

United Nations Development Programme

Country: Georgia

PROJECT DOCUMENT

Project Title: Promotion of Biomass Production and Utilization in Georgia

UNDAF Outcome(s): #4 - Underlying disaster risk factors are reduced, focusing on sustainable environmental and natural resource management

Expected CP Outcome(s): #3.2 - Underlying disaster risk factors are reduced, focusing on sustainable environmental and natural resource management

Expected Output (s): #3.2.1 - Sustainable practices and instruments for the management of chemicals and natural resources, including land, water and biological resources demonstrated at pilot areas and up-scaled at national and/or trans-boundary levels; **#3.2.3** - Environmental concerns and climate change risk considerations incorporated in national policies, strategies and programmes

Implementing Partner: Ministry of Environment and Natural Resources Protection of Georgia

Responsible Partners: Ministry of Environment and Natural Resources Protection of Georgia

Brief Description

The overall objective of the project is to promote sustainable production and utilization of upgraded biomass fuels to meet the municipal services sector's heating needs in a sustainable and efficient way, thereby reducing dependence on fossil fuels and avoiding GHG emissions. To achieve the objective, a comprehensive strategy is proposed, including promotion of demand for and supply of upgraded biomass fuels, establishment of both a biomass financing mechanism and an investment grant mechanism to deliver pilot biomass projects and ensure sustainability of the project's approach.

Programme Period:	<u>2011-2015</u>
Atlas Award ID:	<u>00061612</u>
Project ID:	<u>00078116</u>
PIMS #	<u>4335</u>
Start date:	<u>2013</u>
End Date	<u>2016</u>
Management Arrangements	NIM
PAC Meeting Date	28 May 2013

Total resources required	<u>US\$ 5,380,000</u>
Total allocated resources:	<u>US\$ 5,380,000</u>
• Regular	<u>US\$ 155,000</u>
• Other:	
○ GEF	<u>US\$ 925,000</u>
○ Government	<u>US\$ 3,000,000</u>
○ Private sector	<u>US\$ 1,000,000</u>
In-kind contributions	<u>US\$ 300,000</u>

Agreed by (Government):

Khatuna Gogaladze, Minister of Environment and Natural Resources Protection of Georgia

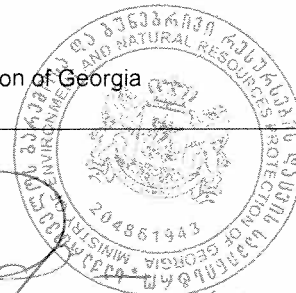
10-06-2013

Date/Month/Year

Agreed by (UNDP):

Jamie McGoldrick, Resident Representative

Date/Month/Year



05/06/2013

Table of Contents

1. Situation Analysis.....	4
1.1. Context and global significance.....	4
1.2. Current energy sector policy.....	9
1.3. Stakeholder Analysis.....	11
1.4. Barrier analysis.....	14
1.5. Project baseline.....	16
1.6. Other related past and ongoing activities.....	17
2. Project Strategy.....	18
2.1. Project Objective, Outcomes, Outputs and Activities.....	18
2.2. Project risks.....	28
2.3. Expected global, national and local benefits.....	29
2.4. Project rationale and GEF policy conformity.....	29
2.5. Country ownership: country eligibility and country drivenness.....	30
2.6. Financial modality and cost-effectiveness.....	30
2.7. Sustainability (including financial sustainability).....	31
2.8. Replicability.....	31
3. Project Results Framework.....	32
4. Total Budget and Workplan.....	34
5. Management Arrangements.....	37
6. Monitoring and Evaluation.....	38
7. Legal Context.....	42
8. Annexes.....	43
Annex 8.1. Offline Risk Log.....	44
Annex 8.2. Agreements.....	46
Annex 8.3. Summary of findings of the PPG pre-feasibility study.....	47
Annex 8.4. Description of pilot investments to be supported by the project.....	48
Annex 8.5. Terms of Reference.....	51
Annex 8.6. Georgian forestry statistics.....	54
Annex 8.7. Development status of key biomass conversion technologies.....	56
Annex 8.8. Greenhouse gas emission reduction analysis.....	57
Annex 8.9. Investment Grant Mechanism.....	60

List of Acronyms

CHP	Combined heat and power plant
CH ₄	methane
CIS	Commonwealth of Independent States
CO	UNDP Country Office
CO ₂	Carbon dioxide
EE	Energy Efficiency
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
HOB	Heat Only Boiler
IDP	internally displaced people
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
M&E	Monitoring and Evaluation
MoEPNR	Ministry of Environment and Natural Resources Protection of Georgia
MoE	Ministry of Energy of Georgia
NGO	Non-Governmental Organization
QPR	Quarterly Progress Report
PIR	Project Implementation Review
PMU	Project Management Unit
PPG	Project Preparation Grant
RCU	UNDP Regional Coordination Unit
RTA	UNDP Regional Technical Adviser
SEAP	Sustainable Energy Action Plan
toe	ton of oil equivalent
TPR	Tripartite Review
TTR	Terminal Tripartite Review
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	Office of United Nations High Commissioner for Refugees

1. SITUATION ANALYSIS

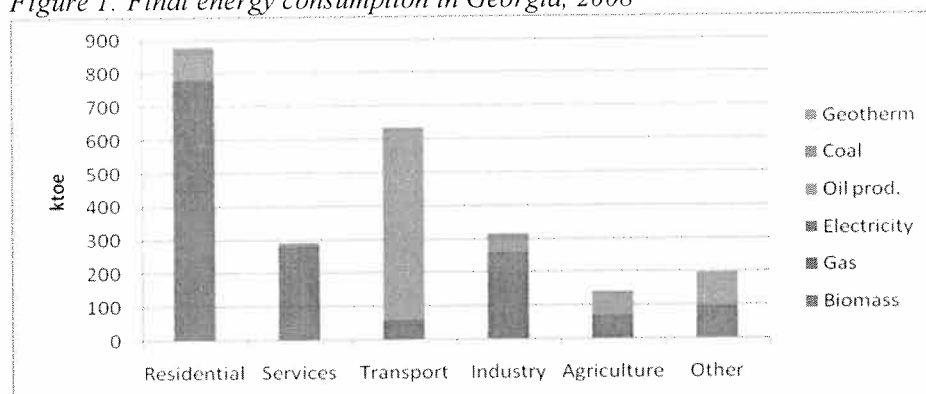
1.1. Context and global significance

Georgia is a lower middle-income country with gross national income per capita of around US\$ 2,500 and a population of 4.2 million people, with 47% living in rural areas and almost 30% in the capital city of Tbilisi. Georgia is located in the Caucasus region, bordering the Black Sea, Turkey, Armenia, Azerbaijan and Russia, and covers a territory of 69,700 km².

Despite availability of significant – and largely untapped – domestic energy resources, particularly hydropower, Georgia is still highly dependent on imports for its energy supply: imported natural gas and oil currently account for around 65% of total primary energy supply, which stands at 3 million tons of oil equivalent (Mtoe)¹. Such a high level of dependence on energy imports highlights the country's economic and political vulnerability and is a major factor in energy security. At the same time, the two major indigenous sources of energy – hydropower and biomass – account for 21% and 13% of the national energy supply, respectively.

The pattern of final energy consumption in Georgia highlights the residential sector as having the largest share, at 36%, followed by transport at 26%, industry at 13% and services at 12% (see Figure 1). Thermal energy consumption in the services sector is dominated by natural gas (at over 40%), while biomass use (at almost 50%) dominates the residential sector. At the same time, both sectors account for almost the entire consumption of biomass in the country equal to 378 ktoe.

Figure 1: Final energy consumption in Georgia, 2008



Source: IEA World Energy Statistics, 2010

With the Government of Georgia consistently promoting domestic hydropower generation (refer to Section 1.2 “Energy Policy” below) and substantial hydropower potential still left untapped², electricity self-sufficiency appears to be within reach: in 2007 for the first time in recent years, Georgia became a net exporter of electric power, despite existing seasonal variations in hydropower output (which accounts for 85% of total electricity generation) and the need for balancing it out using both natural gas-based generation (15% of total electricity production) and electricity imports from Russian and Azerbaijan. Improved electricity export opportunities to neighboring countries, soon to be provided by the 500 kV Black Sea Transmission Line that is being co-financed by KfW, EIB and EBRD, are going to be a crucial factor in facilitating further expansion of hydropower generation in Georgia. Considering the substantial

¹ IEA World Energy Statistics, 2010

² 2010 Survey of World Energy Resources, WEC, estimates *economic* hydropower potential of Georgia at 41 TWh/year, i.e. about six times the current generation of 7.1 TWh/year

governmental commitment and support already leveraged by the international community, the proposed UNDP-GEF project will *not* target power sector.

By contrast, *thermal energy* use is characterized by a relatively high degree of inefficiency stemming from application of obsolete combustion technologies, and a significant gap between supply and demand, including in the services sector. For example, a typical pre-school facility in Tbilisi consumes around 60 kWh/m² of energy for heating³, which is quite low considering the average thermal resistance of buildings in Georgia ($R=0.7 \text{ m}^2\text{K/W}$)⁴, which is half of the average R value for buildings in European countries with similar degree-days, and is indicative of significant level of thermal losses and unmet heating demand. Tbilisi Municipality reports that only 60% of the total floor area is currently heated in a typical municipality-managed pre-school facility⁵. At the same time, there exists a potential for a much more rational and more efficient use of the available biomass resources in Georgia, one that could contribute to enhancing country's energy security by substituting fossil fuels and meeting the constrained heating demand. Thus, the proposed project focuses on *thermal energy production and use* primarily in the *services sector*, by facilitating sustainable production and utilization of upgraded biomass fuels.

Space heating is required in most parts of Georgia throughout the year (up to five months in Nov-Apr). In the services sector, some 46% of heating needs are covered by natural gas, 31% by biomass and around 13% by electricity. Since natural gas based electricity production occurs only during the cold season of the year, when heating loads are at their peak, electricity used for heating can be attributed to natural gas, rather than hydropower, as the marginal generation technology. Hence, substitution of electricity in the heating mix with a renewable source like biomass would lead to a respective reduction in greenhouse gas (GHG) emissions.

Despite being a relatively clean fuel to burn, natural gas use, particularly in Tbilisi, is associated with above-normal emissions of carbon dioxide (CO₂) and methane (CH₄) due to the degradation of the gas grid and the low pressure that it was designed to operate at, satisfying the needs of cooking and occasional water heating. As a result, gas pressure fluctuations are rather common, leading to incomplete combustion and a corresponding drop in efficiency of even the most sophisticated appliances. Further, higher grid pressure resulting from increased user demand leads to even greater gas losses through leaks.

The national GHG data appear to confirm the above conclusion. The overall GHG emissions of Georgia stood at 12.2 million tons of CO_{2eq} in 2006⁶. In line with international trends, the bulk of GHGs (almost 50%, or 5.9 million tons CO_{2eq}) came from the energy sector, where fossil fuel combustion-related CO₂ emissions have the dominant share (80%). Importantly, however, methane accounted for a significant 35% (or 4.1 million tons of CO_{2eq}) of the total national GHG emissions—considerably higher than the CIS average of 20% or OECD average of 8%. A quarter of the above methane emissions is attributable to the energy sector fugitive losses in the natural gas distribution system, pointing to an important double GHG mitigating benefit that renewable energy like biomass could play in the national energy mix: through avoidance of CH₄ fugitives during transportation, and of CO₂ emissions during combustion of natural gas.

As in most other developing countries, biomass in Georgia is used primarily in the form of firewood for heating in the services sector and cooking in the residential sector. However, this biomass is generally burned in low-efficiency ovens and stoves, without additional processing (for instance, densification via briquetting), wasting a significant amount of energy while putting additional pressures on the national

³ Data provided by the Tbilisi Municipality

⁴ "Energy Efficient Potential in Georgia and Policy Options for Its Utilization, USAID 2008"

⁵ "Tbilisi City Hall Energy Efficiency Concept Paper", 2008

⁶ UNFCCC data

forest resources, which exacerbates deforestation and land degradation processes and contributes to GHG emissions.

The bulk of the currently used biomass in Georgia is sourced from forests, which cover some 3 million hectares or 40% of the country's territory; the total forest stock is estimated at 451.7 million m³. The majority of Georgian forests (97%) are situated on mountain slopes with varying steepness, which limits opportunities for cost-effective industrial timber harvesting. The estimated annual increment of timber amounts to 4.6-4.8 million m³. The 2008 authorized cutting was 838,000 m³, which included 105,000 m³ of industrial timber harvested from 160,000 ha under licensed commercial concessions and 733,000 m³ of firewood for the needs of the local population. In addition, there were over 20,000 m³ of timber harvested illegally the same year, according to the Ministry of Environment and Natural Resources Protection (MEPNR)⁷. Unofficial estimates, however, suggest that illegal forest cuttings may actually be far larger: since firewood provides the majority of the 378 ktoe of primary energy supply from biomass in Georgia, then – assuming a mean energy content of 16 GJ/ton and an average density of 0.7 ton/m³ – the total amount of firewood used is close to 1.5 million m³, implying about two thirds of the total firewood is supplied illegally. Still, with the current demand for firewood in Georgia estimated by MEPNR at around 2.5 million m³, there is a substantial supply-demand gap in firewood of 0.5 million m³.

Under the business-as-usual scenario, the existing thermal energy supply gap is unlikely to be filled in the foreseeable future in a sustainable way with the resources and technologies available in Georgia. Natural gas share in the heating balance could be expected to grow, particularly in large cities like Tbilisi, facilitated by the government's drive for further expansion of the natural gas grid, though this trend is going to face significant resistance from the growing natural gas prices. In 2006-2010, the natural gas price for municipal consumers has almost doubled (from US\$ 240 per 1,000 m³ to US\$ 450). Abundant hydropower resources could provide an alternative heating source, however hydroelectricity generation is at its lowest during the cold period of the year when heating needs are at their highest.

On the other hand, the heating supply gap could feasibly be filled (at least partially) by currently un- or underutilized biomass resources, e.g. forestry and wood processing residues, and agricultural waste. In the forestry sector, substantial amount of wood residues (estimated at 120,000 m³ as of 2008⁸) are left in the logging sites and remain largely unutilized due to technological or economic constraints associated with their extraction from the forest. Assuming 0.7 ton/m³ density, this implies about 80,000 tons of wood waste available annually. On top of that, Georgia Timber International, an Italian company operating through its wholly owned Georgian subsidiary D&V, has a 6,000 ha concession (7 years left) of chestnut forest in Zestafoni region (located some 150 km away from Tbilisi) and implements sanitary cuttings, yielding an estimated 200,000 tons of waste biomass over the remaining time period, i.e., 20,000-30,000 ton of waste available annually for the period 2011-2018. Further, almost none of the 540 wood processing entities existing in Georgia use the sawdust and other wood processing waste generated in the process. This sawdust (estimated at some 15,000 tons per year for the entire country) is usually disposed of in the surrounding area or into the closest river. Of this amount, at least 1,500 tons of sawdust is estimated to be available within 10 km distance from the city of Tbilisi.

The 8,000 ha of forested area adjacent to the City of Tbilisi, that is now under the management of the Tbilisi Municipality, along with the urban forestry tree stock, are estimated to provide biomass waste material in excess of 9,000 tons per year⁹. Unfortunately, the city does not have an up-to date urban

⁷ Refer to Annex 6 for further details on the Georgian forestry sector

⁸ FAOStat. 2008

⁹ PPG study "Barriers to biomass use in Georgia" based on a reference case of the city of Stuttgart, Germany, about half the size of Tbilisi.

forestry plan, or inventory of the trees within the city, which prevents from a more accurate assessment of the amount of wood waste generated. Currently, the majority of urban forestry waste gets landfilled¹⁰.

Agricultural biomass residues are also abundantly available across Georgia, but are not used efficiently for energy purposes. In particular, hazelnut cultivation, which has been a traditional activity especially in western part of the country, yields substantial amounts of waste in the form of shells and tree prunings. Over the past decade this business has been scaled up and commercialized; Georgia currently produces around 20,000 tons of hazelnut kernels annually, with 50% of the harvest originating in Samegrelo region. At 40/60 kernel-to-waste ratio, there is an estimated 30,000 tons of hazelnut waste available annually in Georgia. However, as much as half of this biomass fuel (shells, husks) is used by hazelnut processing plants for their own heat requirements; the remainder is sold to the local population or exported. At the same time, Georgian production of hazelnuts is set to grow in the next 4-5 years by an estimated 2,000 tons annually (i.e. 3,000 tons of shells): since 2007, Ferrero Spa.'s wholly-owned Georgian subsidiary, AgriGeorgia Ltd., has been developing 3,000 ha of hazelnut plantations in Zugdidi district of Samegrelo region, ultimately aiming to become a major supplier of hazelnuts in Georgia. An additional 1,500 tons of hazelnut tree prunings may become available annually from these plantations in the coming years.

In summary, based on the preliminary estimates completed during the PPG stage, the annual supply of the currently unused (or soon-to-be-available) biomass waste in Georgia could include 80,000 tons of forestry waste, 25,000 tons of chestnut sanitary cutting waste in Zestafoni, 9,000 tons of Tbilisi urban forestry waste, 15,000 tons of sawdust, 3,000 tons of newly available hazelnut shells, 1,500 tons of hazelnut prunings, totaling about 133,000 tons of biomass waste. This theoretical maximum figure would correspond to a supply of about 2.1 PJ of energy, or about 80% of the current annual natural gas consumption in the services sector, which, if entirely substituted with biomass, would yield up to a maximum of 117,000 tCO₂eq per year in avoided GHG emissions¹¹.

The biomass resources described above could quite efficiently be converted into useful heating energy using advanced technologies which have been tested and improved through years of development in industrialized countries around the world. With bioenergy projects two aspects are essential for tapping the existing potential: security of supply (or production) of the biomass on the one hand, and efficient biomass conversion and bioenergy use on the other. The Georgian biomass feedstocks identified above (wood waste, hazelnut shells) lend themselves to be supplied sustainably and cost effectively within the existing regulatory requirements for timber harvesting and the current timber and hazelnut market operations in Georgia, provided the most advanced harvesting and transportation technologies available on the leading biomass markets (like Austria or Finland) are effectively transferred to Georgia. The bioenergy demonstration to be supported by the proposed project in the city of Tbilisi will need to carefully develop the details of the entire logistics chain from feedstock supply to the densification plant to eventual biomass fuel supply to the end-user (municipality of Tbilisi); selection of the appropriate end-user facilities that could be efficiently converted to biomass heating and picking the right biomass combustion technology that would meet the local requirements.

Different conversion technologies have been developed around the world that are adapted to the different physical natures and chemical compositions of biomass feedstocks, as well as to the energy service required (heat, electricity, transport fuel). Out of the multitude of bioenergy routes which can be used to convert raw biomass feedstock into a final energy product, biomass *upgrading* through densification (i.e. pelletization or briquetting) or pre-treatment (i.e. chipping) followed by efficient *combustion* appear to be

¹⁰ Draft "Sustainable Energy Action Plan of the City of Tbilisi 2011-2020" estimates the share of wood in the total volume of municipal solid waste at 4%, equal to 13,000 tons, which roughly matches the PPG study estimate referred above.

¹¹ Refer to Annex 8 for estimation of GHG emission reductions from the proposed UNDP-GEF project

the only *fully commercial* technologies for *biomass-to-heat* applications¹² available on the world market today.

Compared with fossil fuels, biomass has a lower energy density and larger variability in its physical characteristics, which makes its handling, transport and storage more complex and more expensive per unit of energy carried. Also, the chemical composition and moisture content of biomass feedstocks may vary considerably, which may require pre-treatment in order to meet the requirements for quality and homogeneity of many conversion technologies. For these reasons, biomass upgrading techniques are used to convert raw biomass into easier to handle, denser and more homogeneous fuels, in order to reduce supply chain cost and increase the efficiency and reliability of downstream processes. Increasing the energy density of biomass may be particularly attractive in cases where bioenergy production is spatially disconnected from the point of energy use, and transportation costs make raw biomass deliveries prohibitively expensive. This is likely to be the case of Georgia, and of the proposed pilot in Tbilisi, where numerous relatively small-scale bioenergy sources (like sawmills) are dispersed throughout the country.

The upgrading technologies used to increase the energy density of biomass which are going to be promoted by the present project are: pelletization, briquetting and chipping. Wood *pellets* are small wood-based cylinders 6-12 mm in diameter and 10-30 mm in length. They are produced primarily from sawdust and wood shavings, sometimes mixed with high quality wood-like materials such as nutshells, which are compressed under high pressure using no glue or other artificial additives. Pellets are a highly standardized and energy-dense fuel with bulk density of 600-700 kg/m³, moisture content below 10% and a calorific value over 17 MJ/kg. Pellets thus have great advantages over other woody feedstocks of being a homogeneous, dense, and easy to handle solid fuel, which explains its increasing popularity both at household (in automatic pellet boilers) and industrial (large power plants) scale.

Biomass *briquettes* are a type of densified solid biofuel in the shape of cubiform or cylindrical units that are fabricated in a similar way as pellets and have a typical length of 30-100mm. Briquettes have bulk density of 550-650 kg/m³ as well as high caloric value (over 16 MJ/kg). Briquette can be prepared from pure wood or a mixture of wood, grape seeds and skins as well as olive seeds and other wood like materials. Unlike pellets, which can be used for automatically-charged stoves and boilers, briquettes require manual charging. Most importantly for the Georgian context, briquettes are suitable for use in any type of burner that can burn firewood, which makes them a good substitute for conventional firewood in areas with scarce forestry resources.

Wood chips are thin pieces of wood with a defined particle size (typically 5-50 mm) which are produced by mechanical treatment with sharp tools such as knives. Compared with pellets and briquettes, woodchips have a lower bulk density (250-350 kg/m³) and calorific value (14 MJ/kg) and higher moisture content (20-30%). Wood chips also require more storage capacity (the volume is about four-times that of wood pellets) and somewhat more operations and maintenance efforts, while being generally cheaper than pellets. Wood chips are primarily used in larger buildings where space requirements are not a limiting factor, or in utility-scale power plants.

The production of heat by the direct *combustion* of biomass is the leading bioenergy application throughout the world, and is often cost-competitive with fossil fuel alternatives. Depending on the socio-economic context and environmental legislation in place, domestic biomass combustion technologies range from very inefficient devices such as open fire places or traditional cooking stoves found primarily in developing countries (efficiency 10-30%), through to very efficient and increasingly popular modern

¹² Bioenergy – a Sustainable and Reliable Energy Source, IEA Bioenergy, 2009. Also refer to Annex 5 for details on commercial status of different biomass-to-energy technologies.

chip-burners, heat storing stoves and pellet-boilers with efficiencies of up to 90%. Because combustion is a straightforward and well understood process, there is a wide range of existing *commercial technologies* tailored to the characteristics of the biomass and the scale of the application, which ensure very highly efficient conversion of biomass into useful heating energy service and meet the most stringent emission (particulate matter) requirements. The problem of “clean” biomass combustion is essentially the one of feedstock and end-product quality, as well as thorough design of the combustion process. With due regard for both, international experience shows¹³, emissions from biomass use can be brought to the safe regulated level.

Of particular interest for the proposed project will be dual-fuel boiler systems which enable secure switch to upgraded biomass fuels as a primary source of energy while keeping the existing fossil fuel (natural gas) infrastructure as a peak-load or back-up arrangement. Such an arrangement will be further analyzed and implemented for heating of municipal buildings in Tbilisi which currently use natural gas (and some diesel oil and kerosene) as a primary source of heating energy. The 196 municipal buildings with a total floor area of about 350,000 m² managed by Tbilisi Municipality (kindergartens, schools, sport and health facilities) will be analyzed in terms of the current energy use patterns, to select at least 10 buildings for demonstration of efficient options for conversion to biomass heating.

As a signatory of the Covenant of Mayors, Tbilisi municipality has committed to reducing its carbon footprint by 20% by 2020, hence switch to renewable fuel like biomass could provide – along with other measures e.g. energy efficiency related – a way for the city to meet its 2020 objective, thereby creating a better environment for its residents and showcasing an example to be followed by others. The biomass upgrading plant, to be set up in Tbilisi, will primarily use the locally available feedstock from the municipal forest and urban forestry waste and wood processing residues, but – depending on the eventual heating demand – further options will be carefully investigated for supplying Tbilisi municipality with additional quantities of upgraded biomass fuels based on, e.g. chestnut sanitary cutting waste from Zestafoni and/or hazelnut shells and tree prunings from Samegrelo.

1.2. Current energy sector policy

The basis for long-term energy policy development in Georgia is set by the “**Main Directions of State Policy in the Energy Sector of Georgia**” adopted by the Georgian Parliament in 2006, which defines four main pillars for the sector development: fully meeting domestic energy demand; diversification of the sources of energy supply; achieving independence and sustainability of the power sector; and ensuring energy security. As the cornerstone of the national energy policy, the Government of Georgia (GoG) has prioritized effective utilization of *domestic hydropower resources* toward improving energy safety through:

- Rehabilitation of technologically outdated and obsolete plants;
- Construction of new power plants, transmission infrastructure for electricity and natural gas;
- Diversification of imported energy carriers (natural gas, oil, electricity);
- Establishment of a commercially viable model in the energy sector.

Importantly, the above policy document stresses that the development of RES should take place in a competitive environment, wherein the “traditional and alternative sources of energy shall be treated equally”. Such an approach poses considerable barrier toward robust development of the RES sector in Georgia, as policy support for RES (e.g. in the form of feed-in tariffs, tax exemptions, preferential grid access, public procurement, etc.) has been absolutely indispensable throughout the different stages of RES development in the EU and other developed countries.

¹³ “Emission Controls for Small Wood Fired Boilers”, Biomass Energy Resource Center, 2010

Another significant highlight of the current energy policy is the utmost priority given by the government to hydropower in achieving the country's electricity self-sufficiency, and lack of comparable commitment in promoting other RES, including biomass (probably with the exception of wind). Indeed, the Ministry of Energy does not consider the domestic biomass resources to have sufficient scale and energy density to sustain utility-scale grid-connected generation. Therefore, biomass-to-power applications are not prioritized by the current energy policy in the near- to medium-term. As indicated above, the majority of the Government's focus is on promoting hydropower and in this regard a new 500kV high voltage electricity transmission line to Turkey is currently under construction.

The **Law on Electricity and Natural Gas**, as amended in 2006, provides a general framework of reference for generation, trade, transportation and distribution of electricity and natural gas in Georgia. The Law sets the following key objectives:

- Based on the development of competition and through the regulation of the existing non-competitive market, provide establishment of the Electricity and Natural Gas Markets and tariff systems, which shall accurately reflect economically justified electricity generation, transmission, dispatch, distribution, export, import and consumption costs, as well as costs associated with Natural Gas transportation, distribution, import, export, supply and consumption;
- Provide the legal basis for reliable electricity and natural gas supply for all categories of consumers;
- Encourage domestic and foreign investment participation in rehabilitation and development of electricity and natural gas sectors;
- Encourage the preferential use of indigenous hydro, renewable, alternative and gas resources.

The Law clearly describes the roles and functions of the two main state institutions responsible for the development and operation of the electricity and gas markets: the Ministry of Energy (MoE) and the National Energy Regulatory Commission (NERC). The Law is operationalized through the respective set of regulations for the electricity and the gas markets.

The **Forest Code**, as amended in 2009 and the 2005 **Regulation on Licensing of Forest Use** set the legal basis for protection, restoration, and use of the national forest resources based on the principles of protection, sustainable development and management. Under the new Forest Code, the Forest Department delegates all commercial activities, management and control of forests to private entities. All general and special logging licenses are issued through auctions, which exclude the possibility of concluding corrupt deals. The auctions are conducted in full transparency and concede the right of forest usage to the highest bidders for the period of 20-50 years. At the same time, the entity responsible for the physical management of woods, will receive the corresponding license to carry out all relevant forest works or transfer such rights to third parties within the limits of predetermined forest management plan and/or the preset quotas for obtaining various forest resources.

The **Regional Development Strategy of Georgia 2010-2017** aims to create a favorable environment for the socio-economic development of the regions and improve living standards and conditions of the population. This objective is to be attained through a balanced socio-economic development of the regions, increased competitiveness and minimized socio-economic imbalances amongst the regions. The Strategy puts one of the priorities on development of REs through promotion of wind energy, supply of thermal energy to regions with a lack of heating resources, promotion of biomass and biogas sectors primarily in regional where it is economically profitable and provision of governmental support (through regional administration and local governments) to private sector participation in the developing of the heating sector. The regional strategy implementation is effected through an annually revised Action Plan which includes dedicated budgetary funding toward the prioritized actions. Though biomass promotion is

not explicitly included in the current Action Plan, necessary revisions could be made in the subsequent years to earmark government financing in support of biomass development in the country.

1.3. Stakeholder Analysis

Key groups of stakeholders identified and consulted during project preparation include:

- **Government stakeholders:**

- The *Ministry of Energy* elaborates and coordinates the state energy policy; elaborates and coordinates implementation of electricity and natural gas programs; promotes investments in electricity and natural gas sectors; promotes competition in the electricity and natural gas markets; promotes environmental protection of all energy activities and optimally incorporates environmental protection goals in the formulation and implementation of energy programs.
- The *Ministry of Regional Development and Infrastructure* elaborates and coordinates implementation of the regional development policy and programs of socioeconomic development; promotes economic activities to create new jobs and reduce poverty through employment; coordinates the reform of local self-governance with particular focus on institutional, financial and property matters; implement roads and infrastructure rehabilitation projects in the regions; coordination of activities of regional governors while advancing de-centralization of governance.
- The *Ministry of Economy and Sustainable Development* implements the national economic development strategy to ensure sustainable economic development based on stable macroeconomic policy and private entrepreneurship development.
- The *Ministry of Environment's* key function is to support sustainable development of the country. The ministry elaborates and implements state policy, programs, strategy of environmental protection for sustainable development, national environmental action programs and management plans; implements public administration (regulation, licensing, registration, supervision and control) on natural resource usage, waste management, chemical, nuclear and radiation safety.
- The *National Energy Regulatory Commission* is set up pursuant to the Law on Independent National Regulatory Authorities with the special legal capacity to regulate the energy sector in Georgia. Its key functions include issuing principles and terms for, as well as licenses for electricity generation, transmission, dispatch and distribution as well as for licensees of natural gas transportation and distribution; fixing and regulating consumer tariffs for electricity generation, transmission, dispatch, distribution, transition, import and supply; fixing and regulating natural gas transportation, distribution, and in certain cases, delivery marginal and consumer tariffs; coordinating certification process in energy field; encouraging priority development of local hydro, renewable, alternative and natural gas resources.
- *Regional Administrations and local municipalities* exercise executive powers on the ground and are key agents in ensuring on-the-ground support for state policy interventions:
 - *Tbilisi City Municipality* as a signatory to the Covenant of Mayors has an obligation to reduce GHG emissions in the city by 20% by 2020 against the 2005 level. As part of the agreement, the city has drafted a Sustainable Energy Action Plan (SEAP) that defines concrete GHG reduction measures together with time frames and assigned responsibilities which translate the long-term emission reduction strategy into action. Along with measures to improve the efficiency of energy use, the municipality is readily interested in substituting fossil fuels in the city's energy mix with renewable energy, including biomass. Tbilisi Municipal Development Fund, with annual capitalization of close to US\$ 0.6 million, can lend at below-market rates to private sector companies that wish to pursue

projects which benefit the city (which could include e.g. setting up a biomass upgrading facility in Tbilisi to use urban forestry waste).

- *Samegrelo Regional Administration, as well as Zugdidi and Senaki municipalities* (located within the same region) have been quite supportive of the proposed biomass energy initiative as a means of addressing rural energy access, alternative income generation and re-integration of internally displaced people (IDPs) from the breakaway regions of Abkhazia and South Osetia.

- **Private sector:**

- *Licensed forestry operations* are important long-term sources of biomass energy resources. The companies are obligated by the forest licence requirements to ensure removal of wood residues from forest harvest sites. However, the current practice does not meet the required standards due to number of barriers (see below). Among the key players in sector, which have expressed willingness to participate in the proposed project, are:
 - D&V Ltd. – a Georgian subsidiary of the Italian company Georgia Timber International runs an 8-years license for sanitary cutting in 6,000 ha of chestnut forests in Zestafoni municipality of Imereti region (located 150 km west of Tbilisi). Substantial volumes of forestry waste (estimated at 200,000 tons until 2018) are left after sanitary cuttings, hence the company's interest in collaboration with the project on effectively utilizing the residues;
 - Georgian Wood and Industrial Development Co. Ltd. – Chinese enterprise that has 20-year licences over 46,000 ha of forest across Georgia. Timber harvesting yields considerable amount of waste that the company currently has difficulties handling in an efficient way;
- *Biomass briquette and charcoal producer:* Georgian Coal Ltd., Tbilisi-based company runs a small-scale charcoal production facility supplying charcoal to local restaurants. The annual production of wood briquettes is around 250 tons that yields some 80 tons of charcoal. The company is interested in expanding wood briquetting business but is currently constrained on feedstock supply and technical skills and information on available advanced biomass technologies.
- There are over 540 *wood processing plants and sawmills* across Georgia which are a major source of wood waste and sawdust that could be utilized for energy needs. At least 1,500 tons of sawdust are estimated to be available from wood processing facilities located within a distance of less than 10 km from the city of Tbilisi.
- *Hazelnut producers and/or processing plants*, which are located predominantly in the Samegrelo region, could provide an ample source of hazelnut shells and other residues from hazelnut cultivation. The key players include:
 - AgriGeorgia – a 100% Ferrero-owned company that runs over 3,000 ha of hazelnut plantations in the Zugdidi district of Samegrelo. Once the plantations reach harvest time in 3-4 years, the company will become the largest single producer of hazelnuts in Georgia.
 - Dioskuria Ltd. – a major Georgian wholesale company that sells around 2,000 tons of hazelnuts annually.
- Local *mechanical engineering enterprises* could form the basis for domestic manufacturing of biomass-fired boilers. At least two factories have been identified that have the required technical capacity and skilled personnel to manufacture boilers: Kutaisi Auto Mechanical Plant and Zugdidi Mechanical Plant.

- **NGOs:**

- Zugdidi-based NGO Mizani that works toward improving social conditions of some 2,000 IDPs living in the area has been shaping an idea for setting up a local production

of wood-based briquettes to supply the IDP families and the communities around Zugdidi.

- Tbilisi-based Rural Community Development Agency NGO has been involved in a range of grassroots-level interventions aimed at improving livelihoods of the most in-need communities across the country. One of the areas of activities includes support to local communities in setting up and running of household-scale biogas plants. NGOs
- **International financial institutions:**
 - *European Bank for Reconstruction and Development (EBRD)*, as part of its current country strategy for Georgia, has specifically prioritized promotion of energy efficiency and renewable energy. EBRD plans to finance small and medium sized entities in the industrial and residential sector through dedicated credit lines, subject to availability of technical cooperation and grant co-financing. Policy dialogue will aim at providing technical support to develop a comprehensive legal base for EE/RE development. It will be reinforced with associated regulatory development support to the government and regulators to help with development and implementation of regulatory frameworks for energy efficiency and renewable energy. EBRD has a US\$ 35 million credit line established in Georgia that helps finance energy efficiency and renewable energy (including biomass) investments.
 - The *World Bank's (WB)* current country partnership strategy (CPS) 2010–2013 has a number of relevant focus areas, including accelerated business growth, within which the WB may explore ways of attracting private investors in the hydropower area, both directly and through financial intermediaries, and extend analytic support to strengthen the regulatory role in protecting energy consumers and service quality and to address regional market issues. Although there is considerable potential, the WB has not yet set results indicators in this sector as options still need to be explored.
 - *The German Development Bank (KfW)* has prioritized four areas in its assistance to the Government of Georgia: sustainable economic development; energy; municipal infrastructure; health and the environment (within the framework of the Caucasus Initiative). KfW is financing projects in all three parts of the energy sector in Georgia – power generation, transmission and distribution. In the field of power generation, private operators of small-scale hydropower plants are granted loans on attractive terms from a EUR 5.1 million Renewable Energy Fund (REF) that was set up in coordination with the UNDP-GEF project on renewable energy promotion (refer to Section 1.6 below for further details on coordination with the KfW REF). The loans are passed on via Georgian commercial banks. In its current format, the REF has been fully subscribed, focusing on lending solely to small-scale hydropower plants. A restructured (“phase 2”) REF could potentially include other types of renewable energy, including biomass, but a specific request toward this end should be coming from the Government of Georgia.
- **International/bilateral agencies:**
 - *EU Tacis* - EU assistance has focused mainly on health and judicial and legal reform, with some activity in transport, energy, social protection, and public sector reform. Its latest country strategy paper, covering 2007–2013, identifies the following priority areas of support: (i) democratic development, the rule of law, and governance; (ii) economic development and European Neighborhood Policy Action Plan implementation; (iii) poverty reduction and social reforms; and (iv) resolution of internal conflicts. A regional Tacis project, which includes Georgia, provides assistance to participating countries in implementation of the Kyoto protocol.
 - *USAID* has been funding a 4-year (2007-2011) Rural Energy Program in Georgia, implemented by Winrock Georgia, that focuses on small hydropower rehabilitation and promotion of renewable energy (primarily, biogas) and energy efficiency in the rural

- context. The Program has also touched upon efficiency assessment for domestically-produced firewood stoves, and the proposed project will build upon this work.
- *United Nations High Commissioner for Refugees (UNHCR)* – working as part of the UN efforts to create favourable environment for vulnerable groups, including IDPs, UNHCR has been considering to support a project proposed by NGO Mizani for production of biomass briquettes. The NGO approached UNHCR with a proposal to set up a sawdust briquetting facility at the mechanical plant in Zugdidi (where some 1000 refugees currently live), with the intention to supply part of the produced briquettes for free to the refugees (up to 20% of production) and sell the rest on the market. However, the proposal has not been approved by UNHCR due to high degree of uncertainty in sawdust data and projections put forward by the NGO.

1.4. Barrier analysis

Currently, there are a number of barriers that hinder the development of a local biomass energy market in Georgia. These can be generally categorized as supply-side and demand-side barriers. On the supply side, the key barriers are scarcity and unreliability of the biomass feedstock data, as well as high spatial dispersion of relative small-size biomass stocks. On the demand side, the key barriers are the competition with other sources of energy (like firewood or natural gas), as well as relatively high upfront costs of advanced biomass heating systems. A critical barrier that is applicable to both supply and demand side is a lack of equity to go into projects which makes it more difficult to secure debt finance for project developers. The proposed project offers a comprehensive response strategy that is designed to remove the identified barriers in a targeted manner with a main focus on removing the financing barrier by establishing a two-component Investment Grant Mechanism. The following table provides a summary of the barriers identified alongside the corresponding removal measures proposed by the project, which are further detailed in the Project Strategy section below.

Table 1: Barrier analysis

Barrier description	Type	Project response
<p><i>Lack of reliable and comprehensive biomass feedstock data</i> As the project preparation has clearly demonstrated, scarce, fragmented and unreliable data on the availability, typology and geographical distribution of various biomass resources (most importantly, forest residues, wood processing waste including sawdust, agricultural residues including hazelnut shells) significantly constrains potential private sector interest in developing biomass energy projects and assessment of their technical and financial feasibility.</p>	Policy	<p>Feasibility study for a biomass upgrading plant in Tbilisi (Output 2.1), which will also address biomass feedstock data in the region.</p> <p>Output 1.1 - a comprehensive inventory and mapping of available biomass resources across Georgia, to be completed as part of preparation of the bioenergy strategy, that will help analyze feasible options for utilizing the clearly identified and assessed biomass resources.</p>
<p><i>Lack of a biomass strategy</i> Though the Government of Georgia has declared priority on attaining self-sufficiency of the national power grid through indigenous energy resources (predominantly hydropower), no dedicated strategy has been formulated on how to involve biomass in the current energy mix, most importantly in heating supply, in the</p>	Policy/ institutional	<p>Building on the comprehensive biomass inventory and informed by the pilot investments in Tbilisi, a national strategy for the bioenergy sector along with an action plan in the context of the long-term sustainable development of the energy sector will be formulated (Output 1.1).</p>

Barrier description	Type	Project response
<p>most efficient and sustainable way. A long-term vision for the bioenergy sector development can be instrumental in instilling market confidence and facilitating uptake of bioheat technologies in the country.</p>		
<p><i>Competition with other energy resources</i> Municipal users in Tbilisi currently rely primarily on natural gas and firewood for meeting their heating needs. Alternative biomass heating solutions would have to demonstrate cost competitiveness with natural gas (and diesel oil that is also used to some extent by the municipality), reliability and operational safety. The overall trend of increasing fossil fuel prices, including natural gas, will contribute toward improving biomass system economics and utilization of most advanced biomass combustion technologies will help alleviate other concerns.</p>	Market/ financial	<p>Full-fledged feasibility studies (Output 2.1), focusing on the municipal heating sector, justifying technically and financially installation of biomass-fired boilers. Commissioned biomass boiler systems (Output 3.3) will demonstrate technical and economic benefits of using bioenergy technologies. Quality standards for biomass fuel and bioheat systems (Output 1.2) will contribute toward instilling greater confidence among potential biomass users.</p>
<p><i>Low awareness of biomass energy technologies and related benefits</i> The current situation in Georgia can be characterized by a lack of knowledge among key stakeholders (policy makers, businesses, consumers) on the benefits offered by biomass energy. On the supply side, the stakeholders (e.g. forestry businesses, wood processing plants) are not familiar with cost-effective waste biomass harvesting and/or upgrading technologies. On the demand side, institutional energy users (municipalities) are not familiar with upgraded biomass (e.g. chips, briquettes, pellets) combustion technologies that offer higher efficiency, cost-savings and flexibility compared to conventional firewood or fossil fuel-based heating systems.</p>	Information / technology	<p>Supply-side (biomass upgrading plant - Output 3.2) and demand-side (bioheat installations - Output 3.3) demonstrations will showcase bioenergy benefits. Replication projects (Output 4.3.) will help expand bioenergy adoption and understanding of its benefits across Georgia A dedicated promotional and information campaign (Output 4.1) will be delivered in order to fill the existing information gaps and enhance awareness of the different stakeholder groups on the benefits of biomass energy.</p>
<p><i>Limited local technical capacity</i> Georgian enterprises and municipal institutions lack necessary skills and capacities for efficient operation of biomass extraction, upgrading and combustion systems. For example, one of the major forestry operators, Georgian Wood and Industrial Development Co. Ltd., has acknowledged lack of technical capacity to cost-effectively collect and process wood</p>	Institutional / awareness	<p>Output 4.2 - an established Bioenergy Association that will enable capacity improvements in the sector; training program for Bioenergy Association trainers on the various aspects of bioenergy application.</p>

Barrier description	Type	Project response
logging residues generated by their core wood harvesting operation. Similar challenges are faced by D&V Ltd. another company licensed to make sanitary cuttings of chestnut forests in Zestafoni region.		
<i>High upfront investment costs and lack of affordable financing</i> Development of biomass-based energy systems are constrained by a relatively high upfront investment costs of energy-efficient biomass heating systems. At the same time, commercial lending rates available on the Georgian market are prohibitively high (20-23%).	Financial	Output 3.1 – an Investment Grant Mechanism implemented by the project will help buy down the costs of investment for the pilot demonstrations Output 2.3 – a dedicated financing mechanism in the KfW Renewable Energy Fund and/or other facilities to promote bioenergy uptake

1.5. Project baseline

Under the *business-as-usual* (BAU) scenario with no GEF involvement, it is reasonable to assume that thermal energy provision in the municipal services sector by 2025 (i.e. 10 years post GEF project) would be characterized by the following features:

- Energy consumption for heating of municipal buildings in Tbilisi would grow an average 3% per year, reaching over 134 GJ/year from 2011 level of 90 GJ/year;
- The majority of municipal buildings in Tbilisi (and regional/municipal centers across Georgia) will continue to use natural gas as the primary source of energy (at 65%; followed by firewood at 27%, electricity at 7% and marginal use of diesel oil and kerosene) for meeting their heating needs, putting increasing pressure on municipal budgets from growing natural gas import prices;
- There will be a serious lack of investment in biomass production facilities by private sector investors due to perceived high risks and barriers as described in the previous section. Biomass upgrading projects would be limited to small-scale one-off initiatives pursued by risk-taker entrepreneurs. These small-scale initiatives are less likely to proceed than those carried out by well capitalized companies;
- Considerable amount of forest harvesting and sanitary cutting waste (estimated at 105,000 tons per year), Tbilisi urban forestry waste (estimated at 9,000 tons per year), wood processing waste including sawdust (estimated at 15,000 tons per year), hazelnut shells and pruning residues (estimated at 4,500 tons per year) will continue to be largely unused (e.g., forestry residues left in harvested plots, or urban forestry waste landfilled) or used in an inefficient way (e.g. nutshells) and/or with additional handling limitations (storage space, dust etc.).

Therefore, in the BAU scenario, efficient utilization of upgraded biomass for energy will not receive any meaningful attention or investment in Georgia, resulting in continued wastage of important energy resources in the context of a substantially constrained heating energy demand, persisting vulnerability of the national economy to energy related risks associated with the need to import increasing amounts of fossil fuels to satisfy domestic thermal energy needs, and unmitigated pressures on national forestry resources leading to increased deforestation and land degradation.

GEF assistance is requested to help overcome the barriers outlined above, which currently prevent efficient production and utilization of biomass energy in Georgia – thereby setting the domestic thermal energy market on an alternative path. The *GEF alternative scenario* relies on a set of actions and expected outputs, as described in the following section, in order to create an enabling environment for wider production and utilization of upgraded biomass fuels, as a substitute to the currently used fossil fuels, to

meet the municipal services sector's energy needs in a sustainable and efficient way, thereby reducing dependence on fossil fuels and limit GHG emissions in Georgia.

With the GEF support as part of this project and ensuing replications, the following impacts are expected to be effected by 2025:

- Energy consumption for heating of municipal buildings in Tbilisi continues to grow at the pace equal to that of the BAU scenario, reaching 134 GJ/year, though – importantly – the respective shares of fuels in the heating mix change as follows: upgraded biomass 78%, natural gas 19%, electricity 3%, diesel oil and kerosene are totally phased out;
- A biomass upgrading plant in Tbilisi with an annual output of at least 10,000 tons provides a reliable supply of densified biomass fuels to municipal users;
- The rate of utilization of biomass feedstock resources for energy available in and around Tbilisi reaches at least 80% for forestry residues, 70% for wood processing waste;
- Each US\$1 of GEF money spent will have leveraged at least US\$4 in private and public investment into biomass production and utilization in Georgia;
- Additional private and/or public investments into biomass upgrading plants across Georgia enable efficient uptake of previously unused biomass wastes to produce at least 50,000 tons of upgraded biomass fuels per year.

The combined impacts of the project-supported interventions and ensuing replications within 10 years of the GEF project influence period are estimated to enable cumulative GHG emission reductions of 143-546 ktCO₂eq (over 20 years of investment lifetime), assuming GEF causality factor of 60% (refer to Annex 8 for estimation of GHG emissions reductions).

1.6. Other related past and ongoing activities

KfW REF, UNDP-GEF Renewable Energy project - Since 2004 Georgia has been implementing the GEF project "Georgia-Promoting the Use of Renewable Energy Resources for Local Energy Supply". The main components of the project have been to establish in cooperation with KfW a Renewable Energy Fund (REF), to prepare the Renewable Energy Development Strategy and to prepare the business plans for Small Hydropower Plants (SHPPs) for submission to the revolving fund on the competitive basis. The present project will work in close cooperation and coordination with the implementers and stakeholders of that GEF-funded project. At the initial stage, the eligible projects for the REF are SHPPs while in the future other renewable sources, and among them biomass projects, may be eligible for low interest loans from the REF. As a long-term strategy for biomass promotion in Georgia, the present project will collaborate with KfW to formulate and launch a dedicated bioenergy financing window as part of the existing REF. As confirmed by KfW Georgia during the PPG phase, KfW would support such a dedicated facility provided a respective request is lodged with them by the Government of Georgia. The long-term track record of UNDP, having worked with KfW in Georgia, should assist in this regard.

USAID Winrock Rural Energy Program - The financial assistance from USAID enabled Winrock International to implement a project called "Rural Energy Program" This is a four-year (2007-2010), US\$ 12.7 million program focusing on small hydropower rehabilitation and construction, renewable energy and energy efficiency options, and policy work. The main objectives/activities of the program are: increase hydro power supply, improve access to energy project financing (RE/EE), increase use of renewable energy and energy efficiency, enhance institutional capacity and legal, policy and regulatory environment, improve integrated natural resource management, and conduct public outreach. More than 15 small hydropower projects have been completed and 13 projects were developed with financing totaling US\$ 6.58 million. Additionally the Rural Energy Program has held numerous training sessions, performs energy audits and public outreach campaigns. These projects have demonstrated that there is much potential for developing municipal and community-based renewable energy projects.

EBRD EE/REs loan facility - EBRD has started a new credit line framework for energy efficiency and renewable energy projects with US\$ 30 million available for on-lending to the private sector through participating banks for energy efficiency and renewable energy projects at competitive rates on the local market (interest rates at 10-15%, loan maturity from 12 to 60 months). Along with technical assistance, the EE/REs credit line offers 15% capital subsidy for certain eligible energy efficient products and devices, including biomass boilers and stoves. The use of proceeds will also be extended for on-lending to individuals for residential energy efficiency investments. The maximum sub-loan amount under the framework will be US\$ 2.5 million. An important element of the program is that EBRD is prepared to purchase carbon emission credits earned by the Energy Efficiency and renewable energy projects financed under the program.

AgriGeorgia afforestation project - Another project is related to the development of hazelnut plantations (as forest) over previously degraded land, including conservation of existing forest areas, with the double aim of food production and carbon sequestration in hazelnut trees. This is a voluntary carbon project developed by Ferrero together with AgriGeorgia, recently registered under the Carbon Fix Standard. Subject to favorable feasibility study, Ferrero invests in new technology for high standard hazelnut cultivation in Georgia. In close cooperation with the Ferrero's project, the carbon sequestration potential of the hazelnut industry in Georgia, together with the potential for reclamation of degrading land, will be assessed and project idea notes prepared.

Rehabilitation of Degraded Landscapes, GIZ - A proposal on the plantation of energy forests in order to rehabilitate the degraded lands in East Georgia (Dedoplistskaro region) and to supply the local population with biomass energy resources (Dedoplistskaro region is not rich in forests and has scarce energy resources) has been prepared in the Second National Communication under UNFCCC. Later on in 2008, on the basis of this proposal, the Government of Germany (through the Deutsche Gesellschaft fuer Internationale Zusammenarbeit GIZ GmbH) launched the project "Climate Resilience Rehabilitation of Degraded Landscapes in Georgia". The initial phase (already started) of the project considers the rehabilitation of wind-breakers, while the plantation of forests is considered as a next step. In case of success with these energy forests, Dedoplistskaro is planned to be the first priority region in East Georgia where the current technology will be replicated. The proposed project will coordinate and work very closely with these two projects, particularly in the preparation of biomass development strategy.

2. PROJECT STRATEGY

2.1. Project Objective, Outcomes, Outputs and Activities

The project strategy is presented by a logical framework approach. The essence of this approach is that outputs are clustered by outcomes, which together will achieve the project objective. These are discussed below with further details in Section 3 "Project Results Framework."

Given the barriers identified above, as well as the particular energy mix in Georgia, its trends, and the government's top priority on identifying hydropower as the cornerstone of its national electricity policy, it appears that the most effective way to develop a biomass energy business in Georgia – while delivering GHG emission abatement with respect to the baseline situation – is to focus on biomass-based thermal energy supply to the service sector, which is currently dominated by natural gas and (to a lesser extent) firewood. Therefore, the project strategy will be focused on facilitating establishment of a biomass upgrading plant in Tbilisi that would supply densified biomass fuels to the Tbilisi Municipality to substitute natural gas (and residual volumes of diesel oil and kerosene) used for heating its 196 municipal buildings.

Therefore, the objective of the proposed project is to promote sustainable production and utilization of upgraded biomass fuels in heating applications in the municipal services sector of Georgia, to meet the sector's thermal energy needs in a sustainable and efficient way, thereby reducing dependence on fossil fuels and avoiding GHG emissions. To achieve this objective, a comprehensive strategy is proposed, including promotion of demand and supply of biomass and demonstration activities such as the launch of a pilot plant for making upgraded fuels from biomass waste, one that can be replicated throughout the country, as well as establishment of a two-component Investment Grant Mechanism to deliver pilot biomass supply- and demand-side projects. The project strategy is built around four outcomes, as follows.

Outcome 1: Enhanced policy and regulatory framework for promotion and efficient utilization of biomass energy in Georgia

This outcome will focus on supporting the Government of Georgia in developing a strategy and an action plan for promotion of efficient utilization of currently wasted biomass resources for energy supply, including via production of upgraded biomass fuels. A national bioenergy strategy and action plan will provide a comprehensive inventory and mapping of the available biomass resources in Georgia, an exact evaluation of the technical and economic potential for extracting useful energy from these resources, as well as a roadmap for tapping this potential.

Output 1.1: Bioenergy strategy and action plan

Clearly defined strategy and targets, supported by well-developed action plans, have proved essential in developing biomass energy by providing a “sense of direction” and confidence to biomass heating businesses. A longer term perspective on market development, which takes into account the learning curves of different market actors and the expansion of production and installation capacities, is important for developing a healthy industry. Even though biomass is currently seen by the Government of Georgia as having insufficient potential for grid-connected electricity generation, upgraded biomass could still play an important role in filling-in the existing gaps in heating demand, reduce country's vulnerability and dependence on energy imports during cold season and contribute to reduction of the national carbon footprint through substitution of fossil fuels in the heating mix. Toward this end, a detailed inventory of available biomass resources will be carried out for the entire country, starting with the municipality of Tbilisi, including classification of sources (varieties, residues), production estimates, relevant constraints and technical parameters. The data collected will be analysed and mapped, to enable informed decision-making on development of bioenergy systems in individual regions of Georgia. Building on the results obtained and based on the best international experiences, a national strategy and an action plan for bioenergy promotion in Georgia will be developed in close coordination with key government, business, NGO and other stakeholders.

GEF support is required for the technical assistance in completing an inventory of the available biomass resources, estimating feasibility of the various bioenergy technology and drafting a National Bioenergy Strategy and Action Plan.

Activity 1.1.1: Undertake a detailed inventory and mapping of the available biomass resources in Georgia based on primary data collection to obtain a comprehensive overview of the biomass potential in Georgia

Activity 1.1.2: Complete a study on the technical, economic and financial feasibility of the different bioenergy technologies in Georgian context

Activity 1.1.3: Draft Bioenergy Strategy and Action Plan, facilitate stakeholder consultations and eventual government endorsement and approval during the lifetime of the project, supported by the results of other activities under Outcome 1

Output 1.2: Quality standards for upgraded biomass fuels and biomass heating systems

The majority of biomass systems have a very specific range of fuel requirements if they are to operate efficiently, with low levels of emissions and without blockage of the fuel feed system. Biomass fuel standardization has been a critical success factor in the early stages of biomass development in advanced markets like Austria or Sweden. Further, fuel standardization supports consumer confidence, facilitates smooth bioenergy system operation in line with the designed parameters. Similarly, high-efficiency biomass burning equipment (e.g. boilers) that meets stringent emissions and quality standards is crucial for market transformation. This output will therefore support the development and introduction of quality standards for upgraded biomass fuels (woodchips, briquettes and/or pellets), as well as emissions, safety and performance standards for biomass-fired boilers.

GEF support is required for the technical assistance in developing quality standards for biomass fuels and equipment, as well piloting a voluntary certification scheme.

Activity 1.2.1: Develop specifications and quality standards for upgraded biomass fuels (briquettes, woodchips, pellets) on the basis of best international practice, to be approved and enforced in due order

Activity 1.2.2: Develop requirements for emissions, safety, operation and performance standards of biomass boilers. Provisions for pollution control from application of biomass boilers will be based on best management practices¹⁴ applied in the most advanced bioenergy markets (e.g. Austria)

Outcome 2: Increased market confidence in the feasibility of production of upgraded biomass fuels and their utilization in municipal heating applications

The purpose of this outcome is to support Georgian Coal Ltd.-led consortium to establish detailed parameters of feasibility of production of upgraded biomass fuel from the feedstocks available in and around Tbilisi, draw up a business plan for a pilot 10,000 tons/year biomass upgrading plant, and support Municipality of Tbilisi in identifying cost-effective opportunities for switching from natural gas and/or diesel oil to upgraded biomass in heating of at least 10 of its 196 municipal buildings, and facilitate long-term biomass fuel supply contract with Georgian Coal Ltd.

The pilot plant for production of upgraded biomass fuels will be designed through: i) thorough estimation of the available biomass feedstock; ii) selection of optimal harvesting/collection and upgrading technologies (pelletizing, briquetting or chipping) matching the needs of the municipal end-users; iii) elaboration of in-depth financial and technical feasibility studies; and iv) assistance with the startup of the pilot biomass upgrading plant.

A number of potential options have been investigated at project preparation stage via a pre-feasibility study¹⁵, identifying and involving the major players in the sector, including Georgian Coal Ltd., D&V Ltd., Dioskuria Ltd., Ferrero SpA, Georgian Wood and Industrial Development Co. Ltd. One of the conclusions of the study is that the 8,000 ha of forested area in and around the city that is under the

¹⁴ Refer to e.g. "Emission Controls for Small WoodFired Boilers", Biomass Energy Resource Center, 2010

¹⁵ Refer to Annex 4 for further details on the potential arrangements and Annex 3 for a summary of findings of the PPG pre-feasibility study

management of Tbilisi Municipality, coupled with substantial urban forestry waste that is currently being disposed via landfilling, could sustain a small- to medium-scale biomass upgrading plant that could supply renewable fuel to the municipality, thereby facilitating a switch from natural gas and/or diesel oil to biomass in municipal building heating systems. Tbilisi-based Georgian Coal Ltd. has experience with wood briquetting and charcoal production and will drive a consortium of biomass players in and around Tbilisi to set up and manage a biomass upgrading facility.

Tbilisi Municipality currently spends an equivalent of US\$ 1.8 million annually on energy resources for the 196 buildings under municipal management, with the bulk of payments going toward electricity bills. However, payments for fossil fuels (natural gas, diesel) account for almost 50% of the *heating*-related bills. Together with natural gas-based electricity used for heating during the cold season that figure comes to well over 80%. Aside from putting an ever increasing financial burden on the municipal budget, continued use of fossil fuels is associated with considerable GHG emissions (both CO₂ from natural gas combustion, but also CH₄ from leaks in the gas grid). Importantly, the majority of municipal buildings (mainly 158 kindergartens) do not have central heating systems with boilers; rather, individual gas heaters or electric heaters are mostly installed there. At the same time, being a signatory of the Covenant of Mayors, Tbilisi has committed to reducing its CO₂ footprint by at least 20% by 2020 against 2005 level. Switching from fossil fuels to biomass for heating can provide a valuable contribution for the municipality in meeting its GHG abatement goals, while alleviating dependence on imported natural gas and fuel oil. These considerations have fed into the draft Sustainable Energy Action Plan (SEAP) that Tbilisi has elaborated earlier this year as a formal requirement under the Covenant of Mayors. The SEAP is a strategic and operational document that identifies the best areas of action and opportunities for reaching the municipality's GHG reduction target, which include measures both at the supply (renewable energies) and demand (energy efficiency) sides.

As part of the measures envisaged under the draft SEAP, the municipality foresees the installation of central heating systems in municipal buildings where modern heating systems currently do not exist. GEF funding could thus be used to finance the incremental costs of switching from fossil to biomass fuels in boiler heating systems, while the municipality co-financing will fund the installation of hydronic central heating systems as well as energy efficiency improvements in the target buildings. As with any investment, fuel switching to biomass has to make economic sense, and the project will support the Municipality of Tbilisi in selecting the most cost-effective options for installing new biomass boilers in central heating systems with biomass as a primary fuel and natural gas as a peak-load or back-up arrangement. The buildings energy efficiency improvements to be co-financed by the Municipality of Tbilisi are going to complement the renewable energy interventions in the same buildings, thereby enhancing overall effectiveness of the project GHG mitigation efforts and contributing toward Tbilisi's SEAP goals. However, for reasons of conservativeness and avoidance of over complications, the GHG emission reductions resulting from energy efficiency related improvements in municipal buildings co-financed by the Tbilisi Municipality will not be claimed.

Specific outputs and related activities that will contribute to the realization of Outcome 2 include:

Output 2.1: Completed investment-grade feasibility study and business plan for a biomass upgrading plant in Tbilisi

Long-term security of biomass feedstock supply is an absolute prerequisite for a biomass upgrading plant. Potential investors need to be confident that a reliable supply of required quality and quantity of biomass feedstocks will be forthcoming during the pilot plant's lifetime from a range of sources, including Tbilisi municipality's managed 8,000 ha of forest, city's urban forestry waste and, potentially, D&V Ltd.'s chestnut concession. The cost of biomass feedstock – that has proven to be a major factor determining the price of the biomass fuel end product – should be carefully calculated and properly reflected in the pilot's

business plan, to ensure its viability. The share of biomass feedstock in the total production costs of biomass pellets or briquettes has been estimated in the range of 30% (for production process with drying of raw material) to 60% (for production process without drying)¹⁶. Hence, considerable costs savings and plant's viability improvements could be gained through long-term low-cost feedstock supply contracts for the pilot plant, an activity to be supported by the present project.

The full-scale feasibility assessment will be undertaken in Tbilisi, where municipality-led demand for fuel switch from fossils to biomass in public buildings will be tied to a respective stream of biomass feedstocks, originating from the urban forests and municipality-managed forest areas around the city, upgraded into a high-grade biomass fuel by Georgian Coal Ltd. that already has experience with biomass briquetting and charcoal production. A preliminary assessment completed during the preparation stage has concluded that a biomass pelletizing facility located in Tbilisi, with a total investment cost of US\$ 860,000 and capacity of around 10,000 tons annually, could prove economically attractive with simple backpack times in the range of 2-4 years¹⁷. Other biomass densification technologies (e.g. briquetting or chipping) are essentially less expensive, both in terms of the capital investment and operating costs, hence the above returns on investment for a pelletizing plant as the "worst-case" (i.e. most expensive) scenario clearly demonstrate viability of biomass upgrading in Georgia. The ultimate decision on selecting a given technology will depend on the outcomes of the fully-fledged assessments on the availability, typology, properties, extractability of the biomass feedstocks in Tbilisi, as well as on the cost-effectiveness of switching to a particular type of densified biomass fuel, complexity of supply and storage logistics, and limitations imposed by the particular buildings in terms of integration of biomass based boiler heating systems. These preliminary results will be refined as part of this output and an investment-grade feasibility study will be carried out with the aim of leveraging ultimate investment for a biomass upgrading plant in Tbilisi.

GEF support is required for the technical assistance with preparing an investment-grade feasibility study for the Tbilisi biomass upgrading plant.

Activity 2.1.1: Quantify the available and technically extractable biomass feedstock in and around Tbilisi, so as to enable selection of proper harvesting and upgrading technology and its right sizing

Activity 2.1.2: Identify modalities of operational arrangements of the pilot biomass plant, focusing on ensuring long-term supply of biomass feedstocks from around Tbilisi and linking in the feedstock from D&V Ltd. (and potentially other sources, e.g. Dioskuria Ltd.)

Activity 2.1.3: Identify, on the basis of the available biomass feedstocks and international experience with their utilization, optimal technology for biomass harvesting/collection, transportation, upgrading (pelletizing, briquetting or chipping; or a combination thereof) that would be best suited to the available biomass feedstock and Tbilisi municipal context

Activity 2.1.4: Undertake detailed feasibility assessment of pilot biomass plant focusing on technical, organizational and financial structure, analyze costs and revenues to yield an acceptable return on investment; develop a business plan, including third party review of the pilot's economics

¹⁶ E.g. Johan Karlhager "The Swedish market for wood briquettes – Production and market development" 2008; Alakangas, E. et.al. "Wood pellets in Finland – technology, economy and market" 2001

¹⁷ Based a range of biomass feedstock costs of \$5-30/ton (with feedstock accounting for the bulk of production costs in similar facilities across the world) and a sale price of \$70/ton of biomass fuel. Also refer to Annex 8.4. for details on the pilot biomass upgrading plant in Tbilisi.

Output 2.2: Completed feasibility studies for installing at least 10 biomass boilers in Tbilisi municipal facilities

Prospective investments into new biomass heating systems will require careful assessment of the associated costs, returns and risks, environmental impact, to ensure that biomass systems make economic sense and do not contribute to local pollution, compared to the business-as-usual situation. As concluded by the pre-feasibility assessment done at the preparatory stage, 250-500 kW heat boiler systems typical of medium-scale structures (such as municipal buildings for schools and administration), could be installed in Tbilisi municipal buildings and yield reasonable payback times of 4-5 years¹⁸, facilitated by the increasing natural gas prices that have doubled over the recent years. As indicated above, the project will prioritize those municipal buildings which currently don't have central hydronic heating systems and which are included in municipal retrofit plans, so that the project will cover the incremental costs of biomass boiler system installation to provide base-load heating, with the natural gas systems to be used to cover peak-loads or as a backup.

GEF support is required for the technical assistance in identifying the most cost-effective options for installing biomass-based boiler heating systems in at least 10 municipal buildings in Tbilisi.

Activity 2.2.1: Select a cluster of pilot end-users in Tbilisi (municipality-managed buildings, kindergartens, schools) to develop a set of model biomass boiler heating systems for new biomass installations

Activity 2.2.2: Assess feasibility of fuel switch for at least 10 individual fossils-to-biomass pilots in Tbilisi to identify the most cost-effective options based on comparison of relative costs for different biomass fuels (woodchips, briquettes, and pellets) and respective combustion technologies

Activity 2.2.3: Develop business plans for switching at least 10 municipal fossil fuel heating systems to biomass boilers, and provide other relevant assistance, so as to facilitate investment decision by the Tbilisi Municipality

Output 2.3: Dedicated bioenergy financing mechanism in the KfW Renewable Energy Fund and/or other facilities

Affordable financing is essential to both sides of the biomass market – biomass fuel producers/suppliers and bioenergy end users. The rates prevailing in the Georgian financial market (upward of 18-20%) make commercial bank loans prohibitively expensive, particularly for capital-intensive and high-risk (perceived) investments in biomass energy production and utilization. There are a number of facilities in Georgia (e.g. KfW's Renewable Energy Fund, EBRD's Energy Efficiency Credit Line, Tbilisi Municipal Development Fund) that could be valuable sources of much-needed finance for bioenergy projects in the country. However, these facilities have not been specifically designed for supporting biomass investments and will require certain degree of learning and fine-tuning before they can engage in lending to bioenergy projects. More specifically, the current phase of KfW REF, that prioritizes investments into hydropower plants only, has been fully subscribed to date. A phase-2 REF, as communicated by KfW Georgia, could potentially cover biomass investments as well, but it depends on a specific request from the Government of Georgia to open up and operationalize a new funding window. The proposed UNDP-GEF project will thus collaborate with the relevant stakeholders (most importantly, KfW, Ministry of Energy, Ministry of Finance) to substantiate a dedicated biomass funding window within a phase-2 REF. Alternative funding

¹⁸ Based on capital costs of US\$ 100,000 per boiler, biomass fuel price of \$70-90/ton and natural gas (as the competitive fuel) tariff rate of \$450 per 1,000 m³

options, e.g. ENRB's EE credit line or Tbilisi Municipal Development Fund, will be explored in parallel to ensure that there is synergy between the stakeholders.

GEF support is required for the technical assistance in analyzing options to enable existing financial instruments to lend to biomass projects, as well as in formulating proposal for a new biomass funding window as part of KfW's REF.

Activity 2.3.1: Analyze the existing financial instruments and facilities so as to identify and make necessary adjustment and/or enhancement (e.g. revised financial evaluation tools) to enable lending to biomass projects

Activity 2.3.2: In collaboration with the key stakeholders (KfW, Ministry of Energy, Ministry of Finance, Tbilisi Municipal Development Fund), formulate a proposal for establishing a dedicated funding window to finance future bioenergy projects in Georgia to be instituted within KfW's REF (or other financial partner)

Outcome 3: Created local supply of and demand for upgraded biomass fuels

This Outcome will be the cornerstone of the proposed project, whereby GEF funding will be used to unlock the potential of the Georgian biomass-to-heat market by providing investment grants to the biomass upgrading plant (supply) and biomass boiler installations in Tbilisi (demand). The GEF grant funding of US\$ 258,000 for a biomass upgrading plant and US\$ 300,000 for ten biomass boiler installations (for a total GEF investment grant value of US\$ 558,000) will be matched with the respectively larger co-financing from the project partners: US\$ 3 million from Tbilisi Municipality toward capital and operating costs of ten biomass boiler systems; and US\$ 0.3 million from Georgian Coal Ltd. and US\$ 0.5 million from D&V Ltd. toward capital and operating costs of a biomass upgrading plant in Tbilisi. The above project partners will ultimately manage and operate the new biomass infrastructures. A set of initial overarching principles for the functioning of the grant mechanism are given in Annex 8.9, to be further refined and elaborated during project inception phase in close collaboration with the project partners, including KfW. Synergy will be sought with the future KfW REF's biomass financial mechanism, as well as other financing instruments available in Georgia.

Specific outputs and related activities that will contribute to the realization of Outcome 3 include:

Output 3.1: Executed Investment Grant Mechanism

The majority of GEF funds under this project (60%) will go into supporting actual investments in bioenergy supply and demand systems through an Investment Grant Mechanism to be put in place by the project.

The Investment Grant Mechanism will have two distinct components. Component 1 will support biomass upgrading plant in Tbilisi with a capital investment subsidy of up to US\$ 258,000 or 30% of the total estimated capital investment cost of US\$ 860,000. Component 2 will support installation of at least 10 upgraded biomass-based boilers in Tbilisi municipal buildings with a capital investment subsidy of up to US\$ 30,000 per boiler or 30% of the estimated capital investment cost of US\$ 100,000 per boiler¹⁹. This will help buy down the costs of investment for the pilot plants, thereby considerably reducing the risk of non-investment and increasing the chances of success for the pilot demonstrations.

¹⁹ Refer to Annex 8.4 and Annex 8.9 for further details on the estimated costs and financing of the demonstration projects and the granting mechanism.

GEF support will be required for the actual replenishment of the Investment Grant Mechanism and ultimate disbursement of the funds to the project partners.

Activity 3.1.1: Establish full criteria for component 1 of the Investment Grant Mechanism for biomass upgrading plant in Tbilisi

Activity 3.1.2: Disburse the investment grant to ensure the construction of the biomass upgrading plant in Tbilisi

Activity 3.1.3: Establish full criteria for component 2 of the Investment Grant Mechanism for biomass boilers installation in the Municipality of Tbilisi

Activity 3.1.4: Disburse the investment grant to ensure the installation of at least 10 biomass boilers in municipal buildings in Tbilisi

Output 3.2: Commissioned and operational pilot biomass upgrading plant in Tbilisi

The completed full-blown feasibility study and supply chain arrangements will inform the next phase, wherein detailed technical and engineering designs, and financing plans of the pilot biomass upgrading plant will be drawn and relevant support provided by the project, including 30% investment grant (refer to Output 3.1 above), to ensure ultimate commissioning of a 10,000 tons/year pilot biomass upgrading plant in Tbilisi and start of production of upgraded biomass fuels for supply to the Tbilisi Municipality. The balance of the capital investment costs, as well as initial operating costs will be financed by the pilot plant project partners, i.e. Georgian Coal Ltd. and D&V Ltd.

The level of complexity of a biomass production facility (with issues ranging from securing feedstock supplies, ensuring plant operation, maintenance and sale of the end product) may warrant a consortium of private players, to be managing the biomass supply facility. The current arrangement envisions Tbilisi-based Georgian Coal Ltd. as the lead entity; the project will facilitate interactions with other players in the biomass sector, most notably D&V Ltd. in Zestafoni, to set up viable business arrangements for the pilot biomass plant that would help secure feedstock supplies, proper plant operation and ultimate sales of the biomass fuels.

GEF support is required for financing the investment grant and technical assistance in preparation of technical designs, engineering and financing plans and equipment procurement.

Activity 3.2.1: Prepare detailed technical designs and engineering plans of the pilot biomass upgrading plant in Tbilisi, ensuring compliance with the local regulations and technology requirements.

Activity 3.2.2: Obtain relevant clearances and permits at the municipal and/or national level for the construction of the biomass upgrading plant.

Activity 3.2.3: Develop a viable financing plan for the biomass upgrading plant to effectively combine investment grant, equity and debt financing, as relevant

Activity 3.2.4: Procure equipment, construct, commission and operate the pilot biomass plant in Tbilisi.

Output 3.3: At least 10 installed and operational pilot biomass-based heating systems in Tbilisi

Building on the results of feasibility assessments undertaken as part of the earlier outcome, this output will support installation of biomass-fired boilers in Tbilisi municipality-managed buildings. At least 10 biomass-based heating systems (with an average installed capacity of 250 kW) are to be installed in Tbilisi. The project will use GEF fund to provide an investment grant (refer to Output 3.1) to cover up to 30% of the investment costs for biomass boiler installations.

GEF support is required for financing of the investment grant and technical assistance in identification and sourcing of proper biomass heating technologies, integration of biomass heating systems into existing buildings.

Activity 3.3.1: Prepare technical specification and engineering designs for at least 10 individual biomass boiler installations, including boiler integration into the hydronic heating system, peak-load coverage by alternative sources, fuel supply and storage aspects

Activity 3.3.2: Obtain relevant clearances and permits for installation of biomass boiler heating systems to ensure compliance with the municipal and and/or national requirements, particularly focusing on meeting local pollution regulations

Activity 3.3.3: Procure, install, commission and operate at least 10 biomass heating systems (including construction of auxiliary facilities like fuel storage) in municipal buildings in Tbilisi

Outcome 4: Improved knowledge and stakeholder capacities for bioenergy development and replication

Understanding and effectively communicating the benefits of biomass energy (including cost and efficiency improvements, energy independence through local fuels, local employment in rural areas, innovation, alleviating pressures on the local environment, reducing GHG emissions etc.) is an essential component of any successful market development program. The awareness of the various groups of market stakeholders of the availability, costs, and benefits of biomass energy systems will be raised through targeted outreach and training programs, and creating and disseminating various knowledge products. A national bioenergy association, to be facilitated by the project, will help create an effective platform for information and knowledge exchange on best available biomass technologies among the local stakeholders in Georgia.

Output 4.1: Set of targeted promotional materials on sustainable production and utilization of upgraded biomass fuels

Awareness programs that are independent of the sales of a product and service are crucial to market growth; this is especially true for an emerging industry that has limited resources for marketing. Successful promotion is characterized by a smart and effective mix of communication instruments. This output will support design and implementation of promotional activities for bioenergy, including printed and electronic materials, videos, and web-based articles.

GEF support is required for the technical assistance in developing awareness-raising and knowledge products.

Activity 4.1.1: Design and disseminate printed and electronic materials for promotion of sustainable production and utilization of upgraded biomass fuels in Georgia, including showcasing the successes of the pilot biomass investments supported by the project

Activity 4.1.2: Disseminate the national bioenergy strategy and action plan to ensure maximum stakeholder coverage

Activity 4.1.3: Design and launch a national bioenergy web portal to provide up-to-date information on the available bioenergy technologies, model systems, costs, available resources etc.

Activity 4.1.4: Develop and disseminate knowledge products including manuals and case studies on the use of upgraded biomass fuels and biomass-based boilers

Output 4.2 Established Bioenergy Association of Georgia

The bioenergy sector in Georgia is small and poorly coordinated, which is not conducive to healthy market growth. This output will therefore facilitate creation of a local biomass energy association bringing together key stakeholders from the forestry, agriculture, wood-processing, biomass processing and combustion equipment and service industries, thereby providing a platform for a healthy exchange of experience, lessons and biomass business growth in Georgia.

Since a bioenergy association is essentially a private sector undertaking; neither GEF funding nor partners' co-financing will go toward financing of its operation; rather soft assistance will be provided in facilitating the establishment of association and initial contact building. Thus, GEF support will be required for the technical assistance in provision of initial legal and organizational support for establishment of the Bioenergy Association of Georgia, as well as in provision of training of trainers for its most active and capable members.

Activity 4.2.1: Liaise with key bioenergy stakeholders to identify potential leaders for the future bioenergy association

Activity 4.2.2: Organize and facilitate a kick-off workshop to work out administrative issues, followed by a series of substantive meetings to involve both supply and demand side stakeholders

Activity 4.2.3: Facilitate establishment of the Bioenergy Association of Georgia as a legal entity through provision of necessary legal and organizational support

Activity 4.2.4: Facilitate initial contacts with leading foreign bioenergy associations (e.g. Austria, Sweden)

Activity 4.2.5: Identify a suitable group of members of the Bioenergy Association of Georgia and provide them with initial training on the various aspects of biomass sector development (including inter alia biomass feedstock sourcing, transportation and logistics, upgrading technologies, biomass combustion technologies, costs, etc.) to enable them to act as future trainers for bioenergy sector in Georgia

Output 4.3 At least 2 replication bioenergy projects identified and under development

The PPG phase has clearly demonstrated a significant biomass feedstock potential is available, particularly in Western Georgia (Samegrelo region), supported by large-scale licensed forest harvesting and hazelnut growing operations. The relatively long distance between that region and Tbilisi is likely to be a considerable limiting factor for potential efforts in linking up the Western Georgian biomass feedstock supply with Tbilisi's municipal demand for renewable fuels. At the same time, other municipalities across Georgia could be potentially interested in exploring biomass energy as a substitute to their current fossil fuel-based heating mix. For example, municipality of Zugdidi in Samegrelo region

has stated its interest in biomass-based heating, but could not commit at this stage. The municipality is considering becoming a signatory to the Covenant of Mayors, hence showcasing of the Tbilisi municipality biomass boiler installations will help replicate the positive experiences to Zugdidi and other municipalities. Biomass fuel supply could potentially come from the hazelnut growing and processing operations run by AgriGeorgia Ltd. and Dioskuria Ltd. who could consider setting up a biomass upgrading plant in Western Georgia to supply municipal users. Also, proximity of the seaport of Poti could open up alternative export opportunities for the plant. Thus, as part of this output, the project will seek to identify and facilitate development of at least 2 additional bioenergy investments across Georgia.

GEF support is required for the technical assistance in facilitation of development of replication bioenergy projects.

Activity 4.3.1: Identify and analyze most cost-effective options for utilizing the available biomass feedstock potential in Samegrelo region

Activity 4.3.2: Facilitate contacts between potential players of the Samegrelo bioenergy “hub” (including AgriGeorgia Ltd., Dioskuria Ltd., Georgian Wood and Industrial Development Co. Ltd.) to enable identification of at least 2 replication bioenergy projects and support initial project development through provision of relevant information, sharing of results of the Tbilisi demonstration, and linking up with the biomass financial instrument(s) created under Output 2.3

Output 4.4: Completed project monitoring and evaluation

This output will provide capturing of lessons learned and best practices from project implementation, resulting from ongoing monitoring, as well as mid-term and final independent evaluations.

Activity 4.4.1: *Update baseline study against which the impact of the project will be measured*

Activity 4.4.2: *Undertake project mid-term and final evaluations and other required reviews and reports*

2.2. Project risks

A summary of the main risks identified, along with proposed mitigation measures, is given below. Further details on these and other risks are presented in the “Offline Risk Log” in Annex 1.

- Biomass feedstock (wood residues, hazelnut shells) price growth due to increased competition from alternative uses of biomass waste – mitigation through realistic assessment of feedstock prices in the first place when designing biomass upgrading plant; long-term feedstock supply arrangements (e.g. from forest concessions);
- Reliability of biomass feedstock supply – mitigation through careful sourcing of feedstock, entrance into long-term business arrangements (e.g. consortium) with suppliers, as well as right-sizing the biomass upgrading facility to the lowest guaranteed supply of biomass, which is to be done as part of the full-scale feasibility study;
- Lack of relevant support from the local and central Governments – the Ministry of Environment will need to play a leading role in “lobbying” the project within the government and pushing the relevant decisions, including facilitation of decision by the key Government entities (Ministry of Energy and Ministry of Finance) on requesting a biomass funding window as part of KfW’s REF.
- Eventual investment into biomass energy from private or public sector is not forthcoming – mitigation through the Investment Grant Mechanism that will provide investment subsidies to cover up to 30% of the investment costs of the pilot projects; thorough analysis of the entire spectrum of aspects related to the project (production, organizational and financial structure, costs

and revenues) as part the investment-grade feasibility study, ensuring a return on investment acceptable to the investor.

2.3. Expected global, national and local benefits

On a global level, the project will facilitate a “carbon neutral” path toward sustainable development. The anticipated global environmental benefits will consist of a combination of:

- Direct GHG emission reduction benefits from the pilot demonstration(s) implemented in the framework of the project and supported by project funding; and
- Indirect GHG reduction benefits resulting from replications and broader market transformation brought about by the project activities.

The direct GHG reduction benefits of the project have been estimated at 47.8 ktCO₂eq over 20 years of investment lifetime, resulting from the replacement of fossil fuel heaters and boilers in municipal buildings in Tbilisi with upgraded biomass-based boiler heating systems (at least 10 boilers)²⁰.

The cumulative indirect GHG reduction benefits of the project have been estimated in the range of 143 ktCO₂eq (for bottom-up assessment) to 546 ktCO₂eq (for top-down assessment). This results from scaling up of the production of upgraded biomass fuels (woodchips, briquettes and/or pellets) and their utilization for heating by municipal entities in Tbilisi and potentially, in other parts of Georgia including Samegrelo region. For the indirect (top-down) impact, a GEF causality factor of 3 (60%) has been assumed. For further details about the assumptions made in calculating the project’s global benefits, see Annex 8.

The main national and local benefits are expected to be:

- Improved living and working environment for the occupants of municipal buildings, most notably kindergartens and schools, which have been suffering from underheating during the cold season, resulting in reduced rates of cold-related illnesses and treatment costs;
- Economic costs savings at the municipal level and reduced dependency and expenditures on imported energy;
- General socioeconomic development of the rural communities and enhanced employment opportunities in manufacturing and providing the required services for bioenergy technologies and development of the country’s SME sector.

2.4. Project rationale and GEF policy conformity

The project is in accordance with the GEF-4 Strategic Programme #4 on “Promoting Sustainable Energy Production from Biomass” of the Climate Change Focal Area²¹ in as much as it aims to promote the adoption of modern and sustainable practices in biomass conversion and use as energy.

Biomass energy is among Georgia’s indigenous renewable energy resources that the country intends to develop and utilize. The proposed biomass upgrading and conversion technologies, together with the proposed public private partnerships enhancing demand-supply chains, improve the efficiency of handling and utilizing of solid biomass are in line with the country’s energy sector strategy, aiming at improving Georgia’s energy security through maximal utilization of local renewable resources and increasing of energy efficiency along with the mitigation of GHGs.

Ultimately, wide adoption of biomass upgrading and improved combustion technologies across Georgia will enable efficient utilization of the currently wasted biomass resources, thereby contributing toward

²⁰ Refer to Annex 4 for further details on the proposed pilots

²¹ Focal Area Strategies and Strategic Programming for GEF-4, dated October 4, 2007

improving domestic energy supply, enhancing the country's energy security, and reducing GHG emissions.

2.5. Country ownership: country eligibility and country drivenness

According to the Instrument for the Establishment of the Restructured Global Environment Facility, Georgia qualifies for GEF financing on the following grounds:

- It has ratified the UN Framework Convention on Climate Change on July 29, 1994; and
- It receives development assistance from UNDP's core resources.

The objective of the project is consistent with Georgia's overall energy policy that has four main goals: diversification of the sources of energy supply; fully meeting energy demand; independence and sustainability of the power sector; and energy security.

In 2006-2009 Georgia has prepared its Second National Communication (SNC) to the UNFCCC. The National Climate change Strategy has been developed in accordance with the COP guidance (17/CP.7) for preparation of NAI National Communications. The energy sector strategy, based on the principle: "increase the security of Georgia's energy sector through maximal utilization of local renewable resources and increasing of energy efficiency along with the mitigation of GHGs" is a part of the climate change strategy. Development of biomass energy resource is one of the priorities under this strategy. Considering the biomass fuel as Georgia's future (as fossil fuel importer country) it's also highlighted in the document that this idea is still very new for the country and it needs time and serious efforts to introduce and develop this industry in the country.

The project is also consistent with the objective of the Sustainable Energy Action Plan (SEAP) 2011-2020 prepared by the City of Tbilisi under the requirements of the Covenant of Mayors, in as much as it contributes to the city's goal of reducing its GHG footprint by 20% by 2020.

2.6. Financial modality and cost-effectiveness

The GEF support will consist of grants for investment subsidies and technical assistance, which will support the private and public sector players in establishing reliable supply of upgrade biomass fuels to satisfy municipal heating demand in a sustainable and climate-neutral way. The GEF funding of US\$ 0.925 million will be complemented by the co-financing of US\$ 4.46 million. This means that for each US\$ 1 of GEF funding spent, at least US\$ 4 of private and public co-financing will have been leveraged. For further details about the project budget see section "Total Budget and Work Plan" and the attached co-financing letters.

With the combined GHG emission reduction benefits from the proposed project estimated in the range of 47.8 ktCO₂eq for direct reductions and 143-546 ktCO₂eq (for indirect reductions, bottom-up and top-down, respectively), specific abatement costs for the GEF investment of US\$ 0.925 million come out in the range US\$ 3.4 to 19.3 per ton of CO₂eq reduced.

Cost-effectiveness of biomass energy projects, in particular distributed heat production, relies heavily on the price of biomass feedstocks and application of the most advanced efficient upgrading and conversion technologies, which enable cost reduction per unit of energy produced. The proposed project will therefore emphasize careful selection of the most advanced technologies, as well as enabling efficient utilization of the currently wasted biomass feedstock streams. Alternative biomass-to-heat applications, e.g. small-scale gasification, have not yet reached a full-commercial stage and have, therefore, been de-

prioritized by the project²². Though 1st stage anaerobic digestion systems are fully commercial, their application is most cost-effective in combined heat and power applications; and they are more suited to processing fairly high-moisture agricultural wastes (like manure) rather than solid biomass wastes (like forestry residues).

2.7. Sustainability (including financial sustainability)

The proposed project aims to facilitate creation of an enabling environment for, and provide usable demonstrations for production and utilization for municipal heating applications of upgraded biomass fuels on the basis of the currently non-used biomass streams. As such, effective demonstrations and other barrier removal measures are set to create a favorable basis for private sector interest in investing in biomass development in Georgia and the Investment Grant Mechanism is seen as a key factor contributing toward achieving the project objective. Sustainability of project intervention is also facilitated by the fact that by the end of the project there will be a financing mechanism in place for the financing of biomass projects in Georgia.

On the supply side, involvement of Georgian Coal Ltd. – a Tbilisi-based SME experienced in production of wood briquettes and charcoal – will alleviate some of the technology-related risks and contribute toward smooth operation of the pilot biomass upgrading plant. Participation of an Italian-owned D&V Ltd. – with its long-term license for chestnut forest sanitary cutting, hence secured supply of substantial additional biomass feedstock – will serve as a safeguard for supplying necessary additional biomass feedstock to ensure the heating needs of the Tbilisi Municipality are fully met.

On the demand side, a powerful incentive for Tbilisi Municipality to invest in biomass heating systems is the multiple benefits including reducing dependence on imported fuel, lessening financial burden on the municipal budget, job creation etc. In addition, GHG emission reduction obligations took up by Tbilisi under the Covenant of Mayors provide further incentives for adoption of biomass technologies. Under the Covenant of Mayors, the City of Tbilisi has committed to reduce its greenhouse gas emissions by 20% and has drafted a Sustainable Energy Action Plan for how these emission reductions will be achieved. Promotion of greater use of biomass energy has formed an important part of this action plan.

2.8. Replicability

Replication potential for biomass-to-heat applications is quite substantial in Georgia once the pilot projects have proven the attractiveness of the proposed approach. As indicated in the pre-feasibility study undertaken during project preparation, Georgia has significant incremental biomass potential, conservatively estimated at around 130,000 tons of biomass per year. These feedstocks could easily sustain a number of small- to medium-scale biomass upgrading plants that could cost-effectively produce woodchips, briquettes or pellets both for domestic consumption and for export. Tbilisi municipality alone has close to 200 facilities under its management (kindergartens, schools, hospitals etc.) that use natural gas or diesel oil for heating. These, and similar municipal facilities in other regions across the country, could create sizeable demand for upgraded biomass and bioheat technologies. Further demand for upgraded biomass fuels – provided these are competitively priced and are convenient to use – could come from numerous rural households that currently use fuel inefficiently and have up to half of their heat demand unmet by the available energy sources. Replication aims to have influenced at least two other similar initiatives to be designed and initiated during the lifetime of the project.

²² Refer to Annex 5 for details on commercial status of different biomass-to-energy technologies as per IEA Bioenergy, 2009

3. PROJECT RESULTS FRAMEWORK

<p>This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD: Underlying disaster risk factors are reduced, focusing on sustainable environmental and natural resource management</p>					
<p>Country Programme Outcome Indicators: Enabling environment and status of implementation of national and international environmental commitments</p>					
<p>Primary applicable Key Environment and Sustainable Development Key Result Area (same as that on the cover page): 1. Mainstreaming environment and energy OR 2. Catalyzing environmental finance OR 3. Promote climate change adaptation OR 4. Expanding access to environmental and energy services for the poor.</p>					
<p>Applicable GEF Strategic Objective and Program: GEF-4 Strategic Programme #4 on "Promoting Sustainable Energy Production from Biomass".</p>					
	Indicator	Baseline	End of Project Targets	Source of verification	Risks and Assumptions
Project Goal Reduction of GHG emissions associated with thermal energy use in the municipal services sectors in Georgia	GHG emission reductions, achieved during project lifetime, from project-supported installation and operation of biomass boilers in Tbilisi	Zero	7,000 tons CO ₂ eq	Project monitoring system	- Feasibility studies prove cost-effectiveness of biomass technologies in Georgian context - Required investments are forthcoming
Project Objective To promote sustainable production and utilization of upgraded biomass fuels in heating applications in the municipal services sector of Georgia	Installed capacity of incremental biomass heating systems, substituting fossil fuel-based heating, supported by the project	Zero	At least 2 MW	Commissioning reports	- Feasibility studies prove cost-effectiveness of biomass technologies in Georgian context - Required investments are forthcoming
Outcome 1: Enhanced and approved policy and regulatory framework for efficient utilization of biomass energy	Availability of long-term vision for bioenergy development in Georgia	No long-term vision for bioenergy sector in Georgia	National Bioenergy Strategy and Action Plan, which reflects broad stakeholder consensus, adopted by the Government of Georgia	Bioenergy strategy; stakeholder consultation reports	Government of Georgia willing to formalize vision for bioenergy development in the country
	Share of upgraded biomass fuels on the Georgian market that meet the national quality standards	No standards	Quality standards for upgraded biomass fuels and biomass heating systems are in place At least 30% of upgraded biomass fuels meeting the standards	Testing reports	Relevant stakeholders provide sufficient level of cooperation
	Availability of detailed information on the amount and location of biomass in Georgia	Biomass information scarce and unreliable	Detailed inventory of available biomass resources with update mechanisms in place Established biomass monitoring system	Inventory database, reports	Relevant stakeholders provide sufficient level of cooperation

Outcome 2 Increased market confidence in the feasibility of production and utilization of upgraded biomass fuels	Status of investors' decision to co-finance a biomass upgrading plant in Tbilisi	Preliminary co-financing agreements made	Investors closed financing as per pilot plant's business plan	Biomass plant business plan; financial closure statements	Biomass upgrading plant technical, operational, economics and risk profiles meet the investor's thresholds
	Status of Tbilisi Municipality's decision to co-finance installation of 10 biomass boilers heating systems in municipal buildings	Preliminary co-financing agreements made	Tbilisi Municipality closed financing for the pilot boilers installation business plan	Biomass plant business plan; financial closure statements	Biomass boilers technical, economics, operational profiles meet Tbilisi Municipality's requirements
	Status of a dedicated funding window for bioenergy projects in Georgia	No dedicated funding window available	Dedicated funding window for bioenergy projects fully agreed with KfW (or other facility) and operational	Financial facility agreements	Relevant Government ministries (most importantly, Ministry of Energy and Ministry of Finance) cooperate
Outcome 3 Created local supply of and demand for upgraded biomass fuels	Status of Investment Grant Mechanism	No mechanism	Operational criteria agreed with relevant stakeholders and investment grants released	Project monitoring system	Co-financing partners keep their financial commitments
	Biomass upgrading plant in Tbilisi	No biomass upgrading plant in Tbilisi	Biomass upgrading plant in Tbilisi launched and operational	Commissioning report, project monitoring system	Relevant stakeholders provide sufficient level of cooperation
Outcome 4: Improved public knowledge and stakeholder capacities for bioenergy development and replication	Number of municipal buildings operating new biomass boilers using upgraded biomass fuels	Zero	At least 10 biomass boilers using biomass installed and in operation	Commissioning reports project monitoring system	Biomass fuel supplies and boiler efficiency sustained at designed level
	Status of Bioenergy Association of Georgia	No formal vehicle for bioenergy stakeholder interaction	Established Bioenergy Association of Georgia with a sustainable business plan which is able to continue operations after the project ends	Surveys reports	Sufficient level of interest among potential bioenergy sector participants
	Number of new bioenergy projects initiated in Georgia	No bioenergy projects, insufficient capacities	At least 2 new bioenergy projects designed with financial closure and construction initiated	Project monitoring system	Sufficient level of interest among potential bioenergy sector participants

4. TOTAL BUDGET AND WORK PLAN

Award ID:	00061612	Project ID(s):	00078116
Award Title:	PIMS 4335 CC MSP Promotion of biomass production and utilization in Georgia		
Business Unit:	GEO10		
Project Title:	PIMS 4335 CC MSP Promotion of biomass in Georgia		
PIMS no.	4335		
Implementing Partner (Executing Agency)	Ministry of Environmental Protection and Natural Resources		

GEF Outcome/Atlas Activity	Responsible Party/Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	See Budget Note:
OUTCOME 1: Policy framework for bioenergy	Ministry of Environment	62000	GEF	71200	International Consultants	8,000	8,000	8,000		24,000	1
				71300	Local Consultants	3,000	6,000	6,000	3,000	18,000	2
				71400	Contractual services – individuals	4,500	4,500	4,500	4,500	18,000	3
				71600	Travel	1,500	1,500	1,500	1,500	6,000	4
				72100	Contractual services – companies	5,000	5,000	0	0	10,000	5
				74500	Miscellaneous	500	500	500	500	2,000	
					sub-total GEF	22,500	25,500	20,500	9,500	78,000	
				71300	Local Consultants	5,000	5,000	5,000	5,000	20,000	2
				72100	Contractual services – companies	0	20,000	24,000	0	44,000	5
					sub-total UNDP	5,000	25,000	29,000	5,000	64,000	
	Total Outcome 1	27,500	50,500	49,500	14,500	142,000					
OUTCOME 2: Increased market confidence in bioenergy production and use	Ministry of Environment	62000	GEF	71200	International Consultants	6,000	7,000	8,000	0	21,000	1
				71300	Local Consultants	3,000	4,000	4,000	3,000	14,000	2
				71400	Contractual services – individuals	4,500	4,500	4,500	4,500	18,000	3
				72100	Contractual services – companies	15,000	13,000	13,000	0	41,000	5
					Total Outcome 2	28,500	28,500	29,500	7,500	94,000	
OUTCOME 3: Supply and demand for bioenergy	Ministry of Environment	62000	GEF	71300	Local Consultants	2,000	5,000	5,000	2,000	14,000	2
				72600	Grants	0	408,000	150,000	0	558,000	6
					Total Outcome 3	2,000	413,000	155,000	2,000	572,000	
OUTCOME 4: Information and stakeholder	Ministry of Environment	62000	GEF	71200	International Consultants	0	0	15,000	15,000	30,000	1
				71300	Local Consultants	0	4,000	5,000	3,000	12,000	2
				71400	Contractual services – individuals	6,600	6,600	6,600	6,600	26,400	3

capacities													
			71600	Travel	1,500	1,500	1,500	1,500	1,600	6,100	4		
			72100	Contractual services – companies	6,000	7,000	6,500	6,500	0	19,500	5		
			74100	Professional Services	1,000	1,000	1,000	1,000	1,000	4,000	7		
			74200	Printing and publication costs	0	3,000	3,000	3,000	4,000	10,000	8		
				Total Outcome 4	15,100	23,100	38,600	31,200	31,200	108,000			
			71400	Contractual services – individuals	15,600	15,600	15,600	15,600	15,600	62,400	3		
			71600	Travel	1,500	1,500	1,500	1,500	1,500	6,000	4		
			72400	Communication	650	650	650	650	650	2,600			
			72500	Office supplies	500	500	500	500	500	2,000			
				sub-total GEF	18,250	18,250	18,250	18,250	18,250	73,000			
			71400	Contractual services – individuals	22,100	22,100	22,100	22,100	22,100	88,400	3		
			72200	Equipment	2,600	0	0	0	0	2,600			
				sub-total UNDP	24,700	22,100	22,100	22,100	22,100	91,000			
				Total Project Management	42,950	40,350	40,350	40,350	40,350	164,000			
				PROJECT TOTAL	116,050	555,450	312,950	95,550	1,080,000				

Budget Notes:

Number	Note
1	International consultants are budgeted at US\$ 3000 per week
2	Local short-term consultants are budgeted at US\$ 500 per week
3	Individual contractors' rates based on local UN pay scales
4	DSA's are budgeted at US\$ 200 per day
5	Can cover costs of both international and national consulting companies/institutions and provision of services such as pilot plant's technical design or organization of workshops etc.
6	Grants to provide investment subsidies to the pilot biomass upgrading plant and biomass boiler installations in Tbilisi
7	Audit services
8	Including awareness raising and training materials

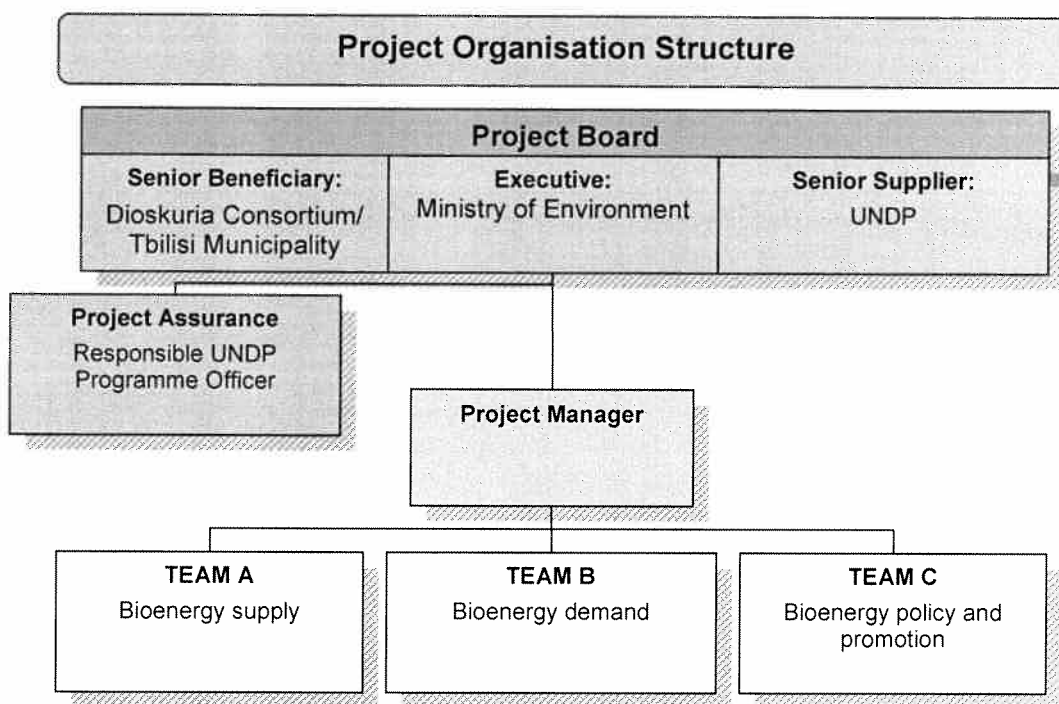
Summary of Funds:

	Amount Year 1		Amount Year 2		Amount Year 3		Amount Year 4		Total
	Cash US\$	In-kind US\$	Cash US\$	In-kind US\$	Cash US\$	In-kind US\$	Cash US\$	In-kind US\$	
GEF		86,350	508,350	261,850	68,450		925,000		
Tbilisi municipality		100,000	1,250,000	900,000	750,000		3,000,000		
Georgian Coal		20,000	180,000	50,000	50,000		300,000		
D&V		70,000	300,000	70,000	60,000		500,000		
Dioskuria		0	50,000	50,000	300,000		400,000		
UNDP		29,700	47,100	51,100	27,100		155,000		
Ministry of Environment		25,000	25,000	25,000	100,000		100,000		
TOTAL		331,050	2,360,450	1,407,950	1,280,550		5,380,000		

Summary of project co-financing

Source	Outcome 1		Outcome 2		Outcome 3		Outcome 4		Project Management		Total	
	Cash US\$	In-kind US\$	Cash US\$	In-kind US\$	Cash US\$	In-kind US\$	Cash US\$	In-kind US\$	Cash US\$	In-kind US\$	Cash US\$	In-kind US\$
Tbilisi municipality			100,000		3,000,000						3,000,000	
Georgian Coal			20,000	30,000	80,000	150,000		20,000			100,000	200,000
D&V			50,000		420,000		30,000				500,000	
Dioskuria							400,000				400,000	
UNDP	64,000								91,000		155,000	
Ministry of Environment										100,000		100,000
TOTAL	64,000		200,000		3,550,000		450,000		191,000		4,455,000	

5. MANAGEMENT ARRANGEMENTS



The project will be executed by the Ministry of Environment and Natural Resources Protection of Georgia following UNDP guidelines for nationally executed projects. The Ministry of Environment and Natural Resources Protection will provide office space to the project team as part of its contribution. The Executing Agency will sign a grant agreement with UNDP and will be accountable to UNDP for the disbursement of funds and the achievement of the project goals, according to the approved work plan. The executing agency will assign a senior officer as the National Project Director to: (i) coordinate the project activities with activities of other Government entities; (ii) certify the expenditures in line with approved budgets and work-plans; (iii) facilitate, monitor and report on the procurement of inputs and delivery of outputs; (iv) approve the Terms of Reference for consultants and tender documents for sub-contracted inputs; and (v) report to UNDP on project delivery and impact.

A Project Board will be established at the inception of the project to monitor the project progress, to guide its implementation and to support the project in achieving its listed outputs and outcomes. The Project Board will be chaired by the MEPNR and include representatives of UNDP, Tbilisi Municipality, Georgian Coal Ltd., D&V Ltd., Dioskuria Ltd. Other members (e.g. KfW, GiZ, USAID etc.) can be invited at the decision of the Project Board on an as-needed basis, but taking due regard that the Project Board remains sufficiently lean to be operationally effective. The final list of the Project Board members will be completed at the outset of project operations and presented in the Inception Report by taking into account the envisaged role²³ of different parties in the Project Board. The project manager will participate as a non-voting member in the Project Board meetings and will also be responsible for compiling a summary report of the discussions and conclusions of each meeting.

²³ **Senior Supplier:** individual or group representing the interests of the parties concerned which provide funding for specific cost sharing projects and/or technical expertise to the project. **Senior Beneficiary:** individual or group of individuals representing the interests of those who will ultimately benefit from the project.

The day-to-day management of the project will be carried out by a Project Management Unit (PMU) under the overall guidance of the Project Steering Committee. The PMU will be based in Tbilisi and will report to UNDP, the executing agency and the Project Board. The PMU will be composed of a full-time Project Manager, a full-time Project Assistant and a part-time Procurement Assistant, whose Terms of Reference are presented in Annex 5 to this project document. The Project Manager will be selected jointly by the Executing Agency and UNDP, in consultation with the UNDP/GEF Regional Technical Adviser from the UNDP/GEF Regional Co-ordination Unit in Bratislava.

The Project Manager will be supported by short-term international and national experts taking the lead in the implementation of the specific technical assistance components of the project. Contacts with experts and institutions in other countries that have already gained more experience in implementing bioenergy projects, related policies and financial support measures are also to be established.

UNDP Georgia will maintain the oversight and management of the overall project budget. It will be responsible for monitoring project implementation, timely reporting of the progress to the UNDP Regional Co-ordination Unit and GEF as well as organizing mandatory and possible complementary reviews and evaluations on an as-needed basis. It will also support the Executing Agency in the procurement of the required expert services and other project inputs and administer the required contracts. Furthermore, it will support the co-ordination and networking with other related initiatives and institutions in the country.

For successfully reaching the stated objective and outcomes of the project, it is essential that the progress of different project components will be closely monitored both by the key local stakeholders and authorities as well as by project's international technical advisor, starting with the finalization of the detailed, component-specific work plans and implementation arrangements and continuing through the project's implementation phase. The purpose of this is to facilitate early identification of possible risks to successful completion of the project together with adaptive management and early corrective action, when needed.

During the implementation, proper care will be taken to have adequate communication and co-ordination mechanisms in place to ensure that areas of common interest can be addressed in a cost-efficient way.

6. MONITORING AND EVALUATION

The project will be monitored through the following M&E activities. The M&E budget is provided in the table below.

Project start:

A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organization structure, UNDP country office and where appropriate/feasible regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

The Inception Workshop should address a number of key issues including:

- a) Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis-à-vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.

- b) Based on the project results framework and the relevant GEF Tracking Tool if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
- c) Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.
- d) Discuss financial reporting procedures and obligations, and arrangements for annual audit.
- e) Plan and schedule Project Board meetings. Roles and responsibilities of all project organisation structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

Quarterly:

- Progress made shall be monitored in the UNDP Enhanced Results Based Management Platform.
- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP GEF projects, all financial risks associated with financial instruments such as revolving funds, microfinance schemes, or capitalization of ESCOs are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).
- Based on the information recorded in Atlas, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.
- Other ATLAS logs can be used to monitor issues, lessons learned etc. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

Annually:

- Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (30 June to 1 July). The APR/PIR combines both UNDP and GEF reporting requirements.

The APR/PIR includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative)
- Project outputs delivered per project outcome (annual).
- Lesson learned/good practice.
- AWP and other expenditure reports
- Risk and adaptive management
- ATLAS QPR
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

Periodic Monitoring through site visits:

UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and

UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

Mid-term of project cycle:

The project will undergo an independent Mid-Term Evaluation at the mid-point of project implementation (insert date). The Mid-Term Evaluation will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the UNDP Evaluation Office Evaluation Resource Center (ERC).

The relevant GEF Focal Area Tracking Tools will also be completed during the mid-term evaluation cycle.

End of Project:

An independent Final Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and GEF guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

The Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Office Evaluation Resource Center (ERC).

The relevant GEF Focal Area Tracking Tools will also be completed during the final evaluation.

During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Learning and knowledge sharing:

Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation through lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Communications and visibility requirements:

Full compliance is required with UNDP's Branding Guidelines. These can be accessed at <http://intra.undp.org/coa/branding.shtml>, and specific guidelines on UNDP logo use can be accessed at: <http://intra.undp.org/branding/useOfLogo.html>. Amongst other things, these guidelines describe when and how the UNDP logo needs to be used, as well as how the logos of donors to UNDP projects needs to be used. For the avoidance of any doubt, when logo use is required, the UNDP logo needs to be used alongside the GEF logo. The GEF logo can be accessed at: http://www.thegef.org/gef/GEF_logo. The UNDP logo can be accessed at <http://intra.undp.org/coa/branding.shtml>.

Full compliance is also required with the GEF's Communication and Visibility Guidelines (the "GEF Guidelines"). The GEF Guidelines can be accessed at: http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding_the_GEF%20final_0.pdf. Amongst other things, the GEF Guidelines describe when and how the GEF logo needs to be used in project publications, vehicles, supplies and other project equipment. The GEF Guidelines also describe other GEF promotional requirements regarding press releases, press conferences, press visits, visits by Government officials, productions and other promotional items.

Where other agencies and project partners have provided support through co-financing, their branding policies and requirements should be similarly applied.

Table 2: M&E work plan and budget

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
Inception Workshop and Report	<ul style="list-style-type: none"> ▪ Project Manager ▪ UNDP CO, UNDP/GEF 	\$2,000	Within first two months of project start up
Measurement of Means of Verification of project results	<ul style="list-style-type: none"> ▪ UNDP/GEF RTA/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members ▪ Monitoring and Reporting consultant 	To be finalized in Inception Phase and Workshop	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on <i>output and implementation</i>	<ul style="list-style-type: none"> ▪ Oversight by Project Manager ▪ Project team 	To be determined as part of the Annual Work Plan's preparation	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG 	None	Annually
Periodic status/progress reports	<ul style="list-style-type: none"> ▪ Project manager and team 	None	To be determined by Project team and UNDP CO
Mid-term Evaluation	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team) 	\$17,000	At the mid-point of project implementation.
Final Evaluation	<ul style="list-style-type: none"> ▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. 	\$17,000	At least three months before the end of project

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
	evaluation team)		implementation
Project Terminal Report	<ul style="list-style-type: none"> ▪ Project manager and team ▪ UNDP CO ▪ local consultant 	0	At least three months before the end of the project
Audit	<ul style="list-style-type: none"> ▪ UNDP CO ▪ Project manager and team 	\$4,000	Annually
Visits to field sites	<ul style="list-style-type: none"> ▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives 		As needed
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US\$ 40,000	

7. LEGAL CONTEXT

This document together with the CPAP signed by the Government and UNDP which is incorporated by reference constitute together a Project Document as referred to in the SBAA and all CPAP provisions apply to this document.

Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

The implementing partner shall:

- a) Put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried; and.
- b) Assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via <http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm>. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

Audit Clause: The Audit will be conducted in accordance with UNDP Financial Regulations and Rules and applicable audit policies on UNDP projects.

8. ANNEXES

Annex 8.1 – Offline risk log

Annex 8.2 – Agreements

Annex 8.3 – Summary of findings of the PPG pre-feasibility study

Annex 8.4 – Description of pilot investments to be supported by the project

Annex 8.5 – Terms of reference

Annex 8.6 – Georgian forestry statistics

Annex 8.7 – Development of key biomass conversion technologies

Annex 8.8 – Greenhouse gas emission reduction analysis

Annex 8.1. Offline Risk Log

#	Description	Date identified	Type	Impact & Probability	Countermeasures / Mgt response	Owner	Submitted, updated by	Last Update	Status
1	Biomass feedstock (wood residues, hazelnut shells) price growth due to increased competition from alternative uses of biomass waste	PPG	Financial	I – high P – medium	Realistic assessment of feedstock prices in the first place when designing biomass upgrading plant; Long-term feedstock supply arrangements (e.g. from forest concessions)				
2	Unreliable biomass feedstock supply for the pilot biomass upgrading plant	PPG	Operational	I – medium P – medium	Careful sourcing of feedstock, including identification of alternative supply options within economically-justifiable distance from Tbilisi; Entrance into long-term business arrangements (e.g. consortium) with feedstock suppliers; Right-sizing the biomass upgrading facility to the lowest guaranteed supply of biomass, which is to be done as part of the full-scale feasibility study				
3.	Eventual investment into biomass energy from private or public sector not forthcoming	PPG	Strategic	I – high P – medium	The project-financed Investment Grant Mechanism will be a key factor in mitigating this risk by providing investment subsidies to cover up to 30% of pilot projects' investment costs; A thorough analysis of the entire spectrum of aspects related to the pilot upgrading plant and biomass boilers (production, organizational and financial structure, costs and revenues) as part the investment-grade feasibility studies, ensuring a return on investment acceptable to the investors				
4.	Lack of relevant	PPG	Strategic	I – medium	Ministry of Environment and Natural				

	support from the local and central Governments			P – low	Resources Protection to play a leading role in “lobbying” the project within the government and pushing the relevant decisions, particularly as part of preparation of the national biomass strategy and action plan, and facilitation of decision by the key government entities (Ministry of Energy and Ministry of Finance) on requesting a biomass funding window as part of KfW’s REF				
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Annex 8.2. Agreements

The co-financing letters are included as separate annex.

Annex 8.3. Summary of findings of the PPG pre-feasibility study

Key findings:

- i. There is biomass waste available in the area around Tbilisi and in Samegrelo region. Aside from amounts already in use under the baseline scenario, additional waste for use in coming years is about 4,500 ton/yr of waste from hazelnut plantations in Samegrelo, owned by Agrigeorgia, a wholly owned subsidiary of Ferrero Spa. Tbilisi could produce up to 9,000 tons of forest waste from 8,000 of municipality-managed forest and urban forestry waste. Further up to 20-30,000 ton/yr could come from a large forestry concession in the region, managed by D&V, a wholly owned subsidiary of Italian company Georgia Timber International.
- ii. Sawdust resources in and around Tbilisi are estimated around 1,500 ton/yr. Similar amounts of sawdust are estimated to be available in Samegrelo region, not enough to support a sawdust based pellet industry on its own, but only in mixture with other biomass feedstocks.
- iii. There is currently no market for upgraded biomass fuel in the region. At the same time, the only possibility to associate enhanced use of biomass energy with GHG abatement is for biomass promotion to focus on fuel substitution, where the baseline fuel is fossil—either heating oil or natural gas, i.e. in municipal heating.
- iv. In order to demonstrate usefulness of upgraded biomass fuel in the region, with potential for wider adoption of more efficient burners, it is proposed to start with 250-500 kW heat boiler systems. These are typical of medium-scale structures, such as municipal buildings for schools and administration, to be replicated in municipalities in Samegrelo as well as in Tbilisi with a desire to switch from fossil fuel (some diesel; mostly natural gas) to biomass to reduce costs, as well as dependence on fossil fuels and related GHG emissions. Project investment costs are about \$100,000 per boiler unit for dual use. Payback periods for switching from gas to biomass are 4-5 years, depending on the price paid for biomass fuel (wood, woodchips, briquettes or pellets) and the price of baseline fuel being substituted (i.e. natural gas) at \$450 per 1000 m³.
- v. It is estimated that, using agricultural waste stream from hazelnut prunings and hazelnut shells, plus supply from two regional forestry enterprises, could support a 10,000 ton/yr plant costing about \$0.9M (pellets) and \$0.5M (briquettes). Cost to make fuel would be \$50/ton for pellets) and \$25/ton (briquette). Assuming sale prices of \$70 (pellets) and \$40 (briquettes) /ton, payback periods for either pellet or briquette plant are about 3-4 years.
- vi. GHG emission reductions of pilot study are small (~1,000 tCO₂eq/yr), yet a full scale up of these activities could achieve in the region up to a maximum of 100,000 tCO₂eq/yr abatement.
- vii. Based on the analyses performed in this report, it is found that a briquette facility located in Samegrelo and/or Tbilisi, with capacity of 10,000 ton annually, is economically attractive and can supply biomass fuel to participating municipalities in Samegrelo and Tbilisi.
- viii. The proposed pilot activities include demand side bioenergy use in participating municipalities in Samegrelo and Tbilisi, as well as supply side of biomass waste supporting production of briquettes in Samegrelo and/or Tbilisi region.
- ix. Joint participation of all partners allows for significant cost savings by all. In particular municipalities benefit from being able to purchase low-cost briquettes and thus increase returns on investments.
- x. Next Steps include establishment of biomass waste supply agreements to support viability of briquette facility; supply agreements for briquettes at cost to participating municipalities, as well as establishment of biomass boiler system using supply of unused waste to other partners in the pilot.

A copy of the pre-feasibility study carried out as part of this PPG and of the report on barriers to biomass energy in Georgia is available upon request.

Annex 8.4. Description of pilot investments to be supported by the project

a) Biomass-based boiler systems for municipal building heating in Tbilisi

This pilot will support switch from natural gas and/or diesel oil to upgraded biomass fuels in heating applications in municipal entities (e.g. schools, administrative buildings) in Tbilisi municipality. Within the proposed UNDP/GEF project, GEF funding will go toward providing necessary technical assistance in identification and assessment of cost-effective opportunities for fuel switch, whereas co-financing committed by the Tbilisi Municipality, together with a GEF investment grant (preliminarily estimated at 30% of boiler investment costs), will go toward actual boiler installations, as well as subsequent biomass system operation and biomass fuel procurement from the upgrading facility to be set up as part of the project's other component. The project will analyze the 196 municipal buildings managed by Tbilisi Municipality to identify at least 10 candidate buildings for biomass conversion. The project will prioritize those municipal buildings which currently don't have central hydronic heating systems and which are included in municipal retrofit plans, so that the project will cover the incremental costs of biomass boiler system installation to provide base-load heating, with the natural gas systems to be used to cover peak-loads or as a backup.

Switching from natural gas (or diesel oil) to biomass fired boilers can represent an incentive for Tbilisi municipality to save money while also reducing its greenhouse gas emissions, given its commitment to reduce GHG emissions by 20% below 1990 levels by 2020. Such a switch would not be cost-effective for household typical power, i.e., 20-40 kW. Analysis shows it is not attractive to switch from natural gas to wood fuels for boiler sizes below 150 kW. Hence, this limitation will be reflected in the selection of municipal buildings that will benefit from biomass installations. Tbilisi municipality has the possibility to scale up the deployment of biomass boilers through several dozen candidate buildings.

Current preliminary computations indicate that investment costs for fuel switching would be about \$100,000 per new biomass boiler, with CO₂ savings of over 7,000 tons of CO₂ over a 20 year investment lifetime. Simple payback period ranges from 4 to 5 years depending on the price of biomass fuel paid (\$70-90 per ton) and the current natural gas price (as the baseline competing fuel) of \$450 per 1,000m³.

The GEF Investment Grant Mechanism will cover up to US\$ 30,000 or 30% of the individual boiler investment costs for a total grant of US\$ 300,000, while Tbilisi Municipality co-financing will cover the balance, i.e. US\$ 70,000 per boiler for a total of US\$ 700,000 for ten boilers. On top of that, Tbilisi Municipality co-financing will be used to co-fund feasibility studies for identification of cost-effective fuel switch options for biomass boilers (US\$ 10,000 per boiler), as well as fund capital investment costs of installing hydronic central heating systems and auxiliary biomass storage and handling equipment (US\$ 50,000 per heating system), cover fuel costs for three years of boiler operation during the UNDP-GEF project lifetime (US\$ 60,000 per boiler) and finance capital costs of renovating the target municipal buildings where biomass boiler installation is envisaged (US\$ 110,000 per building). The building energy efficiency improvements to be co-financed by Tbilisi Municipality are going to complement the overall package of activities toward enhancing municipal energy sustainability and achieving greater GHG mitigation benefits, thus fully meeting the objectives of both the proposed UNDP-GEF project and the Sustainable Energy Action Plan 2011-2020 developed by the City of Tbilisi under the Covenant of Mayors. At the same time, it is worth highlighting that, for reasons of conservativeness and manageability of GHG calculations and monitoring, neither the current emissions from the municipal building stock nor the resultant GHG emission reductions resulting from municipal building energy efficiency improvements will be reflected in the proposed UNDP-GEF project's GHG profile and no emission reductions related to energy efficiency interventions will be credited to GEF.

b) Biomass upgrading plant in Tbilisi

In order to have a working demand-side pilot for biomass energy for heat boilers in Tbilisi municipality, it will be necessary to create a credible and long-term supply of some form of upgraded biomass fuel, for the simple reason that transporting and then storing large amounts of biomass fuel (in the order of 300 tons/year per participating municipality building) is done much more effectively with treated, densely packed material compared to firewood or other types of loose and unprocessed wood waste. The basis for a pilot biomass upgrading plant in Tbilisi will be the 9,000 tons of wood waste coming from urban forestry cuttings and 8,000 ha of forest managed by the municipality. On top of that, at least 25,000 tons of forest waste material could be coming from licensed forestry operations of D&V Ltd. in Zestafoni.

A biomass upgrading plant in Tbilisi is envisaged to be set up by a private consortium, led by Tbilisi-based SME Georgian Coal Ltd., with D&V Ltd. as a co-investor that is currently striving to find a way to eliminate the wood waste stream from its chestnut tree sanitary cutting operations. Preliminary computations done at the PPG stage indicate that a 10,000 tons/year pelletizing facility would be able to have attractive returns while supplying Tbilisi municipality (and potentially other customers in the area). The total investment cost of a pelletizing facility has been estimated at around US\$ 860,000, which is based on analysis of a reference case 45,000 tons/year pellet plant respectively scaled down to the lower capacity and the Georgian economic context as per relevant guidelines²⁴. Investment costs for an equally-sized briquetting facility have been estimated at about half that of the pelletizing plant, i.e. US\$ 400,000.

With both facilities, as international experience shows, biomass feedstock price accounts for the bulk of the total production cost of the final end product (pellets or briquettes): ranging from 30% for technology with feedstock drying and up to 60% for drying-free technology. Specific production costs for both facilities have been estimated from US\$ 25 per ton of briquetted up to US\$ 50 per ton of pellets, which approximates general market figures adjusted to the Georgian context. Capital investment and operating cost for a wood chipping facility (as another alternative biomass upgrading technology) would be a good degree lower than either of the above options.

The PPG stage has focused on analyzing the most costly option, i.e. a pelletizing plant as the “worst-case” scenario, to demonstrate viability of biomass upgrading in Georgia. But the ultimate decision on selecting a given technology will depend on the outcomes of the fully-fledged assessments on the availability, typology, properties, extractability of the biomass feedstocks in Tbilisi, as well as on the cost-effectiveness of switching to a particular type of densified biomass fuel, complexity of supply and storage logistics, and limitations imposed by the particular buildings in terms of integration of biomass based boiler heating systems.

With the above considerations in mind, the GEF Investment Grant Mechanism will cover up to US\$ 258,000 or 30% of the total investment costs for the biomass upgrading plant, while Georgian Coal Ltd. and D&V Ltd. will cover the balance, i.e. US\$ 600,000. The remaining co-financing from the two companies (US\$ 200,000) will go toward the initial operating costs of the biomass plant.

The following table provides a summary of roles of the key project partners, as identified at the PPG stage:

Table 3: Project partners and their respective roles in the pilot demonstrations

Partner	Co-financing Commitment	Role of Partner
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²⁴ Mani, S., S. Sokhansanj, X. Bi, and A. Turhollow “Economics of Producing Fuel Pellets from Biomass” *Applied Engineering in Agriculture*, 2006

Partner	Co-financing Commitment	Role of Partner
Tbilisi Municipality	US\$ 3,000,000	A signatory to the Covenant of Mayors, Tbilisi Municipality has an obligation to reduce its GHG footprint by 20% by the year 2020. The revenues of the municipal budget stand at over \$300 million ²⁵ . The city runs a Municipal Development Fund capitalized annually with close to \$0.6 million. Tbilisi Municipality is the major co-financing partner of this project and their role in the project will be to provide buildings that will have biomass boiler based systems installed, paid for by the municipality and GEF investment grant.
Georgian Coal Ltd.	US\$ 300,000	Tbilisi-based company runs a small-scale briquetting and charcoal production facility supplying charcoal to local restaurants. The company is interested in expanding wood briquetting business but is currently constrained on feedstock supply. The company will lead the biomass upgrading plant to be set up in Tbilisi to supply upgraded biomass fuel to the municipality
D&V Ltd. (Georgia Timber International)	US\$ 500,000	D&V is a Georgian subsidiary of the Italian company Georgia Timber International that runs an 8-years license for sanitary cutting in 6,000 ha of chestnut forests in Zestafoni municipality. Substantial volumes of forestry waste (estimated at around 25,000 tons/year) are left after sanitary cuttings, hence the company's interest in collaboration with the project on effectively utilizing the residues. The company will be a supplier of wood waste to and co-investor into the Georgian Coal Ltd-led biomass upgrading facility
Dioskuria Ltd.	US\$ 400,000	Dioskuria, based in Zugdidi, is a major Georgian wholesale company that sells around 2,000 tons of hazelnuts annually. The company is interested in setting up – in a consortium with other players - a production facility of upgraded biomass fuel (briquettes) in Western Georgia. The fuel can be supplied at cost to municipalities in the region or exported. The company will be the key partner for replication of project-supported pilot biomass upgrading plant in Tbilisi.

²⁵ http://www.tbilisi.gov.ge/index.php?lang_id=ENG&sec_id=174

Annex 8.5. Terms of Reference

Project Board

Duties and responsibilities:

The Project Board is the main body to supervise the project implementation in accordance with UNDP rules and regulations and referring to the specific objectives and the outcomes of the project with their agreed performance indicators;

The main functions of the Project Board are:

- General monitoring of the project progress in meeting of its objectives and outcomes and ensuring that they continue to be in line with the national development objectives;
- Facilitating the co-operation between the different Government entities, whose inputs are required for successful implementation of the project, ensuring access to the required information and resolving eventual conflict situations raising during the project implementation when trying to meet its outcomes and stated targets;
- Supporting the elaboration, processing and adoption of the required institutional, legal and regulatory changes to support the project objectives and overcoming of related barriers;
- Facilitating and supporting other measures to minimize the identified risks to project success, remove bottlenecks and resolve eventual conflicts;
- Approval of the annual work plans and progress reports, the first plan being prepared at the outset of project implementation;
- Approval of the project management arrangements; and
- Approval of any amendments to be made in the project strategy that may arise due to changing circumstances, after the careful analysis and discussion of the ways to solve problems.

Project Board Structure and Reimbursement of Costs

The Project Board will be chaired by the Project Director or other person assigned by the executing agency. The Project Board will include a representative from the key Ministries and Agencies involved in the project, a representative of UNDP and, as applicable, representatives of project's other co-financing partners. Other members can be invited by the decision of the Project Board, however by taking care that the Project Board still remains operational by its size. The project manager will participate as a non-voting member in the Project Board meetings. A draft list of the permanent members of the Project Board is provided under section III of the project document: "Project Management and Implementation Arrangements". Other participants can be invited into the Board meetings by the decision of the Project Board.

The costs of the Project Board work shall be considered as the Government's or other project partners' voluntary in-kind contribution to the project and shall not be paid separately by the project. Members of the Project Board are also not eligible to receive any monetary compensation from their work as experts or advisers to the project.

Meetings

It is suggested that the Project Board will meet at least twice a year, including the annual TPR meeting. A tentative schedule of the Project Board meetings will be agreed as a part of the annual work plans, and all

representatives of the Project Board should be notified again in writing 14 days prior to the agreed date of the meeting. The meeting will be organized provided that the executing agency, UNDP and at least 2/3 of the other members of the Project Board can confirm their attendance. The project manager shall distribute all materials associated with the meeting agenda at least 5 working days in prior to the meeting.

Project Manager (full-time)

Duties and responsibilities:

Operational project management in accordance with the project document and the UNDP guidelines and procedures for nationally executed projects, including:

- General coordination, management and supervision of project implementation;
- Managing the procurement and the project budget under the supervision of the Executing Agency and with support from UNDP to assure timely involvement of local and international experts, organisation of training and public outreach, purchase of required equipment etc. in accordance with UNDP rules and procedures;
- Submission of annual Project Implementation Reviews and other required progress reports (such QPRs) to the Project Board, Executing Agency and the UNDP in accordance with the section “Monitoring and Evaluation” of the project document;
- Ensuring effective dissemination of and access to information on project activities and results, (including an regularly updated project website);
- Supervising and coordinating the contracts of the experts working for the project;
- As applicable, communicating with project’s international partners and attracting additional financing in order to fulfill the project objectives; and
- Ensuring otherwise successful completion of the project in accordance with the stated outcomes and performance indicators summarized in the project’s log frame matrix and within the planned schedule and budget.

Expected Qualifications:

- Advanced university degree and at least 10 years of professional experience in the specific areas the project is dealing with, including solid knowledge of international experiences, state of the art approaches and best practices in building energy efficiency and its sustainable promotion (by applying different policy measures, new financing mechanisms etc.)
- Experience in managing projects of similar complexity and nature, including demonstrated capacity to actively explore new, innovative implementation and financing mechanisms to achieve the project objective;
- Demonstrated experience and success in the engagement of and working with the private sector and NGOs, creating partnerships and leveraging financing for activities of common interest;
- Good analytical and problem solving skills and the related ability to adaptive management with prompt action on the conclusion and recommendations coming out from the project’s regular monitoring and self-assessment activities as well as from periodical external evaluations;
- Ability and demonstrated success to work in a team, to effectively organise it works and to motivate its members and other project counterparts to effectively work towards the project’s objective and expected outcomes;
- Good communication skills and competence in handling project’s external relations at all levels;
- Fluent in Georgian and English languages
- Familiarity and prior experience with UNDP and GEF requirements and procedures are considered as an asset

Project Assistant (full-time)

Duties and responsibilities:

- Supporting the project manager in the implementation of the project, including:
- Responsibility for logistics and administrative support of the project implementation, including administrative management of the project budget, required procurement support etc.
- Maintaining the business and financial documentation up to date, in accordance with UNDP and other project reporting requirements;
- Organizing meetings, business correspondence and other communication with the project partners;
- Supporting the project outreach and PR activities in general, including keeping of the project web-site up to date;
- Managing the projects files and supporting the project manager in preparing the required financial and other reports required for monitoring and supervision of the project progress;
- Supporting the project manager in managing the contracts, in organizing correspondence and in ensuring effective implementation of the project otherwise

Expected Qualifications:

- Fluent in English and Georgian languages
- Demonstrated experience and success of work in a similar position
- Good administration and interpersonal skills
- Ability to work effectively under pressure
- Good computer skills

Annex 8.6. Georgian forestry statistics

Table 6-1: Forest areas according to the 2003 Inventory

Regions	Total Area (forested) in ha	Concessions by regions (Already issued)
Samtskhe-Javakheti	141,606 (127,828)	5 concessions - for 20 years; 2 con.- for 10 years.
Racha-LechkhumiKv. Svaneti	275,817 (263,093)	2 concessions -for 10 years
Kakheti	324,999 (303,321)	3 con-for 20 years; 2 con.-for 10 years
Imereti	293,926 (286,332)	1 con.-for 20 years; 2 concessions- for 10 years
Samegrelo –Zm. Svaneti	283,931 (268,417)	2 con.-for 20 years; 2 con.- for 10 years; 21 con. –for 5 years
Mtskheta-Mtianeti	252,776 (241,285)	3 –for 20 years; 2-for 10 years.
Guria	67,727 (64,940)	1-for 20 years
ShidaKartli	105,923 (97,421)	5 concessions – for 10 years
Kv. Kartli	148,682 (142,297)	0
Total	1,895,387 (1,794,934)	Total area under concessions 173,000 ha

Note: The above data excludes the regions of Adjara, Abkhazia and South Osetia.

Table 6-2. Legal Harvest Volumes (Cubic Meters) Report for Various Years, Ministry of Environment, Forest Department

Year	1995	2000	2005	2006	2007	2008	2009
Tbilisi City	19,192	4,741	6,278	8,889			
Apkhazia AR				3,651			
Adjara AR	24,464	44,648	73,007	52,050			
Sanegrelo/Zm.Svaneti	22,175	55,923	110,376	62,734	72,044	106,282	53,423
Guria	4,952	24,463	56,384	22,820	28,116	33,043	28,296
Imereti	19,098	45,270	103,718	91,031	118,035	84,907	84,455
Racha-Lechkhumi/Kv.Svaneti	16,509	52,706	52,713	29,032	46,081	36,559	41,690
ShidaKartli	13,623	23,227	52,369	45,875	94,077	84,430	82,439
Mtskheta-Mtianeti	20,341	36,029	68,938	72,288	93,132	86,426	66,466
Kakheti	44,890	61,893	119,479	68,868	159,177	184,164	15,1450
KvemoKartli	32,552	20,757	44,100	15,725	88,180	82,715	90,138
SamtskheJavakheti	71,916	72,483	123,253	85,286	106,581	119,705	99,104
Georgia, in Total	289,712	442,140	810,615	558,249	805,423	818,231	697,461

Table 6-3. Illegal Harvest Volumes (Cubic Meters) Report for Various Years, Ministry of Environment, Forest Department

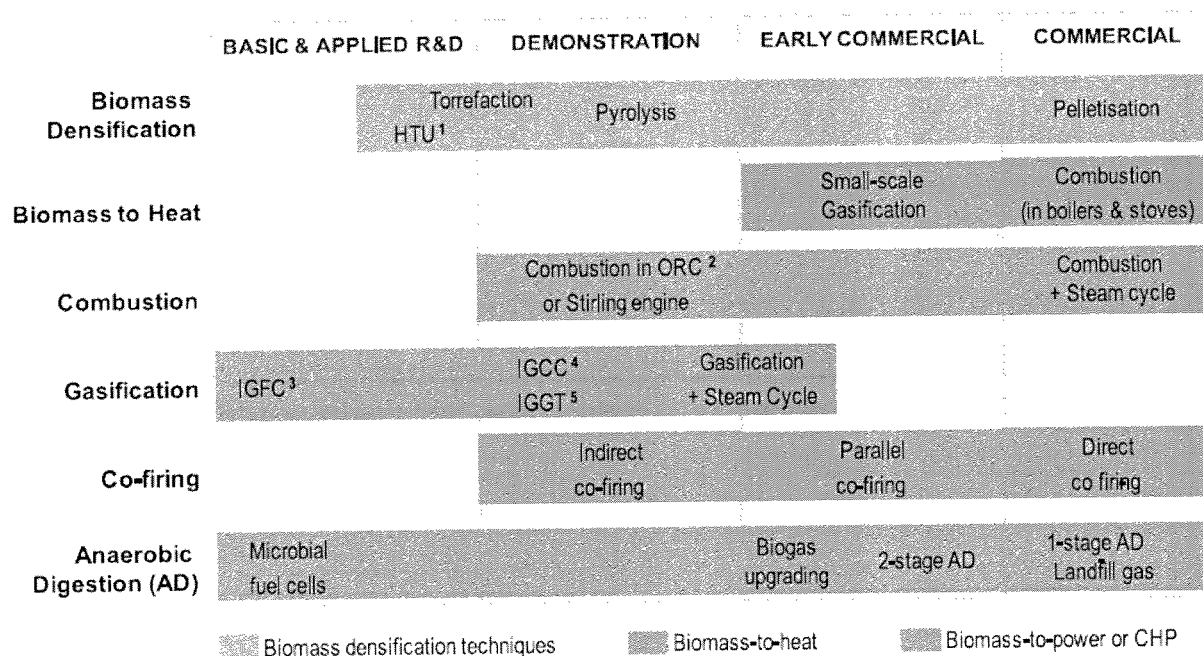
Years	2001	2005	2006	2007	2008	2009
Tbilisi City	1,430	1,722	188			
Apkhazia AR						
Adjara AR	2,577	2,676	3,837			
Sanegrelo/Zm.Svaneti	2,931	3,052	1,046	22,695	1,290	838
Guria	633	1,436	537	1515	306	333
Imereti	6,230	8,673	2,970	4,517	1,603	1,717
Racha-Lechkhumi/Kv.Svaneti	1,615	1672	3,658	8,624	2175	613
ShidaKartli	3,311	3,665	2,586	2,544	202	817
Mtskheta-Mtianeti	3,953	8,480	3,166	26,029	2,389	4,698

Years	2001	2005	2006	2007	2008	2009
Kakheti	9,459	13,299	7,826	10,325	1,936	3,757
KvemoKartli	601	1,747	185	3,453	481	1,934
SamtskheJavakheti	9,547	16,342	11,441	18,973	10,949	15,977
Georgia, in Total	43,287	62,764	40,924	98,675	21,331	30,684

Annex 8.7. Development status of key biomass conversion technologies

Different biomass conversion technologies have been developed that are adapted to the different physical natures and chemical compositions of feedstocks, as well as to the energy service required (heat, electricity, transport fuel). While some conversion means are straightforward (e.g. direct combustion of forest wood for heat production), others necessitate several pre-treatment, upgrading and conversion steps, such as those required for the production of liquid fuels that can be used in an internal combustion engine.

The status of development and commercialization of various biomass conversion technologies is summarized in the chart below. As can be seen, *biomass-to-heat* systems are all commercial, just as combustion (with steam cycle), anaerobic digestion and gasification (+steam cycle) for *power or CHP* applications, or biomass densification through pelletization.



¹Hydrothermal upgrading; ²Organic Rankine Cycle; ³Integrated gasification fuel cell; ^{4,5}Integrated gasification combined cycle (CC)/ gas turbine (GT)

Source: "Bioenergy – a Sustainable and Reliable Energy Source", IEA Bioenergy, 2009

Annex 8.8. Greenhouse gas emission reduction analysis

This section calculates the CO₂ emission reductions²⁶ associated with the implementation of the present GEF project based on the GEF Manual for Calculating GHG Benefits of GEF Projects: Energy Efficiency and Renewable Energy Projects. The annex sets out the methodology and explains key assumptions for calculation of the project direct and indirect CO₂ emission reductions.

A. Project direct emission reductions

The project will support investments into installation of at least 10 biomass-fires boilers in municipal buildings in Tbilisi, thereby substituting natural gas and diesel oil currently used for building heating. As a result of these activities, direct emission reductions totaling **47,800** tons of CO₂eq will be achieved over 20 years of the investments lifetime. The estimate is calculated based on the following formula and assumptions:

$CO_2 \text{ direct} = E * L * C$; where

- C – GHG emission factor, i.e. 74.1 tCO₂eq/TJ for diesel oil and 56 tCO₂eq/TJ for natural gas fired baseline heaters and boilers to be replaced.
- L – Average useful lifetime of boilers, 20 years; and
- E – Annual heat energy generation (in TJ) based on the forecast design parameter of the boilers as per table below.

Table 8-1: BAU and alternative parameters for heat-only boilers at Tbilisi municipality facilities

Tbilisi boilers Parameter	Baseline		Alternative
	Diesel HoB	NG HoB	Biomass HoB
Annual operating hours	3,600	3,600	3,600
Plant load factor, %	41%	41%	41%
Capacity, kW	250	250	250
Efficiency, %	70%	85%	90%
Annual heat production (GWh)	0.90	0.90	0.90
Annual energy use (TJ)	4.6	3.8	3.6
EF, tCO ₂ /TJ	74.1	56	0
Annual emissions, tCO ₂	343.0	213.5	0.0
Annual ERs, tCO ₂ (switch from respective fossil fuel to biomass)	343.0	213.5	
# of boilers to be replaced	2	8	
Project lifetime ERs (3y), tCO ₂	2,057.9	5,123.0	7,180.9
Investment lifetime ERs (20y), tCO ₂	13,719.1	34,153.4	47,872.5

B. Direct post-project emission reductions

The project does not include activities that would result in direct post-project greenhouse gas emission reductions.

²⁶ For reasons of conservativeness, CH₄ emissions associated with natural gas transportation (i.e. leaks) are not included in the present calculation

C. Indirect emission reductions (bottom-up)

Using the GEF *bottom-up* methodology, indirect emission reductions attributable to the project are estimated at **143,400** tons of CO₂eq calculated over 20 years of useful lifetime of the investments. The GEF bottom-up approach implies the replication of the project methodology and investments across Georgia and is calculated per following formula:

$CO_2 \text{ indirect BU} = CO_2 \text{ direct} * RF$, where

- CO₂ direct = estimate for total direct emission reductions
- RF = replication factor

The direct CO₂ emission reductions were estimated in the previous section at 47,800 tCO₂eq. Using a *default replication factor of 3* for a demonstration project with capacity building, suggested in the GEF GHG calculation manual, bottom-up indirect emission reductions were calculated as follows:

$$47,800 \text{ tCO}_2\text{eq} * 3 = \mathbf{143,400 \text{ tons CO}_2\text{eq}}$$

D. Indirect emission reductions (top-down)

Using the GEF *top-down methodology*, indirect emission reductions attributable to the project have been estimated at around **546,000 tons** of CO₂eq over 20 years of useful lifetime of the investments.

The GEF top-down assesses indirect GHG impacts by estimating the combined market potential for the proposed approach or technology within the 10 years after the project lifetime and is calculated per following formula:

$CO_2 \text{ indirect TD} = P10 * CF$, where

- P10 = technical and economic potential for GHG savings with the respective application within 10 years after the project;
- CF = GEF causality factor.

The market potential for GHG emission reductions has been estimated based on the forecast of incrementally available biomass feedstocks Tbilisi and in Samegrelo region that could be engaged in biomass upgrading. The forecast assumes incomplete utilization of the available stocks in the shares indicated in the table below.

Table 8-2: Incremental biomass resources available for upgrading

Type	t/y	GJ/t	TJ/y	% use	TJ/y
forest residues	114,000	16	1,824	50%	912
Sawdust	15,000	16	240	50%	120
hazelnut prunings	1,500	16	24	100%	24
hazelnut shells	3,000	23.5	71	100%	71
	133,500		2,159		1,127

An average emission factor for the current heating energy mix in the services sector has been calculated as follows:

Table 8-3: Calculation of average emission factor for the heating energy mix in the services sector

	Heat energy mix, TJ/y ²⁷	Share	Specific emission factor, tCO ₂ /TJ	Average emission factor, tCO ₂ /TJ		
Natural gas	2,554	46%	56.0	25.6		
Diesel	126	2%	71.9	1.6		
Coal	335	6%	98.3	5.9		
Electricity*	737	13%	56.0	7.4		
Biomass	1,758	31%	0	0.0		
Geothermal	84	1%	0	0.0		
	5,594			40.4		

* This is based on assumption of 10% of electricity consumption in the services sector attributable to heating

Since natural gas based electricity production occurs only during the cold season of the year, when heating loads are at their peak, electricity used for heating can be attributed to natural gas, rather than hydropower, as the marginal generation technology. Hence, specific emission factor of natural gas has been used in the table able to calculate GHG emissions associated with use of electricity in municipal heating.

Thus, based on the above incremental annual energy supply from biomass resources, average emission reduction factor and GEF causality factor of 60%, top-down indirect emission reductions have been calculated as follows:

$$1,127 \text{ TJ/y} * 40.4 \text{ tCO}_2/\text{TJ} * 20 \text{ y} * 0.6 = 546,370 \text{ tons CO}_2\text{eq.}$$

Thus, in summary, project-related emission reductions are estimated as follows:

Table 8-5: Analysis of total GHG emission reductions from the proposed project

Type of assessment	ERs, tCO ₂
Direct	47,800
Indirect:	
BU	143,400
TD	546,000

²⁷ IEA World Energy Statistics, 2010

Annex 8.9. Investment Grant Mechanism

The project preparatory phase has concluded that utilization of biomass upgrading and combustion technologies in Georgia can be economically viable under certain conditions (e.g. availability of sufficient low-cost biomass feedstock within a reasonable distance from the upgrading plant; relatively high price of the competing natural gas etc.), but the non-availability of suitable financing poses a significant barrier to biomass technology development in the country.

In order to address the above barrier, an two-component Investment Grant Mechanism is proposed to be put in place as part of the proposed UNDP-GEF project, whereby the bulk of GEF funds will be disbursed to actual investments into (a) setting up a biomass upgrading plant in Tbilisi and (b) installation of at least 10 biomass-fired boilers in municipal buildings of the city of Tbilisi.

The present annex sets out a set of key initial principles on how the investment grant financing is going to be executed as part of the project. These will be further refined, elaborated and expanded, as relevant, by the project team in consultation with the project stakeholders, reflecting the actual financial environment that the planned pilot investments will be operating in, as well as any further insights and findings from the full-scale feasibility studies to be supported by the project. The final operational principles and granting criteria of the Investment Grant Mechanisms are subject to approval by the Project Board.

Biomass upgrading plant in Tbilisi

Preliminary assessment indicates that a 10,000 tons/year pelletizing facility in Georgia would cost around US\$ 860,000 to build, with drying equipment accounting for 35% of the total investment costs, grinding and milling equipment 30%, miscellaneous equipment and building 16%, truck and loaders 13%, storage and packaging 6%.

Specific production costs are estimated at around US\$ 50 per ton of pellets, which approximates general market figures adjusted to the Georgian context, and could effectively support a sale price of around US\$ 70 per ton to generate sufficient returns on investment to make the project viable. Simple payback time is estimated at around 4 years for the above production cost-pellet price ratio.

The above figures are based on the most costly biomass upgrading option, i.e. pelletizing; other technologies – briquetting or chipping – have proved to be less expensive to build and operate (e.g. US\$ 400,000 for an equally-sized briquetting plant and some US\$ 200,000 for a wood chipper). Hence, the final decision on selecting a particular biomass upgrading technology for the pilot plant will depend on the outcomes of the fully-fledged assessments both on the supply (biomass feedstocks) and demand (municipal building users) sides, to go with the most viable and effective options.

The biomass upgrading plant is going to be set up by a private consortium, led by Tbilisi-based SME Georgian Coal Ltd. with D&V Ltd. as a co-investor and supplier of biomass feedstock from its chestnut tree sanitary cutting operations. The basis for a pilot biomass upgrading plant will be the 9,000 tons of wood waste coming from Tbilisi urban forestry cuttings and 8,000 ha of forest managed by the municipality, as well as part of the 25,000 tons of forest waste material coming from licensed forestry operations of D&V Ltd. in Zestafoni.

With a US\$ 860,000 pelletizing plant as a reference case, the GEF Investment Grant Mechanism will cover up to US\$ 258,000 or 30% of the total investment costs, while Georgian Coal Ltd. and D&V Ltd. will cover the balance, i.e. US\$ 600,000. The remaining co-financing from the two companies (US\$ 200,000) will go toward the initial operating costs of the biomass plant until operating revenue from the

sale of biomass fuel starts to accrue.

Biomass-based boiler systems in municipal buildings in Tbilisi

Preliminary assessment indicates that investment costs for installing new biomass boilers would be about \$100,000 per boiler. With a reference price of biomass pellets at US\$ 70 (as per above calculations) and natural gas price (as the baseline competing fuel) of US\$ 450 per 1,000m³, simple payback period for natural gas to biomass fuel switch is estimated at a fairly attractive 4 years.

Analysis shows it is not viable to switch from natural gas to wood fuels for boiler sizes below 150 kW. Hence, this limitation will be reflected in the selection of municipal buildings that will benefit from biomass installations. Further, in selecting target buildings priority will be given to those structures which currently do not have central hydronic heating systems and which are included in municipal retrofit plans.

The GEF Investment Grant Mechanism will cover up to US\$ 30,000 or 30% of the individual boiler investment costs for a total grant of US\$ 300,000, while Tbilisi Municipality will co-finance the balance, i.e. US\$ 70,000 per boiler for a total of US\$ 700,000 for ten boilers.

On top of that, Tbilisi Municipality will *co-finance* feasibility studies for identification of cost-effective fuel switch options for biomass boilers (US\$ 10,000 per boiler), as well as *fully fund* capital investment costs of installing hydronic central heating systems and auxiliary biomass storage and handling equipment (US\$ 50,000 per heating system), cover fuel costs for three years of boilers operation during the UNDP-GEF project lifetime (US\$ 60,000 per boiler) and finance capital costs of renovating the target municipal buildings where biomass boiler installation is envisaged (US\$ 110,000 per building). Total Cost is us\$3,000,000. The building energy efficiency improvements to be co-financed by Tbilisi Municipality are going to complement and enhance the effectiveness of project-supported renewable energy interventions in the target buildings. However, for reasons of conservativeness, the GHG emission reductions resulting from energy efficiency improvements in the municipal buildings will not be claimed to the GEF.

General principles of Investment Grant Mechanism

- The Investment Grant Mechanism will have two components to co-finance investments into (1) biomass upgrading (wood chipping, briquetting or pelletizing) plant and (2) biomass-based boiler heating systems;
- Component 1 of the Investment Grant Mechanism is set to complement investment by Georgian Coal Ltd. and D&V Ltd of US\$ 800,000 into construction and operation of a biomass upgrading plant in Tbilisi with a capacity of 10,000 tons of densified biomass fuel per year;
- Component 2 of the Investment Grant Mechanism is set to complement investment by the Municipality of Tbilisi of US\$ 3 million into installation and operation of at least 10 boilers combusting upgraded biomass fuels in municipal buildings in Tbilisi, along with installation of central heating systems and energy efficiency improvements in the target buildings;
- The maximum amount available for disbursement as investment grants is set at \$558,000, or 60.3% of the total GEF grant;
- Component 1 of the Investment Grant Mechanism is set to cover up to US\$ 258,000 (or 30%) of the total investment costs of a biomass upgrading plant in Tbilisi estimated at US\$ 860,000;
- Component 2 of the Investment Grant Mechanism is set to cover up to US\$ 300,000 (or 30%) of the total investment costs of installation of 10 biomass boilers in municipal buildings in Tbilisi estimated at US\$ 1 million;
- Individual investment grants will be limited to no more than 30% of pilot project's investment cost;

- The relative shares of the two components of the Investment Grant Mechanism could be revised, upon approval of the Project Board, based on the actual investment costs as detailed in the respective fully-fledged feasibility studies and business plans;
- Granting can only be made against an investment-grade feasibility study and a business plan that detail the technical, organizational, financial and operational parameters of the proposed investments;
- The investment grant is provided at 'financial closure' to eliminate all possible risk of the grant being made and construction not being undertaken;
- Grant funds transfer from UNDP to the beneficiaries (Tbilisi Municipality and Georgian Coal-led consortium) will follow UNDP standard regulations, whereas the actual spending of grant funds for implementation of the pilot demonstrations will be managed by the respective beneficiaries who will be ultimately responsible for effective utilization of the funds;
- The Terms of Reference for each investment grant will be drawn up by the project team on the basis of the respective business plans, to be endorsed by a panel consisting of (i) the Project Manager (ii) two representatives from UNDP Georgia, including one from procurement unit (iii) a representative of UNDP BRC and (iv) the National Project Director;
- The Investment Grant Mechanism shall seek to mobilize additional resources from other partners to support scaling up of investment during the UNDP-GEF project lifetime;