
Bobokvati	Dekhva	103	463	24.0	0.6	1
Khulo	Uchkho	219	985	150.0	0.2	1

Source: UNDP/GEF (2002).

The technical potential of small (mini) hydropower plants can be estimated by the sum of hydropower potential of the sections of rivers whose total capacity does not exceed 10 MW (1 MW for mini HPPs). The analysis of more than 300 rivers of Georgia shows that it would be possible to construct 1 200 derivation type small hydropower plants, of which 700 could be built in western Georgia. The total installed capacity of these plants would equal 3 000 MW, of which 2 000 MW could go to western Georgia, with an annual generation of 16 000 GWh (11 000 MWh in western Georgia).

About 160 units of small hydropower plants could be feasibly constructed (including the ones to be rehabilitated) in Georgia, with a total capacity of approximately 650 MW. The corresponding annual energy output is estimated at 3.9 TWh/a.

In 2002, the Ministry of Energy conducted a study entitled “Potential of Renewable Energy Resources and the Programme of their Utilisation”. Later, one of the authors of this Programme, the “Basiani 93” Engineering-Consulting Company, specified a plan of construction for 177 new small and mini hydropower plants. The parameters of these hydropower plants were determined on the basis of an analysis of topographic maps and hydrological data. Some plants have developed business plans as well.

Data on mini hydropower plants are presented in Table 3. As can be seen from the table, new constructions are foreseen in practically all regions of Georgia. It is important to note that the highest potential for the development of the mini hydropower sector is in mountainous areas (Mtskheta-Mtianeti, Samtskhe-Javakheti, Racha-Lechkhumi and Kvemo Svaneti, Adjara), where electricity supply is very limited and unreliable.

Table 3. Potential Mini Hydro Power Plants in Georgia (0.1 - 1.0 MW)

No	Name of HPP	River	Type of Derivation	Water Discharge (m^3/s)	Head (m)	Rated Capacity (MW)	Annual Production (kWh)	Investment (mln USD)	Cost of 1 kW Installed Capacity (USD)
Kakheti Region									
1	Girevi	Girevistskali	Pipeline	0.3	82.4	0.14	0.70	0.17	1 214
2	Khoshantkhevi	Khoshantkhevi	Pipeline	0.2	182.0	0.32	1.70	0.35	1 094
	Total in region					**0.46**	**2.40**	**0.52**	**1 130**
Kvemo Kartli Region									
1	Dmanisi	Dmanisi	Pipeline	2.2	20.0	0.30	2.00	0.30	1 000
	Total in region					**0.30**	**2.00**	**0.30**	**1 000**
Shida Kartli Region									
1	Tedzami	Tedzami	Pipeline	1.5	48.0	0.60	2.50	0.60	1 000
2	Ateni	Tana	Pipeline	1.5	75.0	0.80	3.60	1.07	1 340
3	Bobnevi	Tana	Pipeline	1.2	40.0	0.40	1.80	0.46	1 160
4	Biisi	Tana	Pipeline	1.0	70.0	0.50	2.25	0.55	1 095
5	Boshuri	Tana	Pipeline	0.7	65.0	0.30	1.35	0.37	1 230
6	Tursebi	Tana	Pipeline	0.4	100.0	0.30	1.30	0.36	1 210
7	Gagluani	Tana	Pipeline	0.2	110.0	0.15	0.65	0.10	1 270
	Total in region					**3.05**	**13.45**	**3.51**	**1 151**
Mtskheta-Mtianeti Region									
1	Chkheri	Chkheri	Pipeline	0.7	173.0	1.00	6.82	1.15	1 150
2	Gergeti	Bashi	Pipeline	0.2	126.0	0.14	0.95	0.19	1 359
3	Gaiboteni	Chkhati	Pipeline	0.2	263.0	0.43	2.93	0.54	1 256
4	Tkarsheti	Usakhelo	Pipeline	0.2	186.0	0.24	1.64	0.28	1 168
5	Khurtisi	Kesia	Pipeline	0.6	115.0	0.47	3.20	0.56	1 189
6	Mna	Mna	Pipeline	1.0	107.0	0.75	5.10	0.82	1 091
7	Akhaltsikhe	Artkhmo	Pipeline	0.9	37.2	0.23	1.57	0.26	1 144
8	Pavliani	Ksani	Pipeline	2.0	50.0	0.80	5.10	1.46	1 830
9	Largvisi	Ksani	Pipeline	4.0	20.4	0.67	5.00	1.13	1 690
	Total in region					**4.73**	**27.31**	**6.39**	**1 351**
Guria Region									
1	Kadagauri	Pavlisghele	Pipeline	0.2	68.0	0.10	0.69	0.11	1 090
2	Ianeuli	Usakhelo	Pipeline	0.1	126.0	0.57	3.93	0.54	793
3	Kvirilistskali	Kvirilistskali	Pipeline	1.8	58.5	0.73	5.23	0.58	792
4	Chkhakoura	Satevznaeghele	Pipeline	0.6	94.0	0.40	2.87	0.41	1 015
5	Bakhmaro	Bakhvistskali	Pipeline	2.0	37.5	0.62	3.23	1.09	1 765
6	Bukshieti	Bakhvistskali	Pipeline	1.1	49.0	0.38	1.98	0.44	1 147
7	Askana	Ochkhanura	Pipeline	0.5	48.0	0.17	0.89	0.24	1 424
8	Makvaneti	Agi-dakva	Pipeline	0.8	34.6	0.20	1.23	0.32	1 374
	Total in region					**3.17**	**20.05**	**3.73**	**1 178**

Samtskhe-Javakheti Region									
1	Niali	Mirashkhani	Pipeline	1.0	160.0	1.00	6.50	0.80	760
2	Gujareti 1	Gujareti	Pipeline	4.0	33.6	0.89	4.41	1.38	1 545
3	Timotesubani	Gujareti	Pipeline	3.0	24.8	0.49	2.38	0.80	1 630
4	Tsagveri	Gujareti	Pipeline	4.0	28.6	0.76	3.68	1.25	1 654
5	Daba	Gujareti	Pipeline	4.0	30.6	0.81	3.86	1.20	1 495
6	Bakuriani 1	Bakurianistskali	Pipeline	0.4	66.0	0.19	0.76	0.31	1 676
7	Bakuriani 2	Bakurianistskali	Pipeline	0.4	85.8	0.24	1.07	0.42	1 763
8	Patara Tsemi	Bakurianistskali	Pipeline	0.5	140.0	0.49	2.19	0.76	1 549
9	Libani	Bakurianistskali	Pipeline	0.6	102.0	0.43	1.77	0.73	1 709
10	Tsemi	Bakurianistskali	Pipeline	0.6	112.0	0.47	2.07	0.76	1 615
	Total in region					**5.77**	**28.69**	**8.41**	**1 458**
Raca-Lechkhumi and Kvemo Svaneti Region									
1	Bobora	Bobora	Pipeline	1.4	86.0	1.00	6.50	1.20	1 200
2	Kveda	Kvedrula	Pipeline	0.7	78.9	0.45	2.90	0.71	1 580
3	Iri	Chalistskali	Pipeline	0.1	135.0	0.10	0.60	0.12	1 200
4	Chala	Chala	Pipeline	0.7	116.0	0.66	4.30	0.76	1 150
5	Chorghi	Chala	Pipeline	0.6	88.0	0.43	2.80	0.53	1 230
6	Nakieti	Vakhatskali	Pipeline	0.3	135.0	0.30	1.60	0.39	1 300
7	Khoteura	Khoteura	Pipeline	1.7	76.0	1.00	5.80	1.44	1 440
8	Chala	Zena	Pipeline	1.2	36.5	0.35	1.90	0.54	1 530
	Total in region					**4.29**	**26.40**	**5.69**	**1 325**
Adjara									
1	Didvake	Kintrishi	Pipeline	2.1	60.8	0.95	6.36	1.36	1 478
2	Orbeza	Chakvistskali	Tunnel	2.0	47.5	0.68	4.84	1.01	1 485
3	Afshila	Kheknara	Pipeline	0.8	46.5	0.27	1.77	0.42	1 556
4	Monastristskali	Monastristskali	Pipeline	0.5	103.9	0.34	2.33	0.51	1 506
5	Mechkhristskali	Mechkhristskali	Pipeline	0.5	98.4	0.35	2.40	0.59	1 686
6	Boloko	Boloko	Pipeline	1.2	96.0	0.86	6.14	1.08	1 256
7	Nusreti	Boloko	Pipeline	1.0	60.0	0.45	3.20	0.51	1 133
8	Charnali	Charnali	Pipeline	1.4	70.0	0.74	4.82	0.83	1 122
9	Khulo mini	Diakonidzeebi	Pipeline	0.5	144.4	0.50	4.00	0.45	900
	Total in region					**5.14**	**35.86**	**6.76**	**1 315**
65	**Total in Georgia**					**26.50**	**161.16**	**35.31**	**1 312**

Source: UNDP/GEF (2002).

The majority of these plants are characterised by sufficient provision of the calculated water discharge (4-6 months), only some of them represent peak (1-month provision) or basis (11-12 months) types. Most plants are of the derivation type. In order to reduce the costs, the derivation pipeline is laid alongside paved and unpaved roads.

2. ELECTRICITY DEMAND AND SUPPLY

2.1. Demand and Supply Analysis

In Georgia, hydropower plants are practically the only source of electricity production in summer. In winter, hydropower contributes to about half of the total electricity supply. Maintenance work is erratic and insufficient to ensure proper operation. In the short term and especially in winter, hydropower generation could be an appropriate way to satisfy peak demand.

Determining the actual demand for electric power is not easy. Until recently, there was a substantial difference between the estimates made by Georgian and foreign experts. According to Georgian experts, energy should be supplied to consumers under any circumstances, which resulted in a high estimate for demand. In contrast, foreign experts determined the demand for electric power not by satisfying consumer needs but on the basis of consumer's willingness and capacity to pay for the energy consumed. The experience from Tbilisi proved the feasibility of the latter approach. When the residents of Tbilisi realised that they should pay for electric power, the population adapted to this situation and started to consume power more economically in order to reduce monetary expenditures. The fact that today people react much more sensitively to electric power tariff increases indicates that the price mechanism can work in Georgia, too. However, this sense of consumer accountability is not always matched by distributors, who fail to provide consumers with a continuous supply of quality power, despite payments.

2.2. Projected Electricity Demand until 2020

The only complete forecast of electricity demand in Georgia up to 2020 was carried out in 1998 by the energy efficiency centre – CENEF (of the Russian Federation) – upon the request of Burns & Roe Enterprises, a company contracted by the US Agency for International Development (USAID).

In 2001, Dr. I. Shekriladze developed an electricity demand scenario taking into account demand growth in conformity with the estimated rates of economic growth and demand reduction as a result of a number of non-linear processes. In particular:

- The improvement of collection rates results in a consumption reduction of up to 40%.
- The step-by-step increase in the electricity tariff causes a decrease in demand of 10% of consumption at 2000 levels.
- The improvement and expansion of natural gas supply causes a reduction in electricity demand of 30% of consumption at 2000 levels.
- The reduction in transmission and distribution losses causes an additional decrease of 10%.

The results are presented in Table 4.

Table 4. Projection of Electricity Demand and Required Supply in 2001 - 2020

Year	Demand, GWh	Required Supply, GWh	Year	Demand, GWh	Required Supply, GWh
2001	6 430	7 940	2011	10 070	11 190
2002	6 240	7 610	2012	10 570	11 740
2003	5 970	7 190	2013	11 100	12 330
2004	6 230	7 420	2014	11 660	12 960
2005	6 710	7 800	2015	12 240	13 600
2006	7 120	8 090	2016	12 850	14 280
2007	7 890	8 770	2017	13 500	15 000
2008	8 700	9 670	2018	14 170	14 740
2009	9 140	10 160	2019	14 880	16 530
2010	9 590	10 660	2020	15 620	17 360

Source: Kipshidze, 2002.

Dr. Kipshidze also developed an electricity demand forecast based on three scenarios of economic development: (i) slow recovery and a subsequent slow growth of the gross domestic product (GDP); (ii) quick recovery and subsequent slow rates of GDP growth; and (iii) quick recovery and fast GDP growth. Results for the third scenario are presented in Table 5.

Table 5. Projected Electricity Demand (in GWh) up to 2020 (Fast Recovery and Fast GDP Growth)

Electricity Consumption Levels	YEARS						
	1990	1998	1999	2005	2010	2015	2020
Stipulated by economic development factors	17 444	7 962	8 147	10 706	13 826	18 255	24 542
Considering price variation impact	17 444	7 962	8 147	9 924	12 442	16 310	21 795
As a consequence of the implementation of energy efficiency measures	17 444	7 962	8 147	9 405	11 636	15 141	20 156

Source: Kipshidze, 2002.

In summary, the estimated electricity demand varies according to different assumptions, and ranges between 17 360 and 20 156 GW/h for the year 2020.

2.3. Electricity Supply

The uneven distribution of power generating facilities creates difficulties for the energy supply. This is also a consequence of the policies in the 1960s when the use of medium and small size HPPs was discouraged. As a result, regions rich in hydroelectric power potential became heavily dependent on the state grid. Today, the state grid is a rather unreliable source of energy supply, and a large part of the rural population is cut off from the electricity supply system, particularly during winter. This has a major impact on living standards.

Electricity consumption has declined since 1990 (see Table 6). This is mainly due to the lack of generating facilities, especially thermal power plants, the lack of finance to purchase fossil fuel for thermal power plants, and a general decline of industrial activity.

Table 6. Electricity Balance of Georgia, in GWh

	Generation			Import	Export	Net Import	Total Supply to the Grid	Losses	Consump-tion
	By Hydro	By Ther-mal	Total						
1990	55%	45%	13 613			-51			13 562
1991	56%	44%	13 140						13 140
1992	61%	39%	11 520	1 547	531	1 016	12 536	2 530	10 006
1993	71%	29%	10 150	1 051	338	713	10 863	2 965	7 898
1994	73%	27%	7 044	949	32	917	7 961	2 494	5 468
1995	90%	10%	7 082	754		754	7 836	1 993	5 844
1996	85%	15%	7 232	344	137	207	7 439	1 332	6 107
1997	84%	16%	7 172	613	277	336	7 508	1 059	6 449
1998	79%	21%	8 062	420	520	-100	7 962	1 119	6 843
1999	80%	20%	8 098	434	384	50	8 148	925	7 222
2000	80%	20%	7 447	612	211	401	7 848	829	7 019
2001	80%	20%	6 905	797	544	253	7 702	833	6 869
2002			7 215	750	251	499	7 965	836	6 883

Source: Kipshidze, 2002.

3. DESCRIPTION OF THE ELECTRICITY SECTOR OF GEORGIA

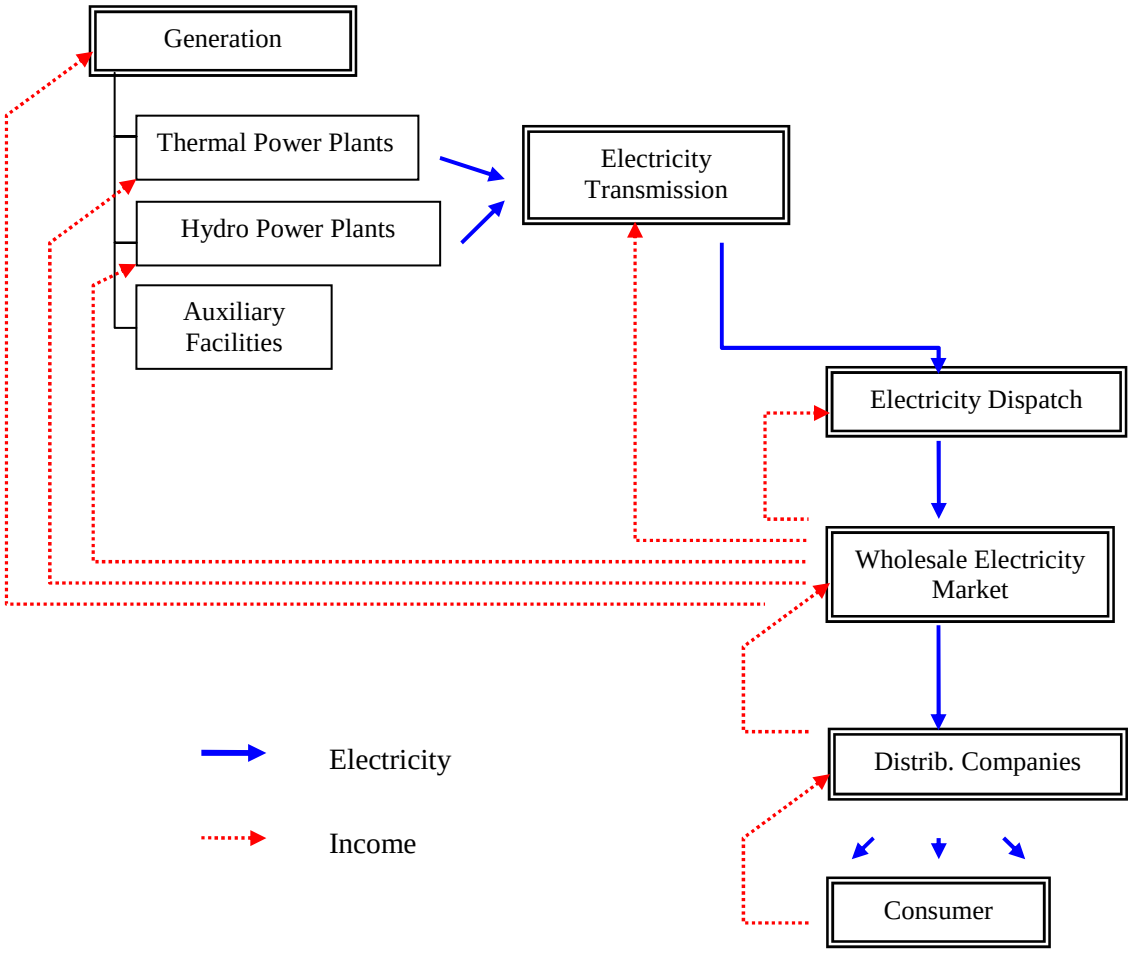
The electricity sector of Georgia has the following structure:

- Electricity generation;
- Electricity transmission;
- Dispatch;
- Distribution;
- Wholesale Electricity Market; and
- National Energy Regulatory Commission.

The relationship among these structures is shown in Figure 1.

Each of these components is described in more detail below.

Figure 1. Energy Sector in Georgia



3.1. Electricity Generation

The total installed capacity of generating facilities in Georgia constitutes about 4 800 MW. However, only 2 400 MW are in operational condition. During the winter peak demand cannot be met by existing facilities because a significant part of the population uses electricity for heating.

About 2 800 MW of Georgia's total installed generation capacity is hydroelectricity, 85% of which is concentrated in the western part of Georgia. Because of the lack of maintenance, most plants are in a poor state and have reduced their output. Hydroelectric generation constitutes about 78% of the electricity balance of the country and will continue to play a major role in Georgia's energy plans for the foreseeable future, primarily because of favourable weather conditions for hydroelectric generation.

Georgia's largest thermal power plant (TPP) is "Tbilsresi", located south-east of Tbilisi at Gardabani (and usually referred to as “Gardabani”). The Gardabani TPP originally had ten units with a total installed capacity of 1 850 MW. The two largest units (9 and 10) have been fully restored for gas operation, and each provides about 300 MW. Only three of the remaining units are operational. These units (3, 4 and 8) are old and cannot be operated at their full capacity. At a maximum, each unit can provide about 130 MW

for a total of about 400 MW. The remaining five units have not been maintained since the early 1990s and cannot be operated. At present, about 700 MW are available at the station as a result of extensive rehabilitation.

The units, most of which were commissioned in the 1950s, are facing a critical technical situation and show a very poor state of turbines, generators, transformers and other facilities, such as canals, buildings, and access roads. Inadequate maintenance is at the heart of the problem. In many cases, the operations of these plants also suffer because of water penstock and electrical installation (wire and transformer). For the plants fed by canals (generally used for irrigation), the water levels are lower due to the lack of cleanup of canals, leaks and an increase in irrigation needs. Nearly half of the capacity is currently not operating.

At present, the principal goals of the energy sector of Georgia, along with the restoration of small hydropower plants, is the rehabilitation of large and medium-size HPPs, and repairing and reinforcing the high voltage transmission system. These would involve relatively moderate investments.

3.2. Electricity Transmission

Georgia's high voltage transmission system comprises 576 km of 500 kV, 1 690 km of 220 kV and 3 911 km of 110 kV lines. In addition, the operable interconnection with Azerbaijan includes 21 km of 330 kV lines.

The lack of adequate maintenance since 1991, theft and vandalism have deteriorated the network and reduced its reliability. Virtually no maintenance or rehabilitation has been done on the 35-110 kV network, causing dozens of transmission lines and pieces of sub-station equipment to become non-operational, adversely affecting the normal functioning of the network.

Furthermore, the system's sub-optimal operation and too frequent switching because of the daily load-shedding (necessary to cope with winter supply shortages), has damaged sub-station batteries and switches, leaving a number of sub-stations without sufficient voltage.

3.3. Electricity Dispatch

The Central Dispatch Centre for Georgia's electric power system is responsible for monitoring and controlling the Georgian power system, including: switching of the 500, 220 and 110 kV high voltage transmission facilities, and scheduling generation to meet load requirements. Generally, it does not own operating assets (transmission lines, transformers, substations, etc).

3.4. Electricity Distribution

After reorganisation of the vertically integrated state power utility Sakenergo in 1997, the distribution sub-sector was divided into 66 distribution areas that received power from the transmission system via 21 major sub-stations. Later, the distribution sub-sector was reorganised again, to consist of 11 distribution companies (excluding Telasi-Tbilisi distribution company), all of which were registered as members of the Georgian Wholesale Electricity Market. These were:

1. Kvemo Kartli
2. Shida Kartli
3. Mtskheta-Mtianeti
4. Samtskhe-Javakheti
5. Imereti
6. Samegrelo
7. Guria
8. Racha
9. Adjara
10. Kakheti
11. Relasi (Rustavi)

In 2001, Shida Kartli, Kvemo Kartli, Samtskhe Javakheti, Mtskheta-Mtianeti, Imereti, Guria, Samegrelo Zvemo Svaneti and Racha distribution companies were merged into the Georgian United Distribution Company (UDC), a joint stock company. So, for the time being, Georgia has 5 distribution companies. UDC serves more than 1.1 million electricity customers, of which about 98% are residential. Telasi, the distribution company for Tbilisi, serves over 340 000 customers.

Distribution companies purchase most of their power from the market, and also receive some power directly from privatised hydropower plants. The physical assets of the distribution companies were, and still are, in a dilapidated condition. Emergency maintenance has only been possible over the last several years. Technical losses, as well as the incidence of operating failures, have increased dramatically due to system overloading. Attempts to commercialise the distribution sector are underway, but despite an upward trend over the last two years, theft and non-payment are still common and collection rates remain low at this stage. As a whole, total technical and commercial losses account for 32% of the system failures and run between 40-50% in many areas.

3.5. Georgian Wholesale Electricity Market

The 1999 amendments to the Law on Electricity resulted in the creation of the Georgian Wholesale Electricity Market (GWEM). The GWEM is an association of market members responsible for electricity market invoicing, settlement and administration of funds. GWEM's primary responsibility is to allocate equitably among the transmission, dispatch and generation enterprises the funds that are received from distributors. The GWEM has the authority to issue orders of disconnection to "Electrodispetcherizatsia" for implementation by "Electrogadatsema" (e.g. because of non-payment or partial payment). The GWEM officially commenced operations on 1 July 1999.

3.6. Georgian National Energy Regulatory Commission

The Georgian National Energy Regulatory Commission (GNERC) was established as a permanent independent body with the status of a legal entity of public justice, and is not subordinated to any governmental body or organisation.

The main objectives of the GNERC are:

- To promote competition within the energy sector (electricity and natural gas);
- To regulate the natural monopolies within the sector;
- To balance the interests of the electricity sector entities and consumers;
- To set and regulate wholesale and retail tariffs for generation, transmission and dispatch, distribution and consumption;
- To license the operations related to the electricity sector;
- To discuss, solve and regulate disputes between the entities of the electricity sector, as well as between electricity sector entities and consumers;
- To regulate export/import activities;
- If necessary, to elaborate proposals in order to make changes in the legislation on electricity and natural gas; and
- To monitor activities of the Georgian Wholesale Electricity Market.

The GNERC is authorised to grant or refuse licenses for the:

- Generation of electricity by all energy sources and facilities (except for those cases when the electricity is generated for own consumption and/or export and the electricity facilities are not connected to the transmission or distribution grids, or the sale of electricity is conducted under competitive market conditions, as determined by the Commission);
- Use of the transmission grid;
- Wholesale or retail sale of electricity and dispatch;
- Use of the distribution network; and
- Supply of consumers by direct contracts.

4. REGULATORY FRAMEWORK

Mini hydropower plants can supply electricity to the state grid or an isolated network. According to the existing regulation, all power producers have to obtain licences for generation and then make contracts on power supply. Until June 2004, hydropower plants could have contracts with the Wholesale Electricity Market or sign contracts directly with consumers, for example with a factory, hotel, etc.

The advantage of these contracts with consumers is that the power generation facility has direct contacts with its customers rather than going through an intermediary (the GWEM) in the case of selling electricity to the state grid. The GWEM distributes what it collects from consumers and payment rates in Georgia have been historically low.

Studies carried out by the UNDP/GEF project "Removing Barriers to the Development of Small Hydro Power Sector for the Mitigation of GHG Emissions in Georgia" confirmed that direct contracts are an attractive option to secure payments from local communities, and from small and medium enterprises. This makes projects more expensive (because of regulation equipment and additional investments in the metering system) but guarantees a higher collection rate. A pre-condition for accessing the UNDP/GEF "Renewable Energy Revolving Fund" for small hydropower plants is to have power purchase agreements (PPAs) with potential direct customers (DC).

Even though many small HPPs had been supplying energy to direct customers, the viability of the whole scheme came into question in June 2004, when the new commissioners at GNERC suspected that small and mini hydropower plants and small distributing companies had been underreporting electricity bought and sold. As a result, all small licences were cancelled.

At present, it is not prohibited to have direct customers, but it has become technically very difficult to have PPAs approved. One exception is for HPPs that have their own distributing network, but only a few of this kind exist. A second is for HPPs to lease a portion of the network from the United Distributing Company (UDC) but this has not been tried yet.

This blockage of DCs and PPAs is making serious trouble for investment projects in the small and mini hydropower sector since most of these had been developed with the assumption of direct sale to consumers rather than through the GWEM. After several rounds of discussion among the Ministry of Environment, the USAID, PA Consulting, KfW and the Ministry of Energy, it was agreed to amend the existing laws to include the deregulation of power plants with capacity of below 5 MW. Deregulation will include the

possibility of direct contracts. In practice, this means that mini hydropower plants would be able to sign direct contracts (including with the GWEM) at an agreed tariff without needing the approval of the GNERC. It is expected that these new amendments will come into the force in March 2006. If so, mini hydropower plants situated near settlements and or small enterprises (e.g. sawmills, small wineries, tea factories) would be able to operate within isolated networks, thus by-passing the GWEM.

In summary, it is expected that HPP will be able to work in isolated networks. However, in view of the current situation, this Report will leave the option of direct contracts and supply to the GWEM open, that is, the remaining sections of this report will only explore the electricity tariffs at which projects become feasible. Whether these tariffs are obtained by means of direct contracts or supply to the GWEM is left open.

5. ELECTRICITY TARIFFS

Currently, tariffs do not vary from winter to summer or between day and night periods. This is envisaged, but can only be implemented once proper metering is in place. At present, the tariffs for production, transmission, dispatch and distribution are fixed. It is expected that in the future only retail prices will be regulated by the GNERC. Resolution No 14 (15 August 2003) defines the following tariffs:

Table 7. Tariffs for Companies Purchasing Energy from the Wholesale Electricity Market (Tetri/ kWh)

Voltage	Tariff, Tetri/kWh
35-110 kV	3.897
6-10 kV	1.477

Source: GWEM.
Note: 1 GEL = 100 Tetri = 0.5 USD.

For small and mini HPPs, tariffs are 2.5 Tetri/kWh. However, for new plants, tariffs are much higher, which creates incentives for the construction and operation of new plants.

Table 8. Examples of Hydropower Generation Tariff for Small and Mini HPPs (Tetri/ kWh)

HPP	Tariff without VAT (Tetri/kWh)
Mashaverahesi	4.17
Rustavihesi Ltd.	4.33
Independent entrepreneur M.Tarashvili	5.00
Intsobahesi	5.17
Natural vines and spirits corporation Kindzmarauli - Chalahesi	5.00
BMG Ltd. – Suramulahesi	5.00

Source: UNDP/GEF (2002).

Table 9. Tariff for Thermal Power Plants (Tetri/kWh)

TPP	Tariff without VAT (Tetri/kWh)
JSC "AES Mtkvari" (Unit 9 of Tbilsresi) among them: - for firm capacity, Tetri/kWh - for supply to the grid, Tetri/kWh	6.50 1.60 4.90
Tbilsresi (Units 3, 4 and 8 of Tbilsresi) - for firm capacity, thousand Lari/month - for supply to the grid, Tetri/kWh	 496.36 5.716
JSC Kartuli Shakari (Georgian Sugar) (TPP) - for supply to the grid, Tetri/kWh	 2.33

Source: UNDP/GEF (2002).

The weighted-average electricity generation tariff is determined at 2.667 Tetri/kWh.

Table 10. Tariff for Electricity Transmission and Dispatch Services (Tetri/kWh)

Service Recipient / Service Provider	Energy Distributing Companies	Direct Customers
1. Transmission a. JSC "Georgian State Electric System" - 35-110-220 kV - 6-10 kV	 0.70 1.28	 - 2.136
b. "Saqgrusenergo"	0.18	0.18
2. Dispatch (JSC "Georgian State Electric System")	0.15	0.15
Total - 35-110-220 kV - 6-10 kV	 1.03 1.61	 - 2.466

Source: UNDP/GEF (2002).

Table 11. Purchasing Tariffs for Electricity Distributing Companies (Tetri/kWh)

Customer by Voltage / Electricity Suppliers	Tariff for 380/220 V Except for Population, Tetri/kWh	Tariff for 6-10 kV, Tetri/kWh
Distributing Companies	7.083	5.333

Source: UNDP/GEF (2002).

6. DESCRIPTION OF DONOR, STATE AND PRIVATE ACTIVITIES IN THE MINI HYDROPOWER GENERATION SECTOR

6.1. Implemented Projects

The first mini hydropower plant built after Georgia's independence was the Akhieli HPP at the River Assa. It supplies energy to three villages and frontier posts in Khevsureti. During the first phase, a 28.8 kW turbine of Bank type was also produced domestically.

In 1991, the Tskhomareti HPP was built on the River Jruchula. Its two turbines (Bank type, 250 kW capacity each) were manufactured in Georgia.

The first phase of the Khadori project (2001) included the construction of the Khadori mini HPP of 720 kW capacity. The total project (24 MW total capacity) was completed by the end of 2004.

The rehabilitation of the Mejvriskhevi HPP (constructed in 1950; installed capacity of 133 kW) included the construction of headwork, which has resulted in an increased capacity of 100 kW.

Finally, the Ministry of Energy is planning to rehabilitate three state-owned mini hydropower plants (Kekhvi HPP, Kazbegi HPP and Sanalia HPP). GEL 300 000 were allocated for each plant in the State Budget of 2004. The remaining investments were considered in 2005.

6.2. Donor Activities

One of the most important donor activities is the project "Georgia – Promoting the Use of Renewable Energy Resources for Local Energy Supply". The project, which is jointly financed by the UNDP/GEF (USD 4.3 million) and the Government of Germany, through the KfW (Euro 5.1 million), will undertake the pilot rehabilitation of small hydropower plants and geothermal hot water supply systems through a "Renewable Energy Revolving Fund" (RERF) to be established by the project. This Revolving Fund will provide soft loans (interest rate 8%; maturity - 7 years) to private small hydropower plants. A financial intermediary (local bank) will be selected to manage the resources of the Revolving Fund which, at the same time, will take responsibility for loan repayment. Eligibility criteria for loan applications include the requirement for owners of plants to cover about 25-30% of their project cost as equity. In the longer term, it is expected that the success of the first demonstration projects will significantly increase the interest of other potential investors in the development of Georgia's renewable energy sector. The technical assistance component of the project, financed by the UNDP/GEF, was started in May 2004 and the financial component (supported by the KfW) was started in July 2005.

The resources of the RERF are limited and will not be sufficient to finance all projects that apply for support. This means that a number of already developed projects will not be financed, even though they have crucial importance for particular regions (communities). This is an area where the resources from DFES can complement and expand existing donor programmes.

USAID is financing the Georgian Energy Security Initiative (GESI), which has recently completed preparatory work for its Community Development Component. About 7 000 communities have been

identified and 10 of them short-listed. For these, the project has produced development plans, including the identification of local renewable energy sources. The primary selection criteria for identifying communities were deforestation rates, potential for generation of the highest income, and the greatest potential for designing, implementing and sustaining replicable projects. For the 10 selected communities, the construction/rehabilitation of mini HPPs is planned. Business plans have been developed based on a combination of loan and grant financing. If a non-profit community-based organisation (CBO) is the applicant institution, it will receive up to a 50% grant and a 50% loan (5% of interest rate, 7 years of maturity). However, GESI can finance only two communities. Others would have to apply for DFES resources.

6.3. Value Added of DFES Financing

DFES has the possibility of expanding state and donor pilot programmes for an increased renewable electricity supply. Specifically, DFES can increase the reach of the GEF/KfW project by expanding the financial resources available for the rehabilitation and construction of HPPs. In the present situation of Georgia, characterised by a constant energy crisis, the expansion of existing pilot programmes is a great necessity.

In addition, DFES will complement the current USAID GESI programme by providing resources to communities that were selected by the GESI but cannot, because of limited financial resources, receive support for the construction of HPPs.

7. STAKEHOLDER ANALYSIS

Private owners of HPPs. The majority of small and mini hydropower plants have been privatised. The owners of these plants are mainly private persons rather than private companies. In general, owners are ready to take a risk in the form of equity in the range of 10-30% to contribute to the cost of rehabilitation. Operators of existing hydropower plants can provide maintenance at a limited level. If rehabilitated/newly constructed plants work within an isolated grid, which will include advanced regulation technologies, then operators will have to receive training.

Local businesses. In rural areas, local businesses lack electricity, especially in terms of quality and guaranteed supply. As a result, many enterprises have got diesel generators and produce expensive energy for self-consumption. They can be considered not only as direct customers, but also as shareholders, especially in the case of new construction. In different regions of Georgia, many small and medium enterprises have expressed their interest to participate in mini hydropower development.

Local communities. Local communities are also stakeholders, and under the GESI community based organisations (CBOs) are expected to *implement* mini hydropower projects.

Private companies. There are a number of engineering and consulting companies, and design/engineering institutes that have experience in the field of small and mini hydropower. They are considered important stakeholders as they ensure an available pool of local expertise. Among them:

- Institute “Hydroproject” - design-engineering;
- “Saktskalproject” JSC - design-engineering;

- “Institute of Energy” Ltd. - design-engineering;
- “Georgian Hydropower” JSC - design-engineering, consulting;
- “Basiani 93” Ltd. - design-engineering, consulting, production of Bank type turbines, assembling, balancing and commissioning;
- “Sakenergomsheni” JSC – construction;
- “Feri” Ltd. - construction, production of electrical equipment, assembling, balancing and commissioning;
- “Energomsheni” JSC – construction;
- “Spetshydromsheni” JSC – construction;
- “Spetsgvirabmsheni” JSC – construction.

8. CAPITAL AND OPERATION AND MAINTENANCE COSTS OF MODEL PROJECTS

8.1. “Rehabilitation” Model Projects

Rehabilitation costs of mini hydropower plants differ from one another depending on the volume of rehabilitation work. The majority of existing mini HPPs needs significant rehabilitation, including civil engineering (construction/repair of headwork, cleaning of headrace canal, repair of penstock, construction/repair of regulation basin, repair of powerhouse, etc.) and major overhaul and often replacement of electrical and mechanical (E&M) equipment as well.

Most of the small and mini HPPs are privatised in Georgia. The owners of plants carry out small-scale rehabilitation work using their own financial resources. Financial support (e.g. credit) necessary for larger-scale rehabilitation is extremely limited or non existent.

In order to identify model projects, this report explores the rehabilitation projects of small and mini hydropower plants developed in the framework of different donor-supported programmes. In particular, we look at “Removing Barriers to the Development of Small Hydro Power Sector for the Mitigation of GHG Emissions in Georgia“ (hereafter the UNDP/GEF project). The GEF project has studied the following small and mini HPPs: Abasha, Borjomi, Dashbashi, Kazbegi, Misaktsieli, Orbeli, Sno, and Sulori HPPs. Among them, the Abasha, Dashbashi, Kazbegi and Misaktsieli HPPs are in operation. Data on these plants are presented in Table 12.

Table 12. Characteristics of Selected Plants

Characteristics	HPP								
	Abasha	**Borjomi**	**Dashbash**	**Kazbegi**	**Misaktsieli**	**Orbeli**	**Sno**	**Sulori**	**Average**
Date of start up	1928	1898	1936	1951	1964	1949	1954	1953	
Current capacity, kW	400	0	420	150	1 000	0	0	0	**246**
Capacity after rehabilitation	1 550	1 490	2 140	1 200	2 500	920	360	600	**1 345**
Current annual output, GWh	3.80	0	1.50	0.80	3.00	0	0	0	**1.138**
Output after rehabilitation	9.30	10.67	17.00	8.07	13.00	6.30	1.60	4.20	**8.768**
Incremental capacity, kW	1 150	1 490	1 720	1 050	1 500	920	360	600	**1 099**
Incremental output, GWh	5.50	10.67	15.50	7.27	10.00	6.30	1.60	4.20	**7.630**

Source: UNDP/GEF (2002).

After rehabilitation, HPPs are designed for both operation in an isolated network and for parallel operation in the public grid. The layout for parallel operation in the public grid assumes that the state grid will be more stable in the future.

Capital and O&M costs have been estimated based on the market prices. It was assumed that western electrical and mechanical equipment would be purchased and installed. Capital and O&M costs are presented in Table 13.

Table 13 shows that all 9 plants need significant rehabilitation, including the replacement of E&M equipment (48-72% of total capital costs). Very small/mini hydropower plants that need smaller rehabilitation and consequently less capital investment (below USD 100 000) were not studied in the framework of the above mentioned project, whose objective was to select 5-8 HPPs for rehabilitation of a total cost of USD 4 - 4.5 million. Therefore, average values presented in Table 13 should be taken with some caution.

Taking into account the above mentioned caveat, the following model projects were identified:

1. **Full rehabilitation 1 (expensive projects)**[35]: mini HPPs needing a major overhaul (average parameters presented in Table 13);
2. **Full rehabilitation 2 (less expensive projects)**: mini HPP needing a major overhaul (average parameters for the 3 least expensive HPPs: Dashbash, Kazbegi and Misaktsieli);
3. **Small-scale rehabilitation**. since there are no available experiences of rehabilitation projects of this type, hypothetic project parameters are based on the following assumptions: civil engineering works, steel structures: 50% of the expensive project (excluding Sulori HPP – the most expensive project); E&M: 20% of the expensive project; no costs for transmission lines; design and supervision: 50% of the expensive project; unforeseen: 25% of the expensive project. The incremental output is assumed to equal 40% of the expensive project.

[35] Projects are identified as “expensive” or “less expensive” according to the specific capital costs, i.e. the cost of an increased unit of capacity/output.

Table 13. Capital and Operational & Maintenance Costs of Selected Plants

Characteristics	HPP								
	Abasha	**Borjomi**	**Dashbash**	**Kazbegi**	**Misaktsieli**	**Orbeli**	**Sno**	**Sulori**	**Average**
Capital costs, USD 1 000									
Civil engineering works	152	789	47	127	143	390	73	165	236
% in total	*16*	*46*	*4*	*12*	*13*	*40*	*19*	*16*	*21*
Steel structures	23		218	72	21	52	43	36	66
% in total	*2*	*0*	*18*	*7*	*2*	*5*	*11*	*4*	*6*
E&M equipment	691	809	783	741	704	467	236	706	642
% in total	*72*	*47*	*65*	*71*	*66*	*48*	*60*	*70*	*58*
Transmission lines		58	65		93				72
% in total	*0*	*3*	*5*	*0*	*9*	*0*	*0*	*0*	*7*
Design and supervision	43	65	50	50	49	25	20	45	43
% in total	*4*	*4*	*4*	*5*	*5*	*3*	*5*	*4*	*4*
Unforeseen	52		37	50	57	30	20	54	43
% in total	*5*	*0*	*3*	*5*	*5*	*3*	*5*	*5*	*4*
TOTAL CAPITAL COSTS	**961**	**1 721**	**1 200**	**1 040**	**1 067**	**964**	**392**	**1 006**	**1 103**
Capital costs of 1 kW incremental capacity, USD	**836**	**1 155**	**698**	**990**	**711**	**1 048**	**1 089**	**1 677**	**1 025**
Capital costs of 1 MWh incremental output, USD[36]	**7**	**6**	**3**	**6**	**4**	**6**	**10**	**10**	**7**
O&M costs, USD 1 000									
Wages including social costs	19				11			15	15
Spare parts	7				4			7	6
Other materials	4				3			3	3
TOTAL O&M COSTS	**30**	**30**	**22**	**10**	**18**	**15**	**10**	**25**	**20**

Source: UNDP/GEF (2002).

The parameters of the model projects are presented in Table 14.

[36] Assumptions: lifetime – 25 years; no discounting.

Table 14. Capital and Operational & Maintenance Costs of Model Rehabilitation Projects

Parameter	Model Project		
	Full Rehabilitation "Expensive"	**Full Rehabilitation "Less Expensive"**	**Small-Scale Rehabilitation**
Incremental capacity, kW	1 099	1 423	N/A
Current annual output, GWh	1.138	1.767	1.300
Output after rehabilitation, GWh	8.768	12.690	4.548
Incremental annual output, GWh	7.630	10.923	3.248
Annual working hours of rehabilitated capacity, hours	6 944	7 674	N/A
Plant factor of rehabilitated capacity	79%	88%	N/A
Capital costs, USD 1 000	1 103	1 129	317
Among them:			
Civil engineering works	*236*	*106*	*123*
Steel structures	*66*	*104*	*36*
Electro-mechanical equipment	*642*	*743*	*127*
Transmission lines	*72*	*79*	*0*
Design and supervision	*43*	*50*	*22*
Unforeseen	*43*	*48*	*10*
Capital costs of 1 MWh incremental output, USD	6.50	4.36	3.91
Annual O&M costs, USD 1 000	20	17	19

Source: Own estimates.

8.2. "New Construction" Model Projects

The model projects for new construction were identified on the basis of data presented in Table 15, which was provided by the "Basiani 93" company. The types of headwork are determined by the types of penstock and turbines to be installed. In the case of metal penstock, as a rule, the intake represents a Tyrol type dam and for derivation canals – an assembly dam.

Powerhouses represent ground buildings of a skeleton type. For different hydropower plants, the installation of different types of turbines (Pelton, Francis, Kaplan and Bank) and synchronous generators is planned.[37]

It is foreseen that hydropower plants will work in a full automation regime guided by a computer system. It is assumed that plants will be able to work in parallel with the state grid simultaneously serving specific consumers.

This report uses world prices for the estimation of costs of electrical and mechanical (E&M) devices. In particular, for the Kaplan turbine - 550 USD/kW was used; for Francis - 500 USD/kW; for Pelton - 450 USD/kW; and for Bank – 300 USD/kW. For 50 years Bank turbines have been manufactured in Georgia, and so turbines of this type can be produced domestically.[38]

In short, the assessment performed by "Basiani 93", even if not completely accurate, is still useful for evaluating the feasibility of constructing new plants. Table 15 shows the ranking (by cost of 1 MWh) of 54 potential mini hydropower plants.

[37] In some cases, where plants will be connected to the grid, non-synchronous generators can be used as well.

[38] Some Georgian companies (Feri Ltd., Hydroagregat Ltd., Aviamsheni Ltd.) started designing and producing Pelton and Francis turbines. However, the long-term reliability of these turbines still needs to be proven.

Table 15. Capital Costs of Potential New Mini Hydropower Plants

No	Type		HPP	Installed Capacity, kW	Annual Output, GWh	Capital Costs, 1 000 USD	Capital Costs of 1 kW, USD	Capital Costs of 1 MWh, USD
1	Less expensive Projects	Least Expensive	Kvirilistskali	730	5.23	580	792	4.44
2			Khulo mini	500	4.00	450	900	4.50
3			Niali	1 000	6.50	800	760	4.92
4			Ianeuli	570	3.93	540	793	5.50
5			Chkhakoura	400	2.87	410	1 015	5.71
6			Dmanisi	300	2.00	300	1 000	6.00
7			Gagluani	150	0.65	100	1 270	6.15
8			Nusreti	450	3.20	510	1 133	6.38
9			Kadarauri	100	0.69	110	1 090	6.38
10			Mna	750	5.10	820	1 091	6.43
11			Akhaltsikhe	230	1.57	260	1 144	6.62
12			Chkheri	1 000	6.82	1 150	1 150	6.74
13			Tkarsheti	240	1.64	280	1 168	6.83
14			Charnali	740	4.82	830	1 122	6.89
15			Khurtisi	470	3.20	560	1 189	7.00
16			Boloko	450	6.14	1 080	1 256	7.04
17			Chala	660	4.30	760	1 150	7.07
18			Gaiboteni	430	2.93	540	1 256	7.37
19	Medium Projects		Bobora	1 000	6.50	1 200	1 200	7.38
20			Chorghi	430	2.80	530	1 230	7.57
21			Gergeti	140	0.95	190	1 359	8.00
22			Iri	100	0.60	120	1 200	8.00
23			Khoshantkhevi	320	1.70	350	1 094	8.24
24			Orbeza	680	4.84	1 010	1 485	8.35
25			Didvake	950	6.36	1 360	1 478	8.55
26			Monastristskali	340	2.33	510	1 506	8.76
27			Buksieti	380	1.98	440	1 147	8.89
28			Largvisi	670	5.00	1 130	1 690	9.04
29			Afshila	270	1.77	420	1 556	9.49
30			Tedzami	600	2.50	600	1 000	9.60
31			Girevi	140	0.70	170	1 214	9.71
32			Nakieti	300	1.60	390	1 300	9.75
33			Biisi	500	2.25	550	1 095	9.78
34			Kveda	450	2.90	710	1 580	9.79
35	Expensive Projects		Mechkhristskali	350	2.40	590	1 686	9.83
36			Khoteura	1 000	5.80	1 440	1 440	9.93
37			Bobnevi	400	1.80	460	1 160	10.22
38			Makvaneti	200	1.23	320	1 374	10.41
39			Askana	170	0.89	240	1 424	10.79
40			Boshuri	300	1.35	370	1 230	10.96
41			Tursebi	300	1.30	360	1 210	11.08
42			Chala	350	1.90	540	1 530	11.37
43			Pavliani	800	5.10	1 460	1 830	11.45
44			Ateni	800	3.60	1 070	1 340	11.89
45			Daba	810	3.86	1 200	1 495	12.44
46			Gujareti 1	890	4.41	1 380	1 545	12.52
47			Timotesubani	490	2.38	800	1 630	13.45
48			Bakhmaro	620	3.23	1 090	1 765	13.50
49			Tsagveri	760	3.68	1 250	1 654	13.59
50			Patara Tsemi	490	2.19	760	1 549	13.88
51			Tsemi	470	2.07	760	1 615	14.69
52			Bakuriani 2	240	1.07	420	1 763	15.70
53			Bakuriani 1	190	0.76	310	1 676	16.32
54			Libani	430	1.77	730	1 709	16.50
			Total in Georgia	**26 500**	**161.16**	**35 310**	**1 312**	**8.76**

Source: UNDP/GEF (2002).

These plants have been divided into 3 groups (18 HPPs in each):

- Expensive projects;
- Medium projects; and
- Less expensive projects.

In addition, 7 of the less expensive plants have been organised into a “least expensive” group. The parameters of these groups of projects are presented in Table 16.

Table 16. Capital and Operation & Maintenance Costs of Model Projects for the Construction of New HPPs

Parameter	Model Project			
	Expensive	Medium	Less Expensive	Least Expensive
Average capacity, kW	489	475	532	521
Average annual output, GWh	2.399	2.883	3.644	3.597
Annual working hours, h	4 909	6 073	6 847	6 899
Plant factor, %	56%	69%	78%	79%
Capital costs, USD 1 000	768	641	560	454
Costs of 1 MWh output, USD	12.81	8.89	6.15	5.05
Annual O&M costs, USD 1 000	12	12	12	12

9. EVALUATION OF THE ECONOMIC POTENTIAL OF REHABILITATING EXISTING, AND CONSTRUCTING NEW, MINI HYDROPOWER PLANTS

There are several benefits from promoting the construction and rehabilitation of HPPs. These are listed below:

- Electricity supply in the rural areas of Georgia is very limited. For cooking, heating and hot water people use mainly firewood, and for lighting - kerosene.
- Electricity generated by mini hydropower plants can be used for lighting and electrical appliances, as well as for cooking and heating water.
- The promotion of renewable energy is one of the powerful ways to reduce dependence on imported fossil fuel and thereby can help to increase the energy security of the country.
- It is generally accepted that small and medium enterprises (SMEs) are and will be the backbone of economic development in Georgia. However, at present, their development outside of Tbilisi is limited because of the lack of a reliable energy supply.
- If mini hydro plants can work in an autonomous regime, this will reduce the load for the whole energy system and avoid the dependence of each region on this system. Besides, electricity will be transmitted over short distances and so energy losses will be reduced.

Electricity generated by mini hydropower plants rehabilitated/constructed under DFES will replace energy otherwise produced by existing facilities. Revenues generated by DFES are equal to the cost of otherwise produced electricity. Since the HPPs rehabilitated/constructed under DFES would most probably operate within isolated networks/direct customers, the cost of replaced energy will include generation, transmission and dispatch costs. According to Resolution 14 of the GNERC of 15 August 2003, the weight-average electricity generation tariff is set at 2.667 Tetri/kWh (1.40 USC/kWh); the weight-average electricity transmission and dispatch tariff is set at 1.61 Tetri/kWh (0.84 USC/kWh). Consequently, benefits generated by the DFES will equal 2.24 USC/kWh.

In addition to the above, DFES resources for mini HPPs will result in a reduction of GHGs by replacing electricity produced by thermal power plants. Based on energy balance data for 2001 (amount of electricity generated by HPP, by TPP, amount of fuel combusted in TPP) and the future share of HPPs in total energy generation, the carbon emission factor was calculated for the country's electricity system. On average, the generation of 1 kWh of electricity emits 198 g of CO_2 or 198 tCO_2/GWh (see Section 14 of this report). The world price for reducing a tonne of CO_2 at present equals USD 5 (or USD 18/t C), which means that 1 kWh of electricity produced by the projects implemented under DFES would generate additional 5 * 198 / 1 000 000 = 0.1 USC. Taking into account the above calculation, the electricity produced by the projects implemented under DFES would generate 2.24 + 0.1 = 2.34 USC/kWh.

In order to refine the technical potential of mini HPPs according to current economic conditions, the following assumptions were used:

- Discount rate: 10 %;
- Economic duration life of HPP: 25 years; and
- Duration of rehabilitation/construction: 1 year.

Tables 17-18 present the input data and the economic rate of return.

Table 17. Input Data

Implementation	
Start of implementation	01/2005
Start-up phase	11/2005
Start of production	01/2006

	Rehabilitation			**New Construction**			
	Expensive	**Less**	**Small-Scale**	**Expensive**	**Medium**	**Less**	**Least**
Actual annual production	1.138	1.767	1.300	0.000	0.000	0.000	0.000
Production after rehabilitation/construction, GWh	8.768	12.690	4.548	2.399	2.883	3.644	3.597
Electricity generation, transmission and dispatch tariff USD/kWh	0.0224	0.0224	0.0224	0.0224	0.0224	0.0224	0.0224
Payment collection rate	100%	100%	100%	100%	100%	100%	100%
Annual income, 1 000 USD							
Before rehabilitation/construction	25.5	39.6	29.1	0.0	0.0	0.0	0.0
After rehabilitation/construction	196.4	284.3	101.9	53.7	64.6	81.6	80.6
Electricity generation emission factor, tCO_2/GWh	198	198	198	198	198	198	198
Income due to GHG reduction, USD/tCO_2	5	5	5	5	5	5	5
Income generated by 1 kWh of electricity produced by DFES project, which replaces otherwise produced energy, USD/kWh	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
Total income generated by 1 kWh of electricity produced by DFES project, USD/kWh	0.0234	0.0234	0.0234	0.0234	0.0234	0.0234	0.0234
Annual GHG reduction, tCO_2	1 511	2 163	643	475	571	721	712
Income generated by GHG reduction, 1 000 USD	7.6	10.8	3.2	2.4	2.9	3.6	3.6
Net annual income	178.5	255.5	76.0	56.1	67.4	85.2	84.1
Increase of income	0%	0%	0%	0%	0%	0%	0%
Capital (investment) costs, 1 000 USD	1 103	1 129	317	768	641	560	454
Operation costs, 1 000 USD							
1st year of operation	20	17	19	12	12	12	12
2-25 years of operation	20	17	19	12	12	12	12
Increase of O&M costs	0%	0%	0%	0%	0%	0%	0%
Discount rate	10%						

For the sake of simplicity, it was assumed that the electricity tariff and O&M costs remain constant during the project's lifetime.

Table 18. Economic Rate of Return (ERR)(Collection Rate = 100%)

Type of Project	Sub-Type:	Income Conditioned by Energy Generation and GHG Reduction, USD/kWh	NPV, 1000 USD	ERR, %	BCR	RNPV	Payback Period, Years
Full rehabilitation	Expensive	0.0234	305	14%	1.26	1.28	7
	Less Expensive	0.0234	945	21%	1.81	1.84	5
Small-scale rehabilitation		0.0234	179	18%	1.40	1.57	6
New construction	Expensive	0.0234	-334	3%	0.58	0.56	18
	Medium	0.0234	-125	7%	0.82	0.81	12
	Less Expensive	0.0234	95	12%	1.16	1.17	8
	Least Expensive	0.0234	182	15%	1.36	1.40	7

Note: *NPV – Net Present Value;*
ERR – Economic Rate of Return;
BCR – Benefit-Cost Ratio;
RNPV – Rate of NPV.

The development of the mini hydropower sector will also generate additional social benefits. Along with direct job creation, it will reduce indoor pollution. It will contribute to improving the education level: during short winter days, schoolchildren will no longer have to learn by candlelight or kerosene lamplight. It will facilitate access to information: due to a very limited electricity supply at present, the rural population cannot watch TV, which is a vital source of information, especially in wintertime, when access roads to mountainous regions are closed.

10. FINANCIAL VIABILITY OF REHABILITATION AND CONSTRUCTION OF NEW MINI HYDRO POWER PLANTS

Along with the economic evaluation, a financial analysis of the rehabilitation of model projects of existing, and the construction of new, mini hydropower plants has been carried out. Input data for the financial calculations are presented in Table 19.

Table 19. Input Data for Financial Calculations (Equity = 20%; Interest on Loan = 6%)

Implementation	**Date**
Start of implementation	01/2005
Start-up phase	11/2005
Start of production	01/2006

	Rehabilitation			**New Construction**			
	Expensive	**Less**	**Small-Scale**	**Expensive**	**Medium**	**Less**	**Least**
Annual energy production, GWh	8.768	12.690	4.548	2.399	2.883	3.644	3.597
Electricity selling tariff USD/kWh	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Payment collection rate							
1st year	40%	40%	40%	40%	40%	40%	40%
2nd year	60%	60%	60%	60%	60%	60%	60%
3-25 years	80%	80%	80%	80%	80%	80%	80%
Annual income, 1 000 USD							
1st year	52.6	76.1	27.3	14.4	17.3	21.9	21.6
2nd year	78.9	114.2	40.9	21.6	25.9	32.8	32.4
3-25 years	105.2	152.3	54.6	28.8	34.6	43.7	43.2
Increase of income	0%	0%	0%	0%	0%	0%	0%
Capital (investment) costs, 1 000 USD	1 103	1 129	317	768	641	560	454
Operation costs, 1 000 USD							
1st year of operation	20	17	19	12	12	12	12
2-25 years of operation	20	17	19	12	12	12	12
Increase of O&M costs	0%	0%	0%	0%	0%	0%	0%
Discount rate	10%						

Sources of financing	**%**	**Amount by Project Type, 1 000 USD**						
Equity capital	20%	221	226	63	154	128	112	91
Grant financing	0%	0	0	0	0	0	0	0
Long-term loan	0%	0	0	0	0	0	0	0
DFES loan	80%	882	903	254	615	512	448	363
Short-term loan	0%	0	0	0	0	0	0	0
Total	100%	1 103	1 129	317	768	641	560	454

Financing Conditions	Interest Rates	Payback Period
Equity capital	0%	0
Grant financing	0%	0
Long-term loan	0%	0
DFES loan	**6%**	7
Short-term loan	0%	0
Taxes	**%**	**Basis**
Income/co-operate tax	20%	Taxable income
Equity tax	1%	Book value
Road tax	1%	Sales revenue
Sales tax	1%	Sales revenue
Depreciation		
Percentage	7.50%	
Process	Accelerating	
Basis	Book value	

Book value by model project type		1 103	1 129	317	768	641	560	454
Working capital								
Initial book value, 1 000 USD	50							

Without DFES or other programmes, the assumed access to project financing is limited or not available at all. It is difficult to find investors for these types of projects, either foreign or local. The conditions of local banks are very unfavourable. High interest rates and short payback periods, along with the required guarantees, make the financing of the model projects considered in this report impossible.

The financing scheme for a project pipeline financed under DFES should be more flexible and consist of co-financing from the project owners (equity) and DFES (combination of grant and soft loan). Taking into account the experience/plans of similar programmes (e.g. the above-mentioned UNDP/GEF-KfW project) for the first version of financing, it was assumed that 20% of investments would be the responsibility of project owners as equity and the rest would be covered by soft loans provided under the DFES at an annual interest rate of 6% and a payback period of 7 years. All existing taxes were considered.[39]

These calculations were carried out using the same electricity selling tariffs as those used in the economic calculations:

- 0.015 USD/kWh;
- 0.020 USD/kWh;
- 0.025 USD/kWh;
- 0.030 USD/kWh;
- 0.035 USD/kWh;
- 0.040 USD/kWh.

The financial feasibility of the projects was evaluated on the basis of the following indicators:

- NPV – Net present value;
- IRR – Internal rate of return;
- BCR – Benefit-cost ratio; and
- RNPV – Ratio of NPV (= NPV/(NPV + Investment).

[39] The financial calculations have been carried out using the 2004 tax rates. A new (simplified) Tax Code has been approved, which is expected to create more favourable conditions for investments.

The results are presented in Table 20.

Table 20. Results of Financial Calculations (Equity = 20%; Interest on Loan = 6%)

Type of Project	Sub-Type:	Electricity Selling Tariff USD/kWh	NPV, 1000 USD	IRR, %	BCR	RNPV
Full rehabilitation	Expensive	0.015	-520	0%	0.52	0.53
	Less exp.		-225	6%	0.71	0.80
Small-scale rehabilitation			-111	3%	0.67	0.65
New construction	Expensive	0.015		(-)		
	Medium			(-)		
	Less exp.			(-)		
	Least exp.			(-)		
Full rehabilitation	Expensive	0.020	-303	4%	0.66	0.72
	Less exp.		89	12%	0.88	1.08
Small-scale rehabilitation			2	10%	0.84	1.01
New construction	Expensive	0.020		(-)		
	Medium			(-)		
	Less exp.		-249	1%	0.55	0.55
	Least exp.		-157	3%	0.63	0.65
Full rehabilitation	Expensive	0.025	-86	8%	0.79	0.92
	Less exp.		403	18%	1.03	1.36
Small-scale rehabilitation			114	17%	0.98	1.36
New construction	Expensive	0.025		(-)		
	Medium			(-)		
	Less exp.		-159	4%	0.66	0.72
	Least exp.		-68	7%	0.75	0.85
Full rehabilitation	Expensive	0.030	131	12%	0.90	1.12
	Less exp.		708	24%	1.15	1.63
Small-scale rehabilitation			222	25%	1.10	1.70
New construction	Expensive	0.030		(-)		
	Medium			(-)		
	Less exp.		-69	8%	0.76	0.88
	Least exp.		21	11%	0.86	1.05
Full rehabilitation	Expensive	0.035	348	17%	1.00	1.32
	Less exp.		998	30%	1.25	1.88
Small-scale rehabilitation			325	33%	1.20	2.03
New construction	Expensive	0.035		(-)		
	Medium		-184	4%	0.66	0.71
	Less exp.		21	11%	0.85	1.04
	Least exp.		110	15%	0.96	1.24
Full rehabilitation	Expensive	0.040	561	21%	1.09	1.51
	Less exp.		1 286	37%	1.34	2.14
Small-scale rehabilitation			429	42%	1.28	2.35
New construction	Expensive	0.040	-325	1%	0.55	0.58
	Medium		-113	6%	0.73	0.82
	Less exp.		111	14%	0.94	1.20
	Least exp.		198	19%	1.05	1.44

To estimate the financial feasibility of the model projects, the following main criteria were used:

- Positive NPV;
- 15% ≤ IRR ≤ 20%.

These criteria are met for:

- Expensive full rehabilitation model project at a tariff 0.035 USD/kWh;
- Less expensive full rehabilitation model project at a tariff 0.025 USD/kWh;
- Small-scale rehabilitation model project at a tariff 0.025 USD/kWh;
- Least expensive new construction model project at a tariff 0.040 USD/kWh.

Taking into account the Georgian reality, and in particular the low capacity of the population to pay, it is not certain that power plants will get paid for produced energy at the planned level, especially in case of high tariffs. Moreover, if the planned deregulation of the sector is not carried out, then the GNERC will continue regulating tariffs and it is not clear if it would approve them in the range of 0.035-0.040 USD/kWh, at least in the next 2-3 years. Therefore, a second version of financing was considered. This second round of calculations is presented in Table 21 below.

Table 21. Input Data for Financial Calculations (Equity=20%; Grant=10%; Interest on Loan=6%)

Sources of Financing	**%**	**Amount by Project Type, 1 000 USD**						
Equity capital	20%	221	226	63	154	128	112	91
Grant financing	10%	110	113	32	77	64	56	45
Long-term loan	0%	0	0	0	0	0	0	0
DFES loan	70%	772	790	222	538	448	392	318
Short-term loan	0%	0	0	0	0	0	0	0
Total	100%	1,103	1,129	317	768	641	560	454

Financing Conditions	**Interest Rates**	**Payback Period**
Equity capital	0%	0
Grant financing	0%	0
Long-term loan	0%	0
DFES loan	6%	7

Table 22. Results of Financial Calculations (Equity = 20%; Grant = 10%; Interest on Loan = 6%)

Type of Project	Sub-Type:	Electricity Selling Tariff USD/kWh	NPV, 1 000 USD	IRR, %	BCR	RNPV
Full rehabilitation	Expensive	0.015	-426	1.5%	0.56	0.61
	Less exp.		-132	7.5%	0.76	0.88
Small-scale rehabilitation			-81	4.6%	0.71	0.74
New construction	Expensive	0.015		(-)		
	Medium			(-)		
	Less exp.			(-)		
	Least exp.			(-)		
Full rehabilitation	Expensive	0.020	-209	5.9%	0.71	0.81
	Less exp.		182	13.6%	0.93	1.16
Small-scale rehabilitation			32	12.1%	0.88	1.10
New construction	Expensive	0.020		(-)		
	Medium			(-)		
	Less exp.		-201	2.1%	0.59	0.64
	Least exp.		-118	4.4%	0.67	0.74
Full rehabilitation	Expensive	0.025	8	10.2%	0.84	1.01
	Less exp.		495	20.1%	1.08	1.44
Small-scale rehabilitation			143	20.0%	1.03	1.45
New construction	Expensive	0.025		(-)		
	Medium		-272	0.5%	0.53	0.58
	Less exp.		-111	5.7%	0.71	0.80
	Least exp.		-29	8.6%	0.79	0.94
Full rehabilitation	Expensive	0.030	225	14.5%	0.95	1.20
	Less exp.		792	26.9%	1.21	1.70
Small-scale rehabilitation			248	28.1%	1.14	1.78
New construction	Expensive	0.030		(-)		
	Medium		-201	3.1%	0.62	0.69
	Less exp.		-21	9.2%	0.81	0.96
	Least exp.		60	12.9%	0.91	1.13
Full rehabilitation	Expensive	0.035	441	19.1%	1.06	1.40
	Less exp.		1 080	34.0%	1.30	1.96
Small-scale rehabilitation			351	36.9%	1.24	2.11
New construction	Expensive	0.035	-318	0.7%	0.53	0.59
	Medium		-130	5.6%	0.70	0.80
	Less exp.		69	12.7%	0.91	1.12
	Least exp.		149	17.4%	1.01	1.33
Full rehabilitation	Expensive	0.040	650	23.9%	1.15	1.59
	Less exp.		1 368	41.5%	1.39	2.21
Small-scale rehabilitation			454	46.2%	1.32	2.43
New construction	Expensive	0.040	-259	2.6%	0.59	0.66
	Medium		-58	8.0%	0.78	0.91
	Less exp.		159	16.4%	0.99	1.28
	Least exp.		236	22.0%	1.10	1.52

The financial criteria are met for:

- Expensive full rehabilitation model project at a tariff 0.030 USD/kWh;
- Less expensive full rehabilitation model project at a tariff 0.025 USD/kWh;
- Small-scale rehabilitation model project at a tariff 0.025 USD/kWh;
- Less expensive new construction model project at a tariff 0.040 USD/kWh;
- Less expensive new construction model project at a tariff 0.035 USD/kWh.

For new construction, the tariff remains still high. Therefore, a third version of financing was evaluated, assuming a reduced equity share (10% instead of 20%) and an increased grant share (25% instead of 10%). The results are presented in Table 23.

Table 23. Results of Financial Calculations (Equity = 10%; Grant = 25%; Interest on Loan = 6%)

Type of Project	Sub-Type:	Electricity Selling Tariff USD/kWh	NPV, 1 000 USD	IRR, %	BCR	RNPV
New construction	Medium	0.025	-181	2.3%	0.61	0.72
	Less exp.		-31	8.5%	0.79	0.94
	Least exp.		36	12.2%	0.89	1.08
New construction	Medium	0.030	-109	5.4%	0.70	0.83
	Less exp.		59	13.0%	0.91	1.11
	Least exp.		125	18.0%	1.01	1.27
New construction	Medium	0.035	-38	8.4%	0.79	0.94
	Less exp.		149	17.8%	1.01	1.27
	Least exp.		213	24.6%	1.11	1.47
New construction	Medium	0.040	33	11.4%	0.87	1.05
	Less exp.		239	23.2%	1.10	1.43
	Least exp.		299	32.0%	1.21	1.66

The financial criteria are met for:

- Less expensive new construction model project at a tariff 0.035 USD/kWh;
- Least expensive new construction model project at a tariff 0.030 USD/kWh.

Based on the result of the financial analysis, the report concludes that the pipeline “Rehabilitation of Existing and Construction of New Mini Hydropower Plants” is financially feasible, though for some projects the required tariff may still be high.

The marginal parameters (minimum values of equity and grant shares; minimum tariff) of the financial scheme, guaranteeing an IRR at a 15%-level, are presented in Table 24.

Table 24. Marginal Parameters of Financial Scheme, Guaranteeing IRR at a 15%-Level

Model Project	Share in Project Financing			Annual Interest on Loan	Payback Period, Years	Electricity Selling Tariff, USD/kWh
	Equity	Grant	DFES Loan			
Small-scale rehabilitation	20%	-	80%	6%	7	0.02335
Full rehabilitation (Expensive model project)	20%	10%	70%	6%	7	0.03051
New construction (Less expensive model project)	10%	25%	65%	6%	7	0.03330

11. SENSITIVITY ANALYSIS

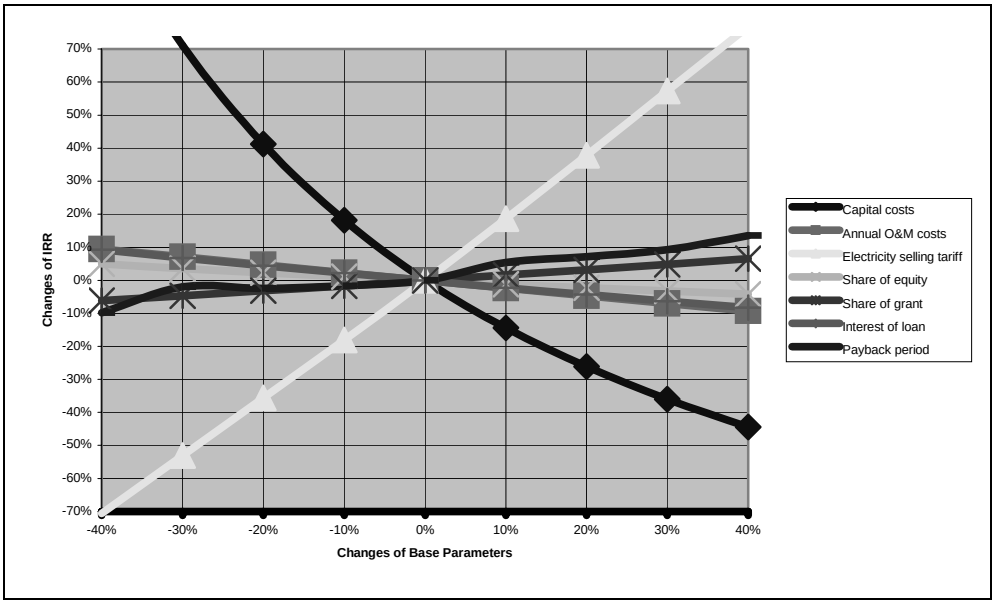
A sensitivity analysis has been carried out only for the model projects included in the financial scheme that guarantees an IRR at a 15% level. The values of the parameters presented in Table 24 were used as base parameters.

The sensitivity analysis was undertaken to evaluate the influence that the parameters affecting the cash flow have on IRR. In particular, these include: capital costs, annual O&M costs, the electricity selling tariff, the share of equity, the share of grant, the collection rate, the loan interest and the payback period.

In simulations, the deviations of parameters varied from -40% of the base parameters to 40% by increments of 10% for all parameters, except for the collection rate and the corresponding values of IRR and its change relative to the calculated base IRR (15%). For the collection rate, it was assumed that it can be lower than the base value only during the first five years, and after that it would reach 80%. In case of positive changes (increase of collections), the boundary condition was set – the collection rate cannot exceed 96%.

The results of the sensitivity analysis are presented in Figures 2-4.

Figure 2: IRR Sensitivity - Full Rehabilitation Model Project



The sensitivity analysis shows that IRR sharply responds to capital costs and tariff variations for all model projects. The share of the grant component in total investment also has a noticeable impact. As for other parameters, their impact is relatively minor.

These circumstances should be taken into account when elaborating the selection criteria for the appraisal of mini hydropower plant projects that apply for financing from DFES. In particular:

- Applicants should have preliminary agreements, or at least should have initiated negotiations, on establishing the required tariff;
- Applicants should have clearly defined consumers (power purchase agreements);
- Feasibility studies should be carried out presenting precise capital cost estimations;
- Necessity for, and the value of, the grant component should be proven by strong arguments; and
- DFES should be flexible in establishing loan conditions.

Figure 3. IRR Sensitivity - Small-Scale Rehabilitation Model Project

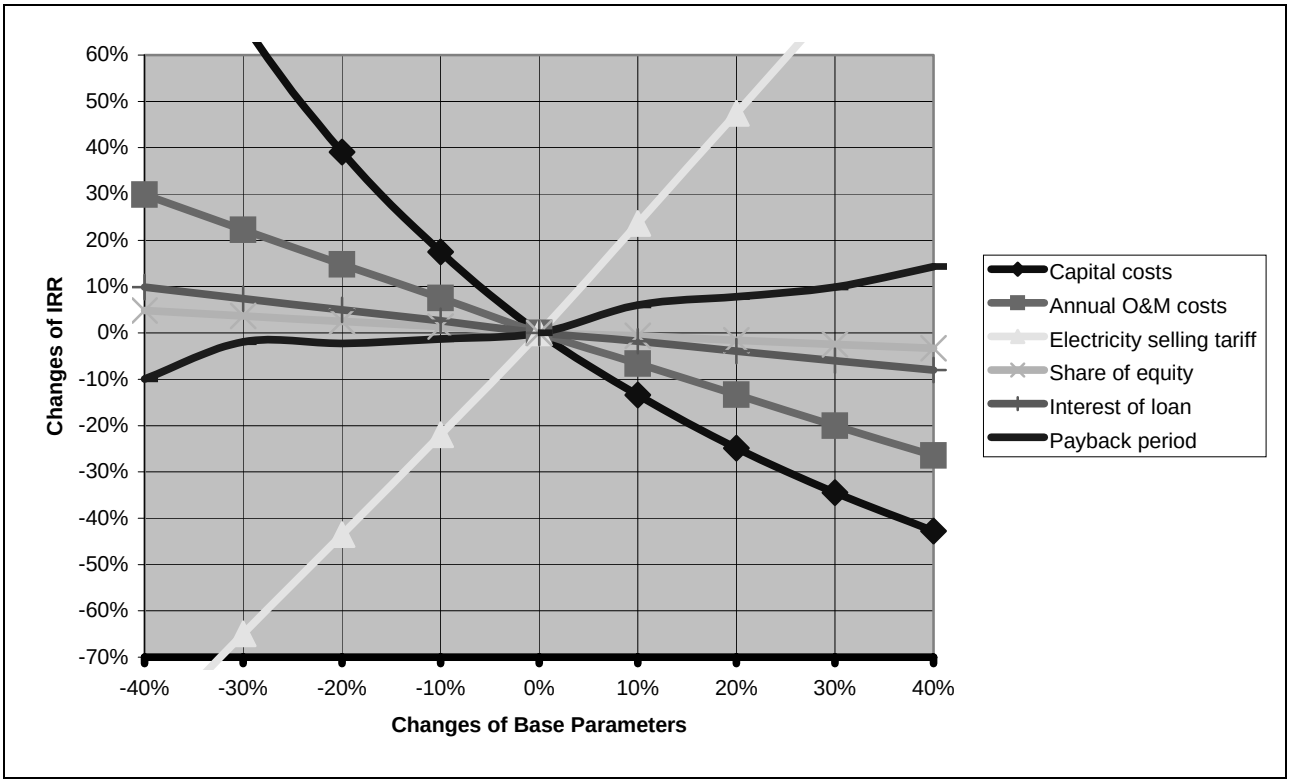
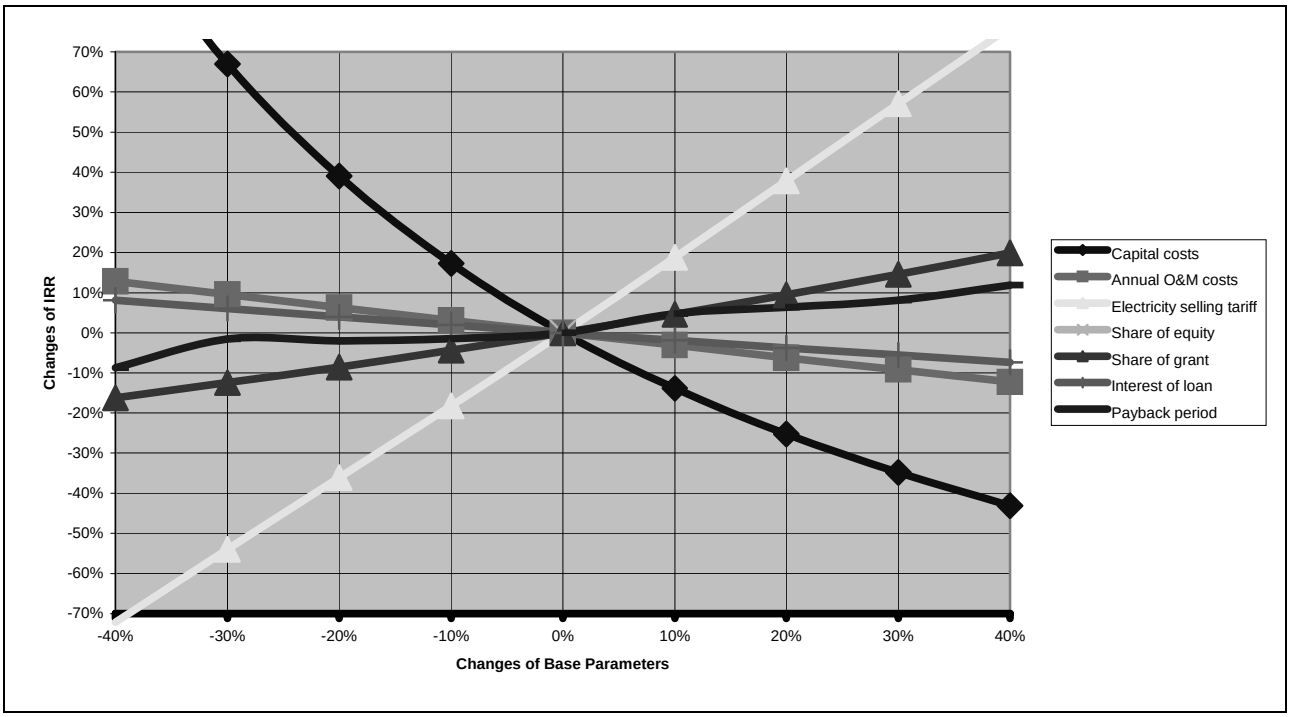


Figure 4. IRR Sensitivity - New Construction Model Project



12. CAPITAL NEEDS FOR THE ENTIRE PIPELINE

12.1. Capital Costs for Rehabilitation Projects

As Table 13 indicates, the rehabilitation of selected plants requires significant investments, which is not available in Georgia yet. Therefore, none of those plants has been rehabilitated. Their total capital cost equals USD 8.351 million. Another USD 2 - 3 million would be needed for full rehabilitation of mini HPP plants not covered in Table 13, and a further USD 1 - 1.5 million for small-scale rehabilitation of mini HPP. Thus, total capital needs for rehabilitation of mini HPPs in Georgia would amount to a maximum of about USD 11 - 12 million. However, we estimate that plants needing a total of **USD 7 million** for rehabilitation would meet the financial requirement to qualify as feasible DFES projects.

12.2. Capital Costs of New Construction Projects

As Table 15 indicates, the capital costs of new construction projects would total USD 35 million. However, we estimate that constructing new plants totalling only USD 8 million would meet the financial requirement to qualify as feasible DFES projects.

12.3. Total Capital Costs

Capital needs for the total project pipeline can be estimated as a maximum of USD 15 million, of which USD 7 million would be for rehabilitation (4-5 full rehabilitation, 8-10 small-scale rehabilitation) and USD 8 million for new construction (12-14 HPPs). This amount does not include technical assistance (preparation of pre-feasibility studies, consultancy, training, etc.) and monitoring and evaluation components of the DFES programme.

13. RISKS AND RISK MITIGATION MEASURES

In general, financial risks in Georgia are high leading to high interest rates, short payback periods and difficulties in getting access to financing. In addition, the financial status of the local renewable energy companies is weak and they have problems in meeting the strict guarantee and collateral requirements of possible financiers.

As the financial analysis shows, the financial viability of the projects (and the whole pipeline as well) is very sensitive with regards to tariffs, collection rates and capital costs.

13.1. Tariffs

As mentioned above, it is expected that at the beginning of March 2006 mini hydropower plants would be able to supply electricity on the basis of direct contracts and establish agreed tariffs without any approval by the GNERC. This would greatly reduce risks related to tariffs being set too low.

13.2. Payment Collections

In addition to low tariffs, the system suffers from low collection rates. The main reasons for this low collection rate include: low income levels of the population; absence of a proper metering system and technical inability to cut-off non-payers. **Direct contracts will reduce this risk**. However, rehabilitation of the metering system will lead to an increase of project costs.

If mini hydropower plants will not be able to work with isolated networks and will supply electricity to the GWEM, the collection rate will be lower. However, the Ministry of Energy, the UDC, and the GWEM have planned a set of measures aimed at improving payments, but there is still a long way to go before the system can be considered financially robust.

13.3. Risks Related to Operation and Maintenance

The lack of qualified staff to operate and maintain plants, especially those equipped with advanced technologies, will lead to an increase of O&M costs.

13.4. Managerial Capacity of HPP Owners

With regard to the managerial capacity of HPP owners, the following risks have been identified:

- Lack of experience of CBOs in mini hydropower;
- Low capacity of mini HPP owners to draw up proper contracts with energy buyers;
- Low capacity of mini HPP owners to carry out analytical work (market study, planning, calculation of cash flow profiles, etc.). Mini HPPs can operate within an isolated grid, but an investigation of their affordability (existing and future) is needed. It is important to know from the outset how mini HPPs could help generate additional income, which in turn would lead to an increase of affordability.

13.5. Water Supply

Most of the mini hydropower plants are situated on small rivers with flow curves that can vary significantly year by year. This risk can be mitigated by proper flow regulation, and thereby an increased turbine efficiency.

Some mini HPPs are dependent on water supply from irrigation canals. Conflicts related to water distribution for hydropower and agriculture purposes can occur. Introducing water contracts among users can mitigate this risk.

14. ESTIMATION OF GREENHOUSE GASES (GHG) ABATEMENT POTENTIAL

To calculate the net GHG reductions associated with DFES, emissions without the programme (the "baseline case") and with the project in place (the "alternative case") have to be estimated. The establishment of a baseline GHG emission scenario is estimated using the formula:

$$E = EF * EL,$$

where EF is the emission factor and EL produced electricity.

$$EF = \frac{EL_T + EL_H}{E_T},$$

where EL_T and EL_H - electricity produced by thermal and by hydro power plants respectively; E_T - GHG emissions due to thermal power generation.

The emission factors for 2001 were calculated using energy balance data. Results are presented in Table 25.

Table 25. Emission Factor in Electricity Generation in 2001

Total production in 2001, GWh	6 937
Share of fossil fuel based electricity in total	20%

Fuel Used for Electricity Production	Amount	Unit	Specific Heat, Tj per Unit	Energy, TJ	Emission Factor, tC/TJ	Emission Factor, tCO_2/TJ	CO_2 Emissions kt	Average EF, t CO_2/GWh
Gasoline	1	kt	44.80	45	18.9	69.3	3	
Diesel oil	20	kt	43.33	867	20.2	74.1	64	
Natural gas	441	Mm^3	35.45	15640	15.3	56.1	877	
						Total	**945**	**136.181**

Source: UNDP/GEF (2002).

The emission factor for the whole lifetime of the project was calculated on the assumption that the share of hydropower plants in total production would equal 55% (share before the crisis), instead of its current 80%. This means that the country would be able to buy the needed amount of fossil fuel for power generation and thereby increase electricity produced by thermal power plants. In this case, the average emission factor would be equal to 198 t CO_2/GWh. The corresponding GHG emission reductions are presented in Table 26.

Table 26. GHG Emission Reductions Potential

Model Project	Additional Annual Generation, GWh	Annual GHG Reduction, t	GHG Reduction in 25 Years
Full rehabilitation	7.630	1 511	37 784
Small-scale rehabilitation	3.248	643	16 084
New construction	3.644	722	18 045
Total Project Pipeline (4 full rehabilitation, 10 small-scale rehabilitation, 12 new construction)	**106.727**	**21 141**	**528 515**

Source: Own estimates.

15. SUSTAINABILITY ASSESSMENT

The International Hydropower Association (IHA) has published Sustainability Guidelines to promote a greater consideration of environmental, social and economic sustainability aspects in the assessment of new hydro projects and the management and operation of existing hydropower schemes. The IHA developed three sustainability rating assessments:

A. **Options Assessment** – compares the sustainability of alternative energy supply options at the early stages of considering requirements for the development of a new energy supply;
B. **Evaluation of Hydropower Projects** – compares the sustainability of alternative hydropower projects at the design stage of a development proposal; and
C. **Appraisal of Hydropower Operation and Management** – assesses the sustainability of existing hydropower schemes.

The first two rating assessments are used to establish supply options that best meet the sustainability criteria. The third is to be used as an industry self-evaluation tool to identify opportunities for improvements in performance. Each sustainability rating addresses twenty economic, social and environmental aspects of sustainability. These are the following:

- Aspects A1 to A10 relate to economic aspects of sustainability; A11 to A15, social aspects of sustainability; and A16 to A20, environmental aspects of sustainability.
- Aspects B1 to B3 relate to economic aspects of sustainability; B4 to B9, social aspects of sustainability; and B10 to B20, environmental aspects of sustainability. Guidance on scoring is provided for each aspect.
- Aspects C1 to C5 relate to economic aspects of sustainability; C6 to C13, social aspects of sustainability; and C14 to C20, environmental aspects of sustainability. Guidance on scoring is provided for each aspect.

The sustainability scoring is based on the following:

- 5 when the option meets all relevant sustainability criteria;
- 3 when most of the sustainability criteria are met;
- 1 when only some of the sustainability criteria are met; and
- 0 when none of the sustainability criteria are met.

The scoring was performed according to the Sustainability Guidelines.[40] Results of the scoring are presented in Table 27.

Table 27. Sustainability Scoring of Rehabilitation and Construction of New Mini Hydropower Plants

Options Assessment					
No	**Aspect**	**Score**	**No**	**Aspect**	**Score**
A1	Demonstrated need for the project	**3**	A11	Community acceptance	**5**
A2	Supply-side and demand-side efficiencies	**3**	A12	Multiple use benefits	**3**
A3	Economic viability and planned monitoring for ongoing performance	**3**	A13	Opportunities and threats to vulnerable social groups	**5**
A4	Distribution and sustainability of economic benefits	**5**	A14	Cultural heritage	**5**
A5	Longevity of benefits	**1**	A15	Safety issues and hazards	**5**
A6	Range and flexibility of electricity supply services	**3**	A16	Environmental impact assessment	**5**
A7	Reliability of primary energy supply	**3**	A17	Level of environmental impact	**5**
A8	Energy efficiency of option	**3**	A18	Environmental footprint	**5**
A9	Energy payback ratio	**3**	A19	Waste products	**5**
A10	Long-term resource depletion	**3**	A20	Carbon intensity	**5**

	Total	**Average**	**Percentage**
Score	**78**	**3.9**	**78%**

Evaluation of Hydropower Projects					
No	**Aspect**	**Score**	**No**	**Aspect**	**Score**
B1	Demonstrated need for the project	**3**	B11	Previously developed river basins	**1**
B2	Economic viability and planned monitoring for ongoing performance	**3**	B12	Area flooded per unit of energy produced	**3**
B3	Distribution and sustainability of	**5**	B13	Avoiding exceptional natural and	**5**

[40] These are available upon request. Contact Dr. Janelidze at Janelidze@caucasus.net

	economic benefits			human heritage sites	
B4	Community acceptance	**5**	B14	Rare, vulnerable, or threatened species; high-quality habitats and habitat restoration	**5**
B5	Multiple use benefits	**3**	B15	Community-support (or lack of opposition) for planned reservoir level management and environmental flow regime	**5**
B6	Opportunities and threats to vulnerable social groups	**5**	B16	Reservoir and downstream sedimentation and erosion risks	**3**
B7	Population displacement	**5**	B17	Passage of fish species	**5**
B8	Enhancement of public health and minimisation of public health risks	**5**	B18	Water quality	**5**
B9	Dam safety	**5**	B19	Planning to manage construction impacts	**3**
B10	Environmental impact assessment	**5**	B20	Planned environmental management system	**3**

	Total	**Average**	**Percentage**
Score	**82**	**4.1**	**81%**

Appraisal of Hydropower Operation and Management

No	**Aspect**	**Score**	**No**	**Aspect**	**Score**
C1	Economic viability and monitoring for economic performance	**3**	C11	Employee opportunity and equity	**3**
C2	Distribution and sustainability of economic benefits	**5**	C12	Effectiveness of resettlement and/or compensation programme	**5**
C3	Range of services and flexibility of electricity supply services	**3**	C13	Cultural heritage and vulnerable social groups	**5**
C4	Reliability of primary energy supply	**3**	C14	Environmental impact assessment and environment management plans	**3**
C5	Energy efficiency of operations	**3**	C15	Environmental management system	**3**
C6	Community acceptance	**5**	C16	Environmental compliance	**3**
C7	Multiple use benefits	**3**	C17	Community-support (or lack of opposition) reservoir level management and environmental flow regime	**5**
C8	Enhancement of public health and minimisation of public health risks	**5**	C18	Reservoir and downstream sedimentation and erosion risks	**3**
C9	Dam, power station and associated infrastructure safety	**5**	C19	Passage of fish species	**5**
C10	Employee safety programme	**3**	C20	Water quality	**5**

	Total	**Average**	**Percentage**
Score	**78**	**3.9**	**78%**

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