

Final Report

# Integrated Woodfuel Development Strategy for Kenya 2008-2012

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## LIST OF ACRONYMS AND ABBREVIATIONS

AFD	French Agency for International Development
BEDA	Biomass Energy Development Authority
CBOs	Community Based Organizations
CDM	Clean Development Mechanism
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ERC	Energy Regulatory Authority
ESDA	Energy for Sustainable Development, Africa
GEF	Global Environment Facility
IAP	Indoor Air Pollution
IEA	International Energy Agency
IPC	Investment Promotion Centre
Jiko	Swahili word for “stove”
KARI	Kenya Agricultural Research Institute
KEBS	Kenya Bureau of Standards
KEFRI	Kenya forestry Research Institute
KEPHIS	Kenya Plant Health Inspectorate Services
KFS	Kenya Forest Service
KFWG	Kenya Forest Working Group
KIRDI	Kenya Industrial Research and Development Institute
KNBS	Kenya National Bureau of Statistics
KRA	Kenya Revenue Authority
Ksh	Kenya shilling
KCJ	Kenya Ceramic Jiko
KWEDA	Kenya Woodfuel Development Authority
LPG	Liquid Petroleum Gas
M&E	Monitoring & Evaluation
MDG	Millennium Development Goals
ME&MR	Ministry of Environment and Mineral Resources
MFI	Microfinance Institutions
MOA	Ministry of Agriculture
MOE	Ministry of Energy
MOed	Ministry of Education
MOL	Ministry of lands

MOYA	Ministry of Youth Affairs
MTI	Ministry of Trade and Industry
NCST	National Council for Science and Technology
NEMA	National Environment Management Authority
NGOs	Non-Governmental Organizations
PRODOC	Project Document
PSDA	Private Sector Development in Agriculture
R&D	Research and Development
REA	Rural Electrification Authority
RELMA	Regional Land Management Unit
RETAP	Renewable Energy Assistance Programme
RETs	Renewable Energy Technologies
SMEs	Small and Medium Enterprises
Tg	Teragrams
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
ESCOs	Energy Service Companies
PV	Photovoltaic

## **Executive Summary**

The integrated woodfuel development and Management strategy is an expression of the Government's commitment to address the prevailing and future woodfuel supply and demand management issues and challenges.

The key issues and challenges noted include: (i) the increasing gap between woodfuel supply and demand impact of loss of resources, (ii) the predominance of woodfuel as a source of energy in the domestic and industrial sectors, (iii) increasing pressure exerted on existing tree stocks in the drylands by the urban demand for charcoal, (iv) weak planning, coordination, monitoring and evaluation capabilities due to insufficient allocation of financial resources and (v) inadequate and weak institutional arrangements which cannot facilitate sustainable woodfuel development and consumption and (vi) lack of an engendered integrated woodfuel development strategies.

The strategy observes that woodfuel is certainly to remain as the main source of energy for cooking and heating for the majority of the Kenyan households in the foreseeable future. Moreover, it has been documented that fuel-wood and charcoal production alone can employ over 300,000 people and that efficient utilization of the resource can save Ksh. 57 billion annually. In addition, production of household stoves has a business potential of Ksh.6 billion (Walubengo and Fridah Mugo). The integrated strategy is thus formulated around five key strategic objectives, which invariably address the identified key issues and challenges. These are: (i) Woodfuel Supply, (ii) Woodfuel demand management, (iii) Woodfuel research, demonstration and development, (iv) woodfuel sub-sector regulation and (v) Woodfuel substitution. The strategies proposed under each of the foregoing strategic objectives are outlined below.

### **Woodfuel Supply**

1. Intensify promotion of small and large scale growing fast-maturing woodfuel tree species
2. Encourage commercial production of woodfuel
3. Promote reforestation of areas cleared for charcoal production through appropriate incentives
4. Strengthen capacity for agro-forestry and on-farm woodlot development
5. Incorporate gender perspectives and concerns while pursuing each of the above strategic objectives

### **Woodfuel demand management**

1. Increase the rate of adoption of efficient charcoal stoves from 47 per cent currently to 85 per cent by 2012
2. Address inherent market barriers to faster adoption of improved stove
3. Increase efficiency of woodfuel production, transformation and end-use
4. Increase the rate of adoption of efficient fuel wood stoves from 4 per cent currently to 15 per cent by 2012
5. Promote woodfuel substitutes such as kerosene and LPG and RETs
6. Adoption of other energy conservation measures including good practice guidelines and use of fireless cookers.

### **Woodfuel research, demonstration and development**

1. A standing inter-agency committee to review the woodfuel research needs and set research agenda

2. Establish a national wood energy research fund to facilitate targeted woodfuel research scholarship activities
3. Strengthen research collaboration between academia, research institutions, private sector and research users
4. Establish a national Renewable Energy Centre of excellence to showcase emerging technologies and best practices. The existing Jamhuri Energy Centre could be refurbished and appropriately equipped to transform it to be the National Centre of Excellence.
5. strengthen research on key wood energy issues in the context of global and national emerging issues

### **Woodfuel sub-sector regulation**

1. Develop charcoal production technology and utilization regulations, rules and guidelines to complement production and marketing guidelines developed by Kenya Forest Service.
2. Enforce improved woodfuel stove standards
3. Promote adoption and wider use of improved charcoal production kilns and practices
4. Remove barriers to the adoption of efficient wood fuel stoves and kilns
5. Develop comprehensive energy policy and legislation for Kenya with sufficient recognition for the woodfuel sub-sector
6. Establish an institution to spearhead woodfuel energy issues

### **Woodfuel substitution**

1. Promote increased use of renewable energy sources including solar, wind, biogas and small hydropower, among others;
2. Increase access to modern and cleaner fuels such as kerosene, liquid petroleum gas to the rural and poor urban households

The strategy has proposed the establishment of a woodfuel Agency, Kenya Wood Energy Development Authority (KWEDA). This is seen as a crucial step to enhance the mainstreaming of woodfuel resource development and management into the national economy. Further, this fully fledged woodfuel institution is in line with similar institutions created in the energy sector in the recent past and is intended to ensure woodfuel issues are closely focused on and consistently developed.

### **Financing of the Strategy**

The estimated cost of implementing the strategy is Ksh. 41.4 million. This is distributed as follows: (i) Woodfuel supply - Ksh 4.8 m, (ii) Woodfuel demand side management – Ksh. 12.2m , (iii) Woodfuel Research and Development – Ksh 6.1 m, (iv) Woodfuel sub-sector regulation - Ksh 8.1 m and (v) Woodfuel substitution – Ksh 10.2m.

## Chapter One:

### 1. Introduction

#### *1.1 Background*

The Ministry of Energy through its partners UNDP and RETAP is implementing the GEF Biomass Energy Project whose aim is to transform markets for highly efficient biomass stoves for institutions and medium-scale enterprises in Kenya by (i) promoting highly efficient improved stoves (ii) establishing woodlots owned and managed by the institutions and private sector and (iii) removing policy and financial barriers to the widespread adoption of stoves. The project aims to reduce carbon dioxide equivalent emissions by an accumulated total of between 400,000 and 960,000 tonnes by 2020 and to contribute to a wide range of other social, environmental and economic benefits.

A major outcome of the GEF Biomass Energy Project is the strengthening of supportive policies and legal framework for sustainable biomass energy business. Overall, biomass energy policies provide a framework within which woodfuel-related businesses operate. However there are inherent barriers that prevent the realization of desirable woodfuel development objectives in Kenya. The need for a policy dialogue arose from identified policy barriers as listed below:

1. Insufficient coordination between the relevant Ministries;
2. Lack of enabling market-oriented policies for the development of local (commercial & high value) markets for improved biomass targeting productive end-uses for income generation and poverty reduction;
3. The absence of strategies for future expansion & transformation of biomass energy in light of the knowledge of the potential and benefits from biomass energy utilization; and
4. Limited availability of information related to diverse issues on biomass energy markets, including how to create sustainable biomass energy markets, leading to insufficiently informed policies.

The GEF Biomass Energy Project proposes increased coordination between government sectors in implementing policy as well as dialogue between business and government; and coordination and strengthening of parliamentary support for market-oriented biomass energy legislation. The indicator for this outcome of the Project is an integrated biomass energy strategy that brings together Forestry, Energy, Environment and Industry, Health, Agriculture and Education sectors.

#### **1.2 Role of Woodfuel in the National energy supply matrix: Setting the context**

The world derives about 11 percent of its energy from biomass (IEA, 1998b) and more than two and a half billion people (Kituyi and Odongo ,2008) depend mainly on traditional fuels for cooking. But in the poor developing countries, biomass accounts for up to 90 percent of energy supply, mostly in traditional or noncommercial forms (firewood, charcoal, dung and agricultural residues) owing to continued lack of: access to, availability and affordability of modern energy services. In sub-Sahara Africa, firewood dominates the traditional use of biomass for cooking and heating. In terms of health, the use of biomass raises concerns with regard to woodfuel-associated indoor air pollution in view of its health impacts. This health dimension inadvertently diminishes the quality of life, especially for women and young children.

It is also widely observed that most of the households that continue to rely on non-commercial energy sources, mainly fuelwood, generally have limited access to modern energy such as electricity and liquid fuels. The lack of capital and technological capacity hinders the development of adequate

supplies, with deleterious effects on economic and social development. The predominance of woodfuel in meeting the energy needs of most rural and urban poor households is of significance as described under chapter two of this report. Besides the households, woodfuel is also required for various rural cottage industries and small scale service establishments. These include fish processing, tobacco curing, brick making, jaggeries, bakeries, food kiosks and hotels among others.

In spite of the past efforts in promotion of woodfuel substitutes, the number of people relying on woodfuel is not decreasing. Consequently, woodfuel will inevitably continue to be the primary source of energy for the majority of the rural population and urban poor for as long as it takes to transform the rural economy from subsistence to a highly productive monetized economy.

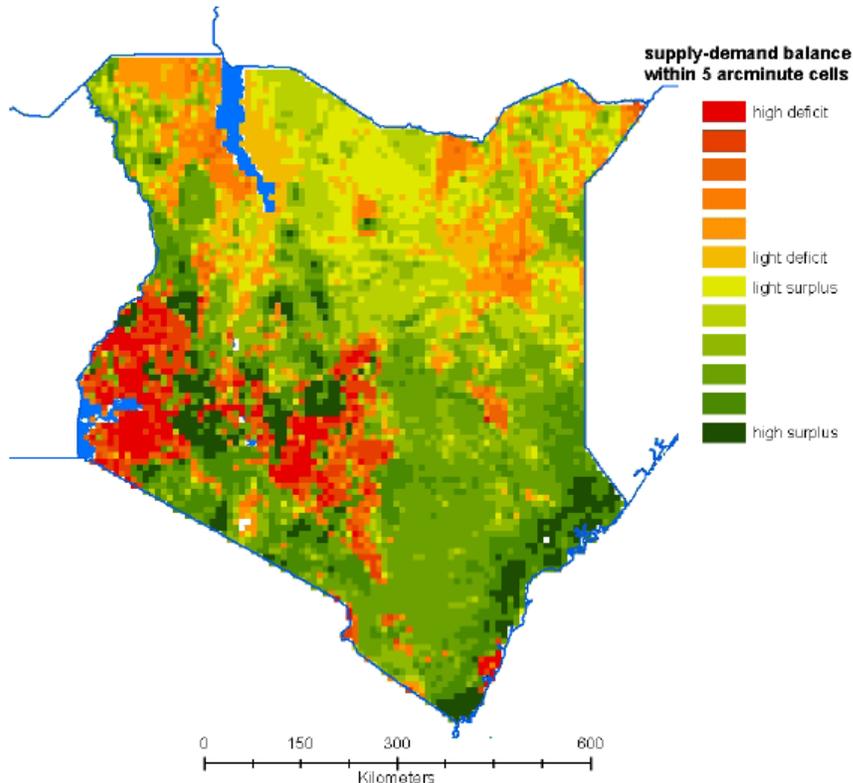
The woodfuel problem is further compounded by widespread inefficient methods of production and consumption, woodfuel resource being depleted faster than its replenishment and the continued lack of a comprehensive woodfuel supply and management strategy, among other factors

It is on the basis of the foregoing that the GEF-RETAP Biomass project undertook to support the formulation of an integrated woodfuel development strategy in order to bridge the current policy and regulatory gaps and thus set the stage for a sustainable management of woodfuel sub-sector.

### 1.3 Woodfuel supply and demand imbalance

Woodfuel supply does not match the demand over various parts of the country. Figure 1 shows the woodfuel supply and demand balance.

Figure 1: Woodfuel supply – demand balance



Source: FAO, 2006.

Against the background of increasing pockets of woodfuel supply deficits, there is need for a strategy to ensure a sustainable supply to meet the demand as well as maintain ecological balance.

#### **1.4 Existing Policy, Legal and Regulatory Framework**

At the macro-policy level, the Vision 2030 aims to promote equitable access to quality energy services at least cost while protecting the environment. It is however notable that woodfuel development is affected by several sectoral policies and legislative instruments including: (i) energy, (ii) forest, (iii) agricultural (iv) industrial, (v) environment, (vi) health, (vii) education and (viii) water, among others. The regulatory framework on the other hand includes: Energy Act 2006, Environmental Management and Coordination Act 1999, Forests Act 2005 and Water Act 2002, among other Acts. The foregoing policy, legal and regulatory frameworks variedly impacts on the woodfuel development and consumption as is outlined in the proceeding sections.

##### **1.4.1 Energy**

The key development objectives contained in the energy policy relevant to harnessing woodfuel are: Providing sustainable quality energy; utilizing energy for rural and urban development; improving access to affordable energy; providing enabling environment for the provision of energy services; enhancing security of supply; promoting development of indigenous energy sources; and promoting energy efficiency and conservation. The policy recognizes biomass fuels as the most important source contributing about 68 per cent of primary energy and underlines the need to promote their sustainable harvesting using innovative and efficient exploitation and utilization of technologies.

With regard to charcoal, the policy seeks achieve a number of objectives which inter alia include to:

- Increase the rate of adoption of efficient charcoal stoves from 47 per cent now to 80 per cent by 2010 and 100 per cent in 2020 in urban areas. This translates to an adoption rate of 2 per cent per year or 10 per cent every 5 years, assuming a linear growth. The improved charcoal stove is estimated to reduce consumption of charcoal by 50 per cent.
- Increase the rate of adoption of efficient charcoal stoves to 40 per cent by 2010 and 60 per cent by 2020 in rural areas.
- Increase efficiency of the improved charcoal stove from the current 30-35 per cent to 45-50 per cent by 2020. The new stove will also reduce charcoal consumption by another 50 per cent for each user.
- Promote woodfuel substitution renewable energy sources as well as cleaner petroleum fuels such as kerosene and LPG.

The Energy policy under chapter seven proposed a range of actions for short, medium and long term timescales with regard to wood energy development. In the short term, the policy sought to draw appropriate plans including resource assessments and surveys; revitalize the existing Energy Centres to make them effective outreaches for promoting agro-forestry and other renewable energy technologies; Undertaking a study to identify the most appropriate charcoal kiln technologies and license charcoal trade to encourage sustainable production during the period 2004 to 2007.

In the medium term, the plan of action sought to review and update biomass energy development plans; implement a program for dissemination of improved charcoal kilns; initiate programmes aimed at improved stove promotion and education; establish biomass energy technology databases; and, expand improved stoves and charcoal kiln programmes, to reduce the fuelwood deficit to 5 million metric tonnes by the year 2012.

In a nutshell, the energy policy explicitly recognizes (i) the lack of harmony in the policies and

activities of ministries responsible for biomass energy issues, (ii) lack of specific law to regulate the management of biomass, and (iii) lack of favorable legal framework for charcoal distribution and marketing. To address the foregoing, the policy calls for (i) preparation of comprehensive plans for woodfuel development including woodfuel resource assessments and surveys (ii) review and update of development plans, and (iii) developing standards and codes of practice for the sustainable production and consumption of woodfuel.

The Energy Act 2006 requires the Minister to formulate a strategy to coordinate research on renewable energy and promote research and development in energy conservation respectively (sections 103(2a) and 104(2d)). Specifically, the Minister for Energy is empowered under section 103 of the Act to promote the development of Renewable Energy technologies, including but not limited to biomass, biodiesel, charcoal, fuelwood, biogas, solar and wind. This includes providing an enabling framework for the efficient and sustainable production, distribution and marketing of renewable energy technologies. Under section 6 (p), it empowers the Energy regulatory Commission to **grant licences, in coordination with other statutory authorities, for sustainable charcoal production upon submission of satisfactory development plans.** The foregoing section does not however state the statutory authorities implied.

Also, the Act emphasizes the need for sustainable management of woodfuel production and use while identifying the key strategies to achieve sustainable woodfuel management. These are: (i) Promoting the use of fast maturing trees for energy production, including biofuels; and the(ii) establishment of Commercial woodlots and peri-urban plantations; (iii) promoting international co-operations on programmes focusing on renewable energy sources; and (iv) harnessing opportunities offered under CDM and other mechanisms including, but not limited to carbon credit, among others.

#### 1.4.2 Forestry

The draft forest policy has received cabinet approval. Its goal is to enhance the contribution of the forest Sector in the provision of economic, social and environmental goods and services. The policy seeks to expand the mandate to cover all types of forests as well as devolve the management of forests to forest conservancies and community forest associations. The specific objects of the policy are to:

- Contribute to poverty reduction, employment creation and improvement of the livelihoods through sustainable use, conservation and management of forests and trees;
- Contribute to sustainable land use through soil, water and biodiversity conservation, and tree planting through the sustainable management of forests and trees;
- Promote the participation of the private sector, communities and other stakeholders in forest management to conserve water catchment areas, create employment, reduce poverty and conserve the sustainability of the forest sector;
- Promote Farm Forestry to produce timber, woodfuel and other forest products;
- Promote dryland Forestry to produce woodfuel and to supply wood and non-wood forest products;
- Promote Forest Extension to enable farmers and other forest stakeholders to benefit from forest management approaches and technologies; and
- Promote forest Research, training and education to ensure a vibrant forest sector.

The foregoing draft policy contains statements that are supportive of woodfuel development. These include: Section **2.2.1:** Sustainable production and efficient utilization of woodfuel, section **2.2.2:** The promotion of efficient wood energy technologies and the use of alternative forms of energy and

section **2.2.3**: The regulation of production and marketing of charcoal.

#### Forests Act 2005

The Forest Act 2005 is supportive of the policy objectives to promote woodfuel production. For instance: **Section 25 of the Act** provides the range of incentives to private sector investment in forestry development, **section 46** provides for community participation in Forest Management and Conservation and **sections 52-57** provide various penalties for forest offenders. Other relevant provisions relate to the regulation of forest resource harvesting and marketing through issuance of certificate of origin and movement permits geared to reducing theft from farms and government forests. Also, the Act calls for establishment of partnerships with woodfuel consumers and the farmers through contract tree farming/ tree out grower schemes. This guarantees market for the farmers and also woodfuel supplies to the consumers. Interestingly, the Act provides for the establishment of a department of Biomass energy within Kenya Forest Service ostensibly to handle issues to do with charcoal production and biofuels. This would lead to unnecessary duplication of effort. As a result, consultations among the concerned institutions are needed to establish the strategy for harmonizing the apparent disharmony.

The Forest Act has jurisdiction over all forests and woodlands on state, local authority and private land. The Act establishes Kenya Forest Service with the responsibility to provide leadership in forest management, formulating, policies and guidelines regarding the management for conservation and utilization of forests and to regulate charcoal trade and to determine the potential uses to which the various forests can be put, including woodfuel production, among other responsibilities.

Sessional Paper No. 9 of 2005 on forestry: The generic relationship with energy: Supplies energy, consumes energy and sequesters carbon. It takes cognizance of the energy policy. The forest policy provides for the promotion of dryland forestry for the supply of woodfuel, sustainable charcoal production, promotion of efficient wood energy technologies and use of alternative of energy as well as regulation of charcoal production and marketing. In essence, the promotion of farm forestry and soil and water conservation have direct and indirect effects on woodfuel supply strategy. The energy policy on the other hand acknowledges that the forestry sector provides 45 % of biomass energy. It is evident that considerable integration between energy and forestry exists, but requires to be deepened to ensure that pursuit of energy objectives does not lead to land degradation.

#### 1.4.3 Environment

A comprehensive environment policy is currently under preparation. A draft Sessional Paper No. 6 of 1999 on Environment is available and provides a policy framework upon which environmental protection, conservation and management activities are underpinned. It is noted that some of the emerging environmental policy concerns that are critical to woodfuel development are those to do with energy, climate change, and cleaner production, among others.

Furthermore, the environmental Management and coordination Act 1999, under Section 49 provides that the National Environment Management Authority (NEMA) shall, in consultation with the relevant lead agencies, promote the use of renewable sources of energy by :-

- promoting research in appropriate renewable sources of energy;
- creating incentives for the promotion of renewable sources of energy;
- promoting measures for the conservation of non-renewable sources of energy; and
- taking measures to encourage the planting of trees and woodlots by individual land users, institutions and by community groups

Draft Sessional paper No. 6 of 1999.

Integration of environmental costs of fuelwood production in charcoal licensing schemes encourages producers and traders to be more responsible. Through legal associations of charcoal producers, it will be easier to monitor the trade, tree species used and types of kilns, etc. The groups encourage their members to perform sustained tree planting, and lower or waived license renewal fees. Apart from programmes by charcoal producers and traders, other organized tree planting/reforestation programmes exist and can be emulated. However, much of their success hinges on sustained capacity building of modern tree production technologies in rural communities, an aspect not stressed by the Energy Policy

Environmental Management and Coordination Act 1999

The environmental management and coordination Act, 1999, under Section 49 provides that NEMA in consultation with the relevant lead agencies, shall promote the use of renewable sources of energy by promoting research in appropriate renewable sources of energy; creating incentives for the promotion of renewable sources of energy; promoting measures for the conservation of non-renewable sources of energy; and taking measures to encourage the planning of trees and woodlots by individual land users, institutions and by community groups.

Other relevant regulations within EMCA which impact on woodfuel sub-sector include environmental Impact Assessment and audit Regulations, 2003 and environment management orders.

#### 1.4.4 Industry

The newly launched vision 2030 recognizes that energy is a critical enabler towards the desired social economic transformation. Also, Kenya's industrial policy recognizes that the transformation of the economy requires among others the supply of steady, predictable, quality and affordable energy to all sectors. Energy is therefore a critical ingredient to spearhead industrial development and that the level of development of a country can be determined by the per capita energy consumption. In addition, the Sessional paper No. 2 of 1997 on industrial transformation to the year 2020 identified energy as one of the major ingredient to catalyze industrialization process.

#### 1.4.5 Health

The health sector is impacted by indoor air pollution that arises out biomass burning for energy. More directly, energy use affects the health of individuals. For instance, the use of traditional biomass fuels increases indoor pollution. Indoor pollution is one of the causes for acute respiratory infections (ARI). In addition, the health institutions rely on woodfuel for cooking and heating. The health policy puts great emphasis on primary health care. To minimize the effects of woodfuel burning on health, it is imperative that the woodfuel development and utilization strategy takes into account the associated health implications with a view to minimizing them. Improved efficiency of biomass usage can help reduce health related diseases. Energy interlinks with health in two contradictory ways: It is essential to support the provision of health services, but energy conversion and consumption can have negative health impacts.

#### 1.4.6 Agriculture

The Strategy for Revitalizing Agriculture 2004 – 2014 affects biomass energy development in the following ways:

- developing incentives for establishment of agro-processing and rural industries in rural areas – woodfuel potential source of energy
- Promoting agro-forestry – potential for increasing woodfuel production for domestic use and agricultural crop processing
- Improved research in agriculture – could help develop improved tree varieties with great environmental and economic benefits.
- Woodfuel is essential for agro-processing and post-harvest drying.

#### 1.4.7 Education

The universal free primary education policy seeks to ensure that all children acquire at least primary level of education. Similarly, the free secondary education policy targets to ensure all children who qualify for secondary education are assisted to the extent possible. The foregoing education policies significantly impact on the woodfuel consumption as they increase the enrollment levels, and hence increase demand for woodfuel.

#### 1.4.8 Water

The Sessional Paper Number 1 of 1999 on National policy on Water Resources Management and Development connects water resources management and forests; agriculture and livestock; and poverty and pollution. The policy underscores the primacy of catchment conservation and notes that integrated water resources management has positive implications for sustainable woodfuel production and utilization. In addition, protection of water catchments and river basin management take into account of role forests and soil conservation measures as important for sustainable biomass energy development. The policy further underscores the need for collaboration with relevant government ministries while identifying and delineating water catchments, as well as instituting preservation and protection programmes. Such an action inadvertently helps to enhance sustainable woodfuel production.

The water Act 2002 emphasizes importance of conservation of water catchment areas and promotes public participation in processes, projects and programmes. The Act under section 8 paragraph 1 sub-paragraph (e) empowers the Water Resource Management Authority to regulate, protect and manage water catchments. This has a bearing on increasing wood production, establishing community based tree nurseries, encouraging community partnerships with commercial enterprises on one hand. On the other hand, regulation and protection of water catchments may also restrict access to woodfuel from the protected area. The integrated water management policy has linkages into other relevant sectoral activities including wood fuel and charcoal industry.

#### 1.4.9 Other Laws & Regulations

Other laws and regulations that will be relevant to consider and which impact on woodfuel development and consumption include:

- Local Government Act
- Chief's Act Cap 128

- Antiquities and Monuments Act
- The Constitution
- Local authorities by-laws and regulations
- regulations under the Agriculture Act
- EMCA's EIA and other possible regulations
- The chief's Act Cap 128, paragraph 10 (g) gives powers to the chief to regulate cutting of timber and prohibiting wasteful destruction of trees.

### ***1.5 Need for an integrated woodfuel Development strategy***

The critical question to deal with is why is an integrated woodfuel strategy desirable? To the largest extent, the integrated strategy is intended to reduce the existing apparent sectoral policy disharmonies that significantly affect woodfuel development and management.

The policy disharmony is manifested by the divergent sectoral policy objectives of the various relevant key sectors as exemplified by the following:

- Agriculture and forestry policies aim at strengthening and supporting the respective sector to increase income to farmers and forest entrepreneurs;
- Environmental policy seeks to reduce ecological impacts of woodfuel harvesting with respect to soil and water protection, biodiversity, air quality etc;
- Energy policy seeks to reduce fossil energy use and therefore substitution of imported energy;
- Climate change policy aspires to institute measures and for means to reduce sectoral or overall GHG emissions;
- Industrial policy focuses on technological opportunities and resulting prospects for commercialization of woodfuel technologies;
- Regional policy emphasizes the contribution of woodfuel options to regional development;
- Foreign policy looks at the geopolitical implication of energy supply and potential role of woodfuel in reducing the related tensions and risks;
- Trade policy highlights the emerging woodfuel markets in the agricultural sector as a chance to increase multilateral trade; and
- Development aid policy pursues the objective to create new opportunities and to reduce sustainability risks.

It is notable that woodfuel problems do not manifest as a simple and direct shortage of fuel. This is in view of the fact that its supply is defined not only by the amount of resources available, but also by the degree of access to these resources. Consequently, access to this resource can be constrained by a number of factors including location, land tenure, and land management practices.

#### **1.5.1 Woodfuel production and consumption is cross-sectoral**

Woodfuel development is considered an important subject for various sectoral policies. For instance, the forestry policy seeks to improve the management of tree and forest resources by villagers, including increasing the value added on-site through processing and marketing support. The energy policy on the other hand seeks to develop woodfuel as an indigenous sources of energy to contribute to diversification of the energy mix and self sufficiency in energy supply. In addition, the macro-economic policy with regard to poverty alleviation targets to improve the livelihoods of rural people and those working in informal-sector , for example towards generating income and employment. Further, the environment policy purposes to arrest the degradation of forest resources and other land use systems, through sustainable patterns of natural resource management and utilization, and to

contribute to efforts to reduce greenhouse gas emissions. The national economic development policy embodies the aspirations to increase productive use of local resources in addition to providing additional energy supply options for economic growth and development.

An integrated woodfuel strategy would thus focus on harnessing the wood energy supply potential stemming from woodlots, harvests from agriculture and forestry or from organic residues in industries or municipal wastes. Moreover, the current woodfuel shortage merits intensified and concerted interventions to conserve as well as enhance the remaining woodfuel supplies, to prevent further degradation of the fragile watersheds and rangelands resulting from exploitation for fuelwood and charcoal and to accelerate reforestation.

### **1.5.2 Need for inter-sectoral Coordination**

Given the cross-sectoral implications of woodfuel supply and management activities, a concerted approach that takes into account sectoral synergies is inevitable. The importance of inter-sectoral coordination is therefore crucial to ensuring efficient resource allocation and consistency. This integrated woodfuel strategy is thus an important step towards institutionalizing the inter-sectoral coordination mechanism while enhancing effective collaboration and complementarities. The potential conflict between resource utilization and conservation may also be resolved if there is a broad and open deliberation of policy and strategy options for wood resource management and energy utilization.

### **1.5.3 Divergent impacts of sectoral policies on woodfuel development**

Various sectoral policies impact on the woodfuel supply in varied ways. For instance, a growth in school enrolments would create a higher demand for woodfuel supply whereas increased consumption of woodfuel inevitably increases the health risks associated with indoor air pollution. Also, changes in land use in favour of agricultural production reduces the land available for fuelwood production. On the other hand, the deforestation associated with charcoal production is a significant threat to the forest resource. The foregoing therefore calls for harmonization and integration of the concerned sectoral policies and strategies.

## **1.6 The Strategy formulation Process**

The methodology used in the formulation of the integrated woodfuel strategy involved the following key processes.

- i. An audit of sectoral policies that affect woodfuel development and management through an audit of the woodfuel policies;
- ii. Consultation with various key stakeholders including public sector players, NGOs and private sector;
- iii. Review, synthesis, and analysis of available data.

### **1.6.1 Audit of relevant woodfuel related policies and legislation**

An audit of policies and laws that affect or are affected by woodfuel production and consumption was undertaken prior to formulating this policy. Also, during the formulation of the strategy, a quick review of existing policies, legal and regulatory framework was undertaken as summarized in section 1.3. The purpose of the policy audit exercise was to establish the policies that affect the development of woodfuel resources with a view to recommending what rules, regulations and codes of practice for the woodfuel industry. The relevant policies included Energy, Forestry, Agriculture, Trade & Industry, Environment, Health and Education.

### **1.6.2 Stakeholder consultations**

Stakeholder consultations were achieved through separate workshops for public and private sector representatives were held. In addition stakeholder views were obtained through roundtable meetings and personal interviews with key stakeholders and experts.

### **1.6.3 Review, synthesis and analysis of available data and information**

A detailed review of various sectoral policies and legislations was undertaken to inform the strategy formulation and thus provide a clear basis for the remedial interventions. In addition, review of available literature contained in various reports was undertaken for similar reasons. Moreover, an institutional analysis was carried out to be able to identify possible areas of convergence and integration. The data and information obtained was then synthesized and analyzed.

## Chapter 2

### 2. Justification

The proposed strategy is justified by a range of fundamental facts, among them:

- i. the significance of woodfuel in the overall national energy supply,
- ii. the prevailing high level of wastefulness in the woodfuel production, transformation and consumption;
- iii. woodfuel sub-sector remains unregulated
- iv. the poor households, who are the largest consumers of traditional biomass fuels need to be empowered to progressively climb up the energy ladder;
- v. existing energy service planning models, including woodfuel planning presumes gender neutrality by assuming that women and men have the same needs; and
- vi. the adverse environmental impacts associated with woodfuel harvesting and consumption.

Each of the above facts is briefly elaborated below.

#### 2.1 Significance of woodfuel in overall national energy supply

In Kenya, woodfuel<sup>1</sup> is the largest form of primary energy used. It accounts for 68 per cent of the total energy consumption (MOE, 2004; KNBS, 2007). The integrated household budget survey (KNBS, 2007) found that 68.3 per cent of all households use firewood as their source of cooking fuel (See also Table 1). In addition, the study found that 87.7 per cent of households in rural areas rely on firewood for cooking. On the other hand, charcoal was found to be the second popular type of cooking fuel used by 13.3 per cent of all households.

Table 1: Percentage distribution of households by main cooking fuel and Region

	Firewood	Grass	Paraffin	Electricity	LPG	Charcoal	Biomass Residues	Biogas	others
Kenya	68.3	0.1	13.2	0.6	3.5	13.3	0.3	0.0	0.6
Nairobi	1.8	0.1	63.5	3.0	20.2	10.5	0.1		0.8
Central	6.9	0.1	11.6	0.5	3.1	14.2	0.7		0.8
Coast	54.5	0.2	24.1	0.7	2.9	16.9	0.1	0.3	0.4
Eastern	87.4	0.1	3.8	0.1	1.0	6.8	0.0		0.7
N/Eastern	90.2	0.4	0.6	0.1		8.2			0.4
Nyanza	79.8	0.0	3.6	0.2	0.9	15.1	0.2		0.3
R/Valley	70.2	0.2	7.0	0.5	1.8	19.3	0.4	0.1	0.7

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<sup>1</sup> Woodfuel refers to both firewood and charcoal

Western	88.5	0.1	2.3	0.2	0.5	7.1	0.8	0.0	0.4
Rural	87.7	0.1	2.7	0.2	0.7	7.7	0.4	0.0	0.4
Urban	10.0	0.2	11.9	1.8	11.9	30.2	0.1	0.1	1.1

Source: KNBS, 2007.

Analyzing the demand and supply of woodfuel, the Kamfor Study completed in 2002 found that the use of charcoal was about 47 per cent at the national level representing 82 per cent and 34 per cent of urban and rural households, respectively. The per capita consumption of charcoal was computed to be 156 kilogrammes in urban areas and 152 kilogrammes in rural areas. The study further established that 84 per cent of firewood was sourced from agro-forestry or on-farms, 8 per cent from trust lands and 8 per cent from gazetted forests. Furthermore, about 76 per cent of households obtain all their firewood free while 17 per cent of households regularly purchase and 7 per cent supplement their free collection by purchasing some firewood.

Evidently, woodfuel remains the primary source of energy for the majority of Kenyan households. The small-scale enterprises also depend on woodfuel for cooking and heating services. However, its supply does not match the growing demand, thus occasioning a rapidly soaring deficit. Given the above scenario, it is imperative that a woodfuel strategy is developed to ensure that:

- Supply is adequate to meet demand at reasonable costs and on a sustainable basis;
- Biomass energy is used or processed in an efficient way so as to prevent wasteful consumption, reduce health risks as well as environmental hazards and remove energy-related barriers to economic development;
- Appropriate support mechanisms and incentives are in place to facilitate a switch towards modern fuels where appropriate; ]

## 2.2 Wasteful woodfuel consumption practices

On one hand, inefficient woodfuel production and consumption technologies and practices lead are still prevalent. These lead to massive wastefulness . On the other hand, the penetration and use of improved efficient kilns and stoves is also low and unsatisfactory. Moreover, research and development necessary to stimulate improvement of efficiency of charcoal production processes is not given the desirable priority in terms of budgetary and policy support. Nonetheless, the benefits of embracing higher end-use efficiency for cooking and heating which easily lead to biomass energy savings of up to 80 per cent is not in dispute. Furthermore, improved efficient charcoal conversion technologies can reduce feedstock losses by up to 50 per cent. The foregoing wastefulness can be avoided by simply evolving a robust woodfuel efficiency improvement strategy.

## 2.3 *Lack of regulation of woodfuel sub-sector*

The woodfuel sector is not regulated. As a result, charcoal production and distribution have remained illegal, while consumption and retailing have been legal. This means that more than 200,000 charcoal producers are operating “illegally”. Yet, charcoal industry provides jobs to more than half million people (producers, transporters and vendors) involved directly in the charcoal trade who support around 2.5 million dependants, according to ESDA’s National Charcoal Survey (ESDA, 2005). The forest Act 2005 also provides for the regulation of charcoal industry. There is need therefore to harmonize institutional mandates and institute clear coordination mechanisms in order to ensure effective and efficient delivery of woodfuel services. The ESDA study further observed

that with no standards for charcoal distribution,, buyers and sellers are likely to continue to be Swindled. as they are required to pay the same price for bags weighing between 30 and 45 kilograms. Moreover, poor charcoal quality in the market is also a growing issue of concern.

#### 2.4 *Traditional woodfuel consumers need to climb the energy ladder*

The overriding government objective is to achieve socio-economic development, among other objectives. This cannot achieve if the poor households continue to depend on traditional energy forms. Such households aspire to climb the energy ladder gradually. The recent integrated household survey (KNBS, 2007) found out the following: (i) that 68.3 per cent of households used traditional stone fire as their main cooking appliance; (ii) 8.4 per cent of the households used improved traditional stone fire; (iii) 7.1 per cent used ordinary jiko(traditional metal stove); (iv) 6.5 per cent of all households used improved jiko; (v) 12.8 per cent used kerosene stove, (vi) 3.4 per cent used gas cooker (LPG) and (vii) 0.4 per cent used electric cooker. See details in Tables 1 and 2 appended at the end of this report.

Furthermore, in terms of rural and urban household disaggregation of end use appliances for cooking, the household survey revealed that:

- (i) 78 per cent and 9.1 per cent of rural households and urban households respectively, used traditional stone fire;
- (ii) 3.9 per cent of rural households used improved stove compared to 14.2 per cent of the urban households; and
- (iii) 0.3 per cent of rural households used electric cooker compared to 1.3 per cent of the urban counterparts.

On the basis of the above findings, it is clear that the greatest majority of Kenyans are still locked in use of traditional and improved traditional stone fire as their cooking appliance (See steps 1 and 2 of the energy ladder in Figure 1 below). Inevitably, an integrated strategy is therefore necessary to empower these poor households to progressively climb to the higher energy rungs in the long term. However in the short and medium term, the emphasis is to promote efficient use of biomass energy as well as biomass energy substitution where possible. The latter is meant to relieve pressure on the dwindling woodfuel resource.

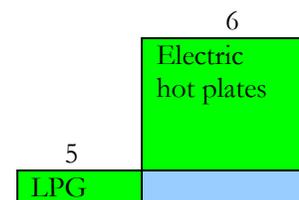


Fig. 1: The Cooking and heating energy ladder



## 2.6 Contributes to global environmental objectives

Woodfuel production and consumption play a critical role towards the achievement of various global environmental objectives including the millennium development goals.. Given the fact that energy demand is derived demand, the changes envisaged in the Millennium Development Targets (MDT) will definitely affect both the total amount and mix of energy requirement. To this end, it is clear that a reliable, efficient and affordable biomass energy supply and consumption helps lessen the burden of time-consuming domestic labor and therefore releases time for engaging in productive activities which help generate income and reduce poverty (MDG 1), reducing the workload placed on women also fosters gender equality and helps empower women (MDG 3), enhances biomass combustion facilitated through more efficient appliances and good housekeeping practices. Ultimately, prudent woodfuel management contributes to environmental sustainability (MDG 7).

Sustainable woodfuel production and consumption contributes to the global efforts to combat global warming by enhancing the sink for greenhouse gas emissions. On the other hand, the imbalance between woodfuel supply and demand leads to deforestation, which is a significant driving factor of desertification. The efforts to combat desertification cannot therefore succeed if the woodfuel needs are not sustainably met.

While biomass energy consumption can be said to be carbon neutral when all biomass produced is used for energy, its sustained production on the same surface of land can have considerable negative impacts on soil fertility, water use, agrochemical use, biodiversity, nutrients and landscape. Furthermore, the collection and transport of biomass increases the use of vehicles and infrastructure and consequently the emissions to the atmosphere.

## Chapter 3:

### 3. Issues and Challenges

#### 3.1 Issues

The proposed strategy identifies some key pillars, namely social, economic, environmental and institutional issues and concerns that are critical in defining the interventions to be adopted. In each of the pillars, the issues revolve around fuelwood production, consumption as well as woodwastes or residues as outlined below.

##### 3.1.1 Social

- land tenure issues particularly those that determine availability of land, traditions and culture.
- cultural taboos that restrain the participation of all gender groups in tree planting and harvesting.
- indoor air pollution,
- long distances covered in search of fuelwood and the loss of school time, particularly by the girl child to attend to fuelwood gathering. and
- Increasing gap between woodfuel supply and demand.

##### 3.1.2 Economic

- Support income generation projects (tree seedlings and selling firewood, incentives), Promotion of cooking for commercial purposes,
- impact of loss of resources (deforestation, time for school and other chores, pressure on healthcare system),
- Packaging ash and other residues for sale and reuse of unburnt fuelwood pieces
- woodfuel sub-sector largely functions and operates in the informal sector. It is therefore considered poor business with little attention for large capital investment and little promise of rich revenues. There is therefore lack of appeal to the conventional investors.
- The charcoal industry is not regulated.
- Inefficient use of woodfuel

##### 3.1.3 Environmental

- Woodfuel is predominant as a source of energy in the domestic and industrial sectors that contribute to depletion of forest cover. The rising demand for charcoal in urban areas exerts increasing pressure on existing stocks of trees in the drylands without matched tree planting efforts
- Wood production from sustainable sources (correct species and site selection, loss of tree cover, Water catchment potential of area),
- Gaseous emissions, for example greenhouse gases
- Use of residue (ash) to increase soil fertility.
- Moreover, cooking and heating with solid biomass energy, notably with open fires and traditional stoves, is a major source of indoor air pollution triggering respiratory diseases that are a leading cause of mortality in African countries

### 3.1.4 Institutional

- Weak planning, coordination, monitoring and evaluation capabilities due to insufficient allocation of financial resources and lack of integrated strategies
- Inadequate and weak institutional arrangements which cannot facilitate sustainable woodfuel development and consumption;
- Low priority given to woodfuel sub-sector development and management compared to the convention energy sources
- Lack of gender mainstreaming in the entire woodfuel sub-sector activities including production, distribution and utilization;

## 3.2 Challenges to Woodfuel Development

In addition to the foregoing issues, there are challenges to woodfuel development. These range from low priority, other competing land uses, financial, policy and institutional, technical to socio-cultural barriers which must be addressed as appropriate.

### 3.2.1 Low Priority

The government policy, for a long time has recognized the importance of rural energy. However, low priority in terms of resources allocation is given to rural energy. Also, there has not been in place a legal and regulatory framework necessary for stimulating and enforcing wood energy policy implementation. After the end of the three bilateral projects implemented by the Ministry in the early to late 1980s (KREDP, KWDP/KWAP and GTZ-SEP), there has not been major woodfuel project. Compared to the conventional energy, woodfuel programme has not been given the priority that matches its importance in meeting the overall energy demand.

### 3.2.2 Financial barriers

Most of the woodfuel consumers lack financial resources that would otherwise enable them invest in commercial woodfuel supply and thus reap the benefits of adopting modern biomass technologies. Also, majority of the rural households are poor and thus unable to afford modern rural energy technologies. Further, there is a lack of rural energy financing schemes and a low awareness of the existing sources of financing. The high investment cost required to build energy-system infrastructure is a major barrier to sustainable development.

There are several factors limiting the potential for large-scale fast-growing fuelwood plantations on a commercial scale: international petroleum fuel prices, remaining subsidies on commercial fuels, large initial investment requirements for woodfuel plantations, long gestation period between planting and harvesting, and conversion and transportation costs.

### 3.2.3 Policy and Institutional barriers

The divergent sectoral policies and uncoordinated efforts that affect woodfuel supply and consumption remain a challenge. This leads to stakeholders to work without cooperation or coordination at the national and local levels. The situation is further exacerbated by the lack of appropriate institutional framework to provide consistent and quality services to users and producers of woodfuel. Also, the degree of involvement of the commercial sector is low resulting in low commercialization of wood energy technologies.

### **3.2.4 Technical barriers**

Low quality and inefficient woodfuel technologies are dominating wood energy conversion and utilization in Kenya. There is also non-availability of reliable data for rural energy planning. Woodfuel technologies available in Kenya include: improved household stoves, improved institutional stoves, efficient charcoal making kilns and efficient bakeries

Mugo and Ong (2006) noted that using a traditional charcoal kiln, every ton of charcoal produced depletes about 0.1 hectares of woodlands. An efficient kiln would need about 0.05 hectares for every ton of charcoal produced. There is justification for promoting efficient charcoal kiln as strategy to minimize associated environmental degradation.

### **3.2.5 Social Cultural barriers**

Poor understanding and consideration by energy planners of social and cultural issues of a targeted community is an important area of concern. People have a tendency to resist changes when new technologies and practices are introduced without their participation. Tree planting is yet to be fully embraced by all rural households. This is due various factors including: the lack of adequate information, technical knowledge, and training, lack of adequate capital or financing possibilities and lack of incentives for careful maintenance. It is reiterated that an effective strategy to address the energy needs of rural populations is to promote the climbing of the 'energy ladder'. This implies moving from simple biomass fuels (dung, crop residues, firewood) to the most convenient, efficient form of energy appropriate to the task at hand - usually liquid or gaseous fuels for cooking and heating and electricity for most other uses. Such climbing involves not only a shift to modern fuels but is often also complemented by the synergistic use of modern, more efficient end-use devices such as cooking stoves.

## Chapter 4

### 4. Proposed Integrated Woodfuel Development Strategy

The broad objective of the energy policy is to ensure adequate, quality, cost effective and affordable supply of energy to meet development needs, while protecting and conserving the environment. Specifically, the policy seeks to provide sustainable quality energy services for development; utilize energy as tool to accelerate economic empowerment for urban and rural development; improve access to affordable energy services; provide an enabling environment for the provision of energy services; enhance security of supply; promote development of indigenous energy resources; and, promote energy efficiency and conservation as well as prudent environmental, health and safety practices. This proposed integrated woodfuel development strategy therefore aims to contribute towards the attainment of the above broad and specific policy objectives.

The strategy assumes that the energy policy as set out in the Sessional Paper No. of 2004 will not only be fully implemented but the outcome will be enhanced through parallel necessary adjustments during the course of its implementation. The strategy further calls for achievement of greater synergies with other relevant sectors. It is structured into five thematic strategy areas, namely: (i) Woodfuel supply, (ii) Woodfuel demand side management, (iii) Woodfuel Research and Development (iv) Woodfuel sub-sector regulation and (v) Woodfuel substitution.

#### 4.1 Strategy aims and objectives

The aims and objectives of this integrated woodfuel development strategy are to :

- (i) Prepare a wood fuel strategy and action plan
- (ii) Formulate a research strategy for woodfuel research
- (iii) Define the disharmony between existing policies, legislation and institutions
- (iv) Incorporate plans to address the disharmony in the woodfuel strategy and action plan, and
- (v) Develop a clear implementation plan for the drafting of rules and regulations for the woodfuel sub sector
- (vi) Promote modern biomass energy supplies including biodiesel, biogas, bioethanol, wood wastes, among others.

#### 4.2 Woodfuel supply Strategy

Woodfuel supply management is crucial to ensure sustainable supply to meet the growing demand. The key issues in this thematic area include: competing land use activities, the growing imbalance between supply and demand and the attendant adverse environmental as well as related land and tree tenure issues, among other things. To resolve fuelwood shortage, FAO (1995) identified three fundamental options, namely: planting more trees, improving combustion efficiency and better planning and distribution of woodfuel.

##### 4.2.1 Statement of the problem

There is rapidly growing woodfuel supply and demand imbalance and where demand outstrips supply. This precipitates a series of social and environmental impacts.

#### 4.2.2 Regulation:

The regulation of wood supply entails:

- Strengthening quarantine procedures, inspection, permitting, treatment and phytosanitary certification of tree planting materials that are sourced out of the country;
- Land use zoning to specify the type and configuration of trees and/or crops

#### 4.2.3 Objectives

The objectives of the woodfuel supply strategy are:

- i. Promote increased supply of woodfuel through intensified and expanded household programmes, community and institutional woodlot development
- ii. Promote use of biogas for cooking and lighting in high potential areas with fuelwood scarcities and in remote areas where adequate feedstock and water are available
- iii. Strengthening national capacity for agro-forestry extension services.
- iv. To significantly increase support for sustainable production and efficient utilization of biomass energy, given the predominant role it has continued to play in the overall energy supply mix, and the need for progressive shift to modern biomass energy technologies;
- v. To ensure security and reliability of woodfuel supply;
- vi. To create an enabling environment through enactment and establishment of appropriate legislation, institutions, regulatory, standards and codes of practice for biomass energy production, transportation and marketing infrastructure;
- vii. To promote energy efficiency and conservation; and
- viii. To support technology transfer and modernization of biomass energy systems.

#### 4.2.4 Strategies

The following strategies for enhancing woodfuel supply have been identified.

- a. Intensify promotion of small and large scale growing fast-maturing woodfuel tree species

##### Activities

- i) Identify woodfuel production zones
- ii) Provide technical support to commercial woodfuel production
- iii) Link CDM and other global initiatives to woodfuel production
- iv) Develop and implement short and long term plans for massive tree plantings
- (v) Promote commercialization of woodfuel production, distribution and marketing by addressing inherent barriers, formation of woodfuel production co-operatives and commercializing tree seed/seedling production.

- b. Promote reforestation of areas cleared for charcoal production through appropriate incentives

##### Activities

- i. Strengthen national reforestation and Afforestation efforts
- ii. Initiate and/or strengthen Community woodlots development and management
- iv) Prepare reforestation/ Afforestation plans

- c. Strengthen capacity for agroforestry and on-farm woodlot development

##### Activities

- i. Strengthen social forestry
- ii. Training on nursery establishment and management

- iii. Tree-crop selection and management
- iv. Agro-forestry species agro-ecological zoning
- d. Promote efficient wood conversion technologies including wood carbonization and end-use technologies.

Activities

- i. Promote highest-efficiency charcoal production kilns;
- ii. Accelerate the diffusion of improved wood and charcoal stoves to achieve the targets specified in the Energy Sessional Paper\
- iii. Adapt develop and disseminate modern biomass technologies including briquetting, pelletization and gasification technologies
- e. Make the use of improved charcoal kilns compulsory in all charcoal producing areas with adoption rates of 10 per cent by 2010

Activities

- i) Formulate rules and guidelines for use of improved charcoal kilns
- ii) Continue to develop and improve performance and technology efficiencies of improved kilns

### 4.3 Woodfuel demand side management Strategy

The dissemination of improved charcoal and woodstoves is recognized as a major woodfuel demand management strategy. Improved efficient kilns are also recognized as important drivers of woodfuel demand management.

In 2000, Kenya's overall per capita wood energy consumption was estimated at 627 kg for rural households and 877 kg for urban households (Government of Kenya, 2002). However, the unrestrained consumption of fuelwood has been estimated at 1,015 kg per year.

The traditional stoves are estimated to have 10-15 per cent efficiency compared to 25-30 per cent for improved ones (Njoroge, 1994). For the purpose of this analysis, every household that adopts an improved stove reduces its fuelwood consumption by 50 per cent. In addition, conservation and fuel management knowledge are assumed to contribute to fuel reduction of 10 per cent while fireless cookers reduce consumption by an average of 40 per cent (Mugo and Poulstrup, 2003).

The energy policy calls for an increase of the rate of adoption of efficient charcoal stoves from 47 per cent in 2000 to 80 per cent by 2010 and 100 per cent in 2020 in urban areas. This translates to an adoption rate of 2 per cent per year or 10 per cent every 5 years. The improved charcoal stove is estimated to reduce consumption of charcoal by 50 per cent. The promotion of the improved charcoal production and consumption efficiency is therefore a fundamental driving factor for effective management of the woodfuel demand.

#### 4.3.1 Statement of the problem

There is low efficiency of technologies for woodfuel production and end-use in households and institutions.

#### 4.3.2 Objectives

- Increase woodfuel production, transformation and consumption efficiencies
- Diversify energy supply for rural and urban households and institutions

#### 4.3.3 Strategies

Strategy 1: Increase the rate of adoption of efficient charcoal stoves by 10 % by 2012.

Activities

- i) Promote private sector participation in biomass energy production, distribution and marketing
- ii) Promote introduction of efficient charcoal kilns in charcoal producing
- iii) Eco-labeling of charcoal
- iv) Promote inter-fuel substitution

Strategy 2: Address inherent market barriers to faster adoption of improved stoves

Activities

- i) Identify current barriers and prepare action plans
- ii) Implement the action plans
- iii) Address marketing barriers
- iv) Create awareness on benefits of adopting improved stoves

Strategy 4: Increase the rate of adoption of efficient wood stoves from 4 per cent to 15 per cent by 2012

Activities

- i) Promote private sector participation in improved woodstove production and distribution and marketing
- ii) Promote wider use of efficient and cost-effective kilns for improved woodstove liner production

Strategy 5: Promote woodfuel substitutes such as kerosene and LPG and RETs.

Activities

- i) Identify and implement fiscal incentives to facilitate expansion of kerosene and LPG distribution outlets. For instance, smart subsidies are suggested targeting the kerosene and LPG stove to make them affordable by more rural households
- ii) Provide incentives to allow faster adoption of improved efficient stoves for instance by providing affordable micro-credits
- iii) Promote matured renewable energy technologies( RETs) including wind, solar, biogas and improved efficient stoves, among others.

Strategy 6: Adoption of other energy conservation measures

Activities

- i) Sensitization on energy conservation practices
- ii) Promote the use of fireless cookers

#### **4.4 Woodfuel Research and Development Strategy**

Research, development and demonstration is a critical input into woodfuel development and management activities as it helps resolve outstanding information and management gaps. It is in recognition of its importance that a research plan included in this integrated woodfuel strategy.

Woodfuel research and development agenda entails improvement of woodfuel production and conversion efficiencies, ways to acquire, domesticate and efficiently utilize modern woodfuel technologies and woodfuel information management, among other aspects. For instance, Improving wood stove efficiencies call for sustained research and development efforts, which in turn, requires collaboration by artisans and Research and Development institutions. Currently, improved charcoal and woodstoves boast efficiencies of 30-35 per cent. Acceleration of adoption of these stoves will be achieved if the public is presented with higher quality stoves that last longer and are affordable.

#### 4.4.1 Statement of the problem

There are limited and uncoordinated research and development activities on woodfuel products and practices. Also, the amount of financial resources allocated to research and development activities is too low to produce significant impact.

#### 4.4.2 Objective

To develop an integrated woodfuel research and development plan

#### 4.4.3 Strategies

Strategy 1: Formulate woodfuel research and development plan (See details in Appendix 3)

Activities:

- i. Undertake woodfuel research needs assessment – woodfuel surveys, multi-stakeholder research planning and execution, quality partnerships and local ownership to be facilitated through multi-stakeholder participatory processes involving various relevant stakeholders
- ii. Research priority setting – thematic approach, Brainstorming forums
- iii. Commissioning of research activities to various selected researchers and/or research agencies
- iv. Research monitoring and evaluation plan
- v. Communication of research findings – workshops, seminars, roundtables, publications, preparation and delivery of policy briefs, dissemination workshops, demonstration pilot projects,
- vi. Research financing plan - Establish a national wood energy research fund to facilitate targeted woodfuel research activities
- vii. Research coordination

#### Research Priorities

During this period when the shift towards modern biomass fuels increasingly gaining momentum globally, Kenya will require to vigorously pursue a systematic research agenda adapting and promotion of appropriate energy crops and/or biomass technologies: Key areas to focus include:

- Biomass technology evaluation, adaptation, demonstration and promotion;
- Energy crops species evaluation in terms of geographical and spatial suitability and agronomy;
- Assessment of current and future potential for biomass based electricity generation

- including: co-generation, biogas, bio-waste, municipal waste, wood waste, etc in order to take advantage of the existing feed-in tariff which provides for guaranteed price regimes;
- Determine the potential for , various wood based electricity generation pathways, namely: (i) Direct biomass combustion, Gasification and liquid biofuels
  - Value addition to woodfuel tree crops

Strategy 2: Establish a national wood energy research fund to facilitate targeted woodfuel research

Activities

- i) Mobilize research funds;
- ii) Prepare a research and development plan for woodfuel sub-sector as a key priority; and
- iii) Inventory of completed woodfuel related research and major findings

Strategy 3: Constitute a standing inter-agency committee to review woodfuel research and set research priorities

Activities

- i) Review woodfuel research findings
- ii) Set woodfuel research priorities
- iii) Assign responsibilities to appropriate research institutions
- iv) Co-ordinate research

Strategy 4: Strengthen research collaboration between academia, research institutions, private sector and research users

Activity

- i) Undertake an inventory to take stock of concluded research on woodfuel issues
- ii) Information dissemination and networking
- iii) Mobilize woodfuel research funds

Strategy 5: Establish Renewable energy Centre of excellence to showcase emerging technologies and best practices

Activities

- i) Identify site
- ii) Appoint inter-agency steering committee
- iii) Formulate a comprehensive development and operational plan
- iv) Procure technology Hardware
- v) Exhibitions, shows, field demonstrations and pilot projects

Strategy 6: Strengthen research on key wood energy issues in the context of global and national emerging issues

Activities

- i) Research on environment, energy and health perspectives
- ii) Tree species selection and site marching
- iii) Research on energy efficiency improvement and conservation
- vi) Facilitate research that would lead to the development of efficient and affordable kilns for the millions of small-scale charcoal producers

## 4.5 Woodfuel sub-sector regulation

Poor quality cookstoves from unscrupulous dealers have been a major reason for their rejection by the market over the past decade. Setting standards for stoves and kilns and requiring producers to demonstrate observance through a certification or labelling scheme is imperative. Standards for sustainable charcoal production also cover the use of certain tree species, tree harvesting methods, harvesting areas, approved kilns in specified locations, and replanting for charcoal production. The proposed Kenya Wood Energy Development Authority (KWEDA) will oversee woodfuel resource management and development .

### 4.5.1 Statement of the problem

There is lack of harmony in the sectoral policies and activities of ministries involved in woodfuel development and management. In addition, there is lack of specific law to regulate the management of biomass, and a favorable legal framework for charcoal distribution and marketing.

Trade in charcoal needs regulation and appropriate standards in place. Charcoal may be traded as any other commodity on the market and its production and retail taxed to give revenue to the Government. Regulation requires the use of specific vegetation types and approved kilns in select locations. The producers and marketers will be required to have permits that compel them to plant a minimum number of trees for each felled. They will also need to verify the survival of such trees as a precondition for license renewal.

### 4.5.2 Objectives

To strengthen institutional capacity for woodfuel sub-sector regulation

To develop robust and comprehensive legal and regulatory instruments for effectively managing woodfuel activities

### 4.5.3 Strategies

Strategy 1: Develop charcoal regulations, rules and guidelines

Activities

- i) Formulate and enforce charcoal production and distribution regulations, rules and guidelines
- ii) Identify current charcoal trade barriers
- iii) harmonize with other charcoal regulations initiated other stakeholders including KFS

Strategy 2: Enforce improved woodfuel stove standards

Activities

- i) Education and awareness creation on available stove standards
- ii) Quality control monitoring to ensure compliance with the standards

Strategy 3: Promote adoption and wider use of improved charcoal production kilns and practices

Activities

- i) Public awareness and education campaigns
- ii) Technical support to improved stove producers and distributors
- iii) Training of private sector artisans and stove marketers

Strategy 4: Remove information and other barriers to the adoption of efficient wood fuel stoves and kilns

Activities

- i) Identify and address inherent information and marketing barriers
- ii) Provide technical and advisory support to stove production centres and women and youth groups

Strategy 5: Develop comprehensive Woodfuel policy and legislation

Activities

- i) Formulate appropriate woodfuel tree species and site matching guidelines
- ii) Harmonize sectoral laws that affect woodfuel production, distribution and consumption as identified during the review of existing policies and laws that affect woodfuel activities
- iii) Disseminate and enforce woodfuel sub-sector rules and regulation

Strategy 6: Establish a Kenya Wood Energy Development Authority (KWEDA) to manage woodfuel, among other biomass energy issues

Activities

- i) Establish committee to formulate the functions of the institution
- ii) Prepare cabinet memorandum to explain the intended objectives
- iii) Draft a Sessional Paper for tabling in Parliament
- iv) Setting the right framework conditions including continued market reforms, consistent regulations, and targeted policies in order to minimize woodfuel markets imperfections, reduce the cost of woodfuel services to end users, and protect important social and environmental benefits;
- v) Removing obstacles or providing incentives, as needed, to encourage greater woodfuel utilization efficiency and the development and diffusion to wider markets of new sustainable woodfuel technologies.

Strategy 7: Facilitate the formation and/or strengthening of woodfuel sub-sector associations in order to enhance self-regulation and advocacy

Activities:

- i) Hold regular consultative meetings with registered associations with view to evaluating their effectiveness
- ii) Facilitate formation and establishment of necessary associations to spearhead their effective participation in the woodfuel sub-sector activities

Strategy 8: Strengthen public information dissemination through various stakeholders including relevant woodfuel sub-sector associations such as KEISA, National Federation of Jua Kali Association and NGOs, among others.

Activities:

- i) Organize roundtable meetings with leaders of key organizations involved in woodfuel sub-sector
- ii) Organize joint activities with woodfuel-relevant associations and other players in order to strengthen collaboration

#### 4.6 Woodfuel substitution

Woodfuel is mostly used for cooking and heating services. The possible substitutes includes: biogas, solar cookers, kerosene, liquid petroleum gas and electricity, among others. The potential for substitution depends on the availability and affordability of the substitute fuels.

Studies have shown that there is a progressive shift from biomass fuel to kerosene and liquid petroleum gas (LPG) by middle income urban households, and to LPG and electricity by higher income urban households (TERI,1992; Reddy and Reddy, 1994). In the rural areas, the woodfuel substitution is severely hampered by the unavailability of the alternative energy sources and more importantly, the fact that majority of the rural households are less able to afford the substitutes.

Kerosene as a cooking and lighting fuel is important for the poor in rural and urban areas and has in some cases served as a substitute for wood fuel. Hence, any efforts to increase kerosene consumption will undoubtedly relieve pressure on wood use. In the recent past, the packaging of LPG in smaller quantities helped increase the penetration rates. The integrated household budget survey (KNBS, 2007) conducted by the National Bureau of Statistics indicated that 13.2 per cent of all households use kerosene for cooking in 2006. Also, less than 4 per cent of all households use LPG. The situation is worse for rural households as less than 3 per cent and less than 1 per cent used kerosene and LPG respectively.

In order to achieve greater woodfuel substitution, the energy policy has called for the promotion of increased access to clean energy alternatives including grid power, renewables, LPG and kerosene. This woodfuel substitution strategy therefore rests on successful implementation of the above stated policy objective.

##### 4.6.1 Statement of the problem

The current woodfuel supply and demand situation clearly shows an unsustainable production and consumption pattern. It is therefore imperative that alternative fuels be increasingly and rigorously promoted in order to continually reduce the pressure of woodfuel demand.

##### 4.6.2 Objectives

To promote a steady transitions towards cleaner and efficient modern energy sources for cooking and heating, among other energy services.

##### 4.6.3 Strategies

Strategy 1: Promote increased use of renewable energy sources including solar, wind, biogas, biofuels and small hydropower, among others;

##### Activities

- i) Intensify the schools' and health institutions' solar PV electrification
- ii) Increase access outlets for LPG and kerosene for rural households

- iii) Public awareness and education on renewable energy options
- iv) Implement pilot projects to demonstrate the efficacy of renewable energy applications
- v) Expand training of renewable energy technology support capacity
- vi) Extend cleaner fossil fuel (Kerosene and LPG) and renewable energy technology distribution infrastructure to rural areas
- vii) Expand access to micro-credit to the rural and urban poor
- viii) Strengthen private sector and civil society participation

It observed that a number of activities proposed above may be outside the jurisdiction of the proposed woodfuel development agency. In this regard, the activities will be undertaken by the relevant department (s) within or outside the public institutions.

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## Chapter 5

### 5. Institutional framework to implement the strategy

The woodfuel sub-sector has many stakeholders involved in its development and/or consumption. This means that an effective inter-and intra-stakeholder participation and coordination of activities will be imperative if the goals and objectives of the strategy is to be attained. The coordination is necessary to ensure that the collective efforts of each of the players are directed towards the attainment of the set objectives. This arises out of the realization that there has been poor coordination of woodfuel activities. There are also functional conflicts, particularly on the charcoal issues. For instance, since the Kamfor study was completed in 2002, several of the recommendations from the study were never satisfactorily implemented. There is therefore the need for establishment of an agency to play the coordination role to ensure woodfuel programmes are given the deserved priority.

#### 5.1 Woodfuel inter-agency coordination

The Ministry of Energy will be the lead government agency to coordinate national woodfuel development and implementation of this strategy. The proposed new semi-autonomous body, Kenya Wood Energy Development Authority (KWEDA) will spearhead the national woodfuel development and management programmes. In collaboration with other relevant agencies, KWEDA will facilitate and coordinate the collection of data, issuing of licenses, labeling of wood and charcoal products, setting standards and monitoring the flow of charcoal and wood from production to consumption centres.

In addition, it is recommended that an inter-agency standing committee bringing together forest related sectors such as Ministries of Energy, Environment, Kenya Forest Service, Agriculture, public universities, private sector and NGOs be established to manage the cross-sectoral woodfuel issues under the auspices of KWEDA..

The disaggregated policy interventions and disharmony among public institutions can be addressed through:

- Consultative collaboration during formulation of the strategy and regulations on biomass energy to capture all sectoral interests;
- Appointing one sector to spearhead areas in which they have expertise, for example, the Ministry of Energy to lead in formulating policies and regulations in consultation with the others;

#### 5.2 Other functions of KWEDA

In addition to coordination of woodfuel issues, KWEDA will routinely undertake (i) capacity development, (ii) resource mobilization and (iii) incentive schemes for promoting woodfuel sub-sector development. The specific elements to considered under each of the above ncilliary functions are outlined below.

##### (i) Capacity development

- Undertake training needs assessment
- Development of training modules
- Undertaking training
- Deployment of trained personnel

##### (ii) Resource mobilization

- Identification of resource needs
- Prioritize the needs
- Sourcing of the resources
- Distribution of resources to the relevant institutions

(iii) Incentives

KWEDA will undertake necessary assessments of various incentive options that may help stimulate faster development of woodfuel resource as well as adoption of efficient utilization practices. Such incentives may include appropriate subsidies. It is however noted that the efficacy of woodfuel subsidies should be judged on many grounds: the extent by which the poor are covered, the share of the subsidy going to the poor, predictability of the benefits for the poor and the extent of pricing distortions and other unintended side-effects. Setting the right framework conditions - including continued market reforms, consistent regulations, and targeted policies - to encourage competition in energy markets, reduce the cost of energy services to end users, and protect important public benefits.

## 5.2 *Stakeholder Analysis*

### 5.2.1 Ministry of Energy

The Ministry of Energy will have the overall responsibility for planning and coordinating all woodfuel supply and demand management activities among the various participating institutions, organizations and private sector. It will be responsible for preparing a coordinated work programmes for the various woodfuel projects and activities in the districts. It will further organize and provide the required materials, equipment, transport and other operating funds to support the implementation of programmes. In addition, it will organize and support various levels of training in the districts for both technical extension personnel from the participating institutions, the local group leaders involved in the projects and the local artisans involved in technology development and dissemination.

- Undertake training needs assessment
- Development of training modules
- Undertaking training
- Deployment of trained personnel
- Identification of resource needs
- Prioritize the needs
- Sourcing of the resources
- Distribution of resources to the relevant institutions
- Identification of key areas requiring rules and regulation
- Formulation of the rules & regulations
- Harmonization with ongoing processes
- Dissemination of the rules and regulations
- Enforcement
- Provision for redress

#### 5.2.1.1 Energy Centres

The Energy Centres are the information dissemination and technology demonstration outlets of the

Ministry of energy. Their activities stimulate development and dissemination of low cost renewable energy technologies, support development of other promising RETs

- Strengthen their operational capacities through training, staffing, exchange visits
- AF demonstration, training and extension
- Improved stove dissemination
- Biogas & other renewable technology promotion
- Public awareness

#### 5.2.1.2 REA

The relevant functions of Rural Electrification Authority ( REA) as stipulated under section 67 of the Energy Act, 2006 are to promote use of renewable energy sources including but not limited to small hydro, wind, solar, biomass, geothermal, hybrid systems and oil fired components taking into account specific needs of certain areas including the potential for using electricity for irrigation and in support of off-farm income generating activities.

#### 5.2.1.3 ERC

The functions of Energy Regulatory Commission (ERC) are outlined under paragraphs 5 and 6 of the Energy Act, 2006 as they relate to woodfuel sub-sector are to:

- Regulate production, distribution, supply and use of renewable and other forms of energy;
- Protect the interests of consumer, investor and other stakeholder interests.
- Monitor, ensure implementation of, and the observance of the principles of fair competition in the energy sector, in coordination with other statutory authorities;
- Provide such information and statistics to the Minister as he may from time to time require;
- Collect and maintain energy data;
- Prepare indicative national energy plan; and
- Grant licenses, in coordination with other statutory authorities, for sustainable charcoal production upon submission of satisfactory development plans (section 6 (p)).

The role of regulating the woodfuel sub-sector is vested with the Energy Regulatory Commission (ERC).The Commission will issue licenses and permits for all undertakings and activities in the development and use of woodfuel, and make proposals to the Minister for regulations as necessary. In liaison with other statutory bodies, the Commission will formulate, enforce and review environmental, health, safety and quality standards for the energy sector. It will also enforce and review regulations, codes and standards.

#### 5.2.2 Kenya forest Service

Within the purview of its functional mandate, Kenya Forest Service will support the implementation of the woodfuel strategy by:

- Providing overall general forestry management guidelines regarding the management, conservation and utilization of all types of forest areas in the country;
- promoting capacity building in forest management;
- Identifying woodfuel research needs and applying research findings;
- providing forest extension services by assisting forest owners, farmers and

- Associations in the sustainable management of forests;
- enforce the rules and regulations pertaining to charcoal making and other forest utilization activities;
- managing forests on water catchment areas primarily for purposes of water and soil conservation, carbon sequestration and other environmental services;

### 5.2.3 Ministry of Agriculture

It is noted that sustaining an increasing population requires a continuous flow of agricultural and forest products, such as food, fodder, timber and fuelwood. These products all require land to be produced. Increasing this flow requires more productivity. Productivity can increase through intensification of agricultural practices, improved cropping systems and increase in agricultural areas. Currently, the Ministry of Agriculture is involved in implementing woodfuel relevant activities including:

- Promotion of agro-forestry through the soil conservation objective
- Promoting dissemination of improved woodfuel stoves through the home economics extension services as well as through public sector development in Agriculture (PSDA) project. The project also has a component of promoting biogas technology.

Furthermore, woodfuel is a critical input into rural agro-processing activities (tobacco curing, tea processing and fish drying therefore affecting the overall national woodfuel demand. On the other hand, agricultural crops residues are important fuel sources.

### 5.2.4 National Council for Science and technology

The National Council of Science and Technology has a functional mandate to coordinate scientific research, including woodfuel. It would therefore be instrumental in setting the woodfuel research agenda, identification of research gaps and mobilization of research funds.

### 5.2.5 Academia and Other National Research Institutes

The Public Universities and various relevant national research institutes will undertake research on various pertinent aspects of woodfuel sub-sector development and management.

### 5.2.6 Ministry of Trade and Industry

The Ministry of Trade and Industry regulates and oversees trade and industrial activities. In keeping with this responsibilities, the Ministry will play a role in woodfuel development and management including to:

- Develop licensing guidelines for micro-enterprises
- Organize and promote the charcoal makers' association
- Training in business planning and management
- Develop charcoal production standards through KEBS

### 5.2.7 Ministry of health

The goal of the health sector is to ensure good health for all. Production and consumption of

woodfuel affects health through pollutant gas emissions. The promotion of improved stoves as a strategy for demand side management is therefore beneficial to the sector by controlling indoor air pollutants.

#### 5.2.8 Ministry of Water

The harvesting of woodfuel affects water resource’s ability to sustain social and economic needs. On the other hand, tree planting helps protect and conserve water catchments.

#### 5.2.9 Ministry of Environment and Mineral Development

Tree planting for fuelwood purpose also serves to conserve and protect the environment, control of desertification as well as increasing greenhouse gas sinks through carbon sequestration. The implementation of the woodfuel strategy will reinforce the attainment of sound environmental practices.

#### 5.2.10 Civil Society

The civil society organizations, including NGOs and CBOs have strengths in public awareness raising, resource mobilization, grassroots development activities, advocacy for rights of the poor and vulnerable socio-economic groups, among other things. Various relevant civil society organizations will be strengthened to participate in the implementation of the integrated woodfuel strategy.

### 5.3 Indicative stakeholder roles

In recognition of the multi-stakeholder and cross-sectoral nature of woodfuel development, a consultative forum of public sector stakeholders identified various desired actions and corresponding roles to be played by different stakeholders. These roles are underpinned on six fundamental pillars, namely: Micro-enterprise development, Research and development, Capacity building, resource mobilization, rules and regulations and monitoring and evaluation. These are summarized in Table 3. below.

Table 3 Indicative actions and suggested actors

	PILLAR	ACTION PLAN	ACTORS
1	Micro enterprise development	<ul style="list-style-type: none"> <li>▪ Develop licensing guidelines</li> <li>▪ Organize charcoal makers associations and promote group production</li> <li>▪ Publish production standards for charcoal</li> <li>▪ Training in business planning and management</li> </ul>	<ul style="list-style-type: none"> <li>▪ MTI, KRA</li> <li>▪ Entrepreneurs,</li> <li>▪ KEBS,</li> <li>▪ MFIs</li> <li>▪ Federation of Jua Kali association</li> </ul>
2	Research & Development	<ul style="list-style-type: none"> <li>▪ Inventory on research</li> <li>▪ Identify gaps</li> <li>▪ Source for funds</li> <li>▪ Assign responsibilities to research institutions</li> <li>▪ Co-ordinate research</li> </ul>	<ul style="list-style-type: none"> <li>▪ National Council for Science and Technology in liaison with other lead agencies</li> <li>▪ Development Partners</li> </ul>

3	Capacity Building	<ul style="list-style-type: none"> <li>▪ Undertake training needs assessment</li> <li>▪ Development of training modules</li> <li>▪ Undertaking training</li> <li>▪ Deployment of trained personnel</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ministry of Energy</li> <li>▪ KFS</li> <li>▪ Universities</li> <li>▪ NGOs</li> <li>▪ Development Partners</li> <li>▪ Other training institutions</li> </ul>
4	Resource mobilization	<ul style="list-style-type: none"> <li>▪ Identification of resource needs</li> <li>▪ Prioritize the needs</li> <li>▪ Sourcing of the resources</li> <li>▪ Distribution of resources to the relevant institutions</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ministry of Energy</li> <li>▪ Ministry of Environment and Natural Resources</li> <li>▪ Ministry of Trade &amp; Industry</li> <li>▪ Ministry of Finance</li> <li>▪ Ministry of Planning National Development</li> <li>▪ Other relevant agencies</li> </ul>
5	Rules & Regulations	<ul style="list-style-type: none"> <li>▪ Identification of key areas requiring rules and regulation</li> <li>▪ Formulation of the rules &amp; regulations</li> <li>▪ Harmonization with ongoing processes</li> <li>▪ Dissemination of the rules and regulations</li> <li>▪ Enforcement</li> <li>▪ Provision for redress</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ministry of Energy</li> <li>▪ Ministry of Environment and Natural Resources</li> <li>▪ Ministry of Local Government</li> </ul>
6	Monitoring & Evaluation	<ul style="list-style-type: none"> <li>▪ Development of criteria &amp; indicators</li> <li>▪ Develop a monitoring programme</li> <li>▪ Implementation of the monitoring programme</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ministry of Energy (Internal M &amp; E)</li> <li>▪ Multi-stake holder committee to be formed ((External M &amp; E)</li> </ul>

#### 5.4 Institutional arrangement in the Woodfuel production and distribution

##### 5.4.1 Production level

- Ministry of Environment & Natural Resource (KFS, KEFRI) To implement tree planting activities and conduct training on nursery establishment, plantation establishment and tree management with communities, private sector, NGOs and other interested parties
- Ministries of Energy and the Ministry of Trade and Industry to create awareness on improving energy supply, efficient harvesting methods, energy markets, standards, rules and regulations, commercial tree planting etc.
- Ministry of Agriculture to be involved during production level
  - Promotion of Agro-forestry
  - KARI for seed production
- Private Sector (Plantation establishment)
- Communities (Individual/community tree planting)
- Local Authorities (leasing out land for tree planting)
- NGO's (promotional activities, awareness creation, implementation of projects)

##### 5.4.2 Harvesting Level

The institutions will be involved as outlined under production.

#### 5.4.3 Conversion Level

- Ministry of Energy in charge of technology dissemination (efficient harvesting and wood preparation methods, efficient kilns)
- Ministry of Trade & Industry to be in charge of Standards for charcoal (KEBS, KIRDI)
- KEFRI to be in charge of advisory services on appropriate species for charcoal production within specific agro ecological zones
- NEMA to be in charge of environmental standards such as Green House Gas emissions

#### 5.4.4 Marketing Level

- Ministry of Co-operative Development and Marketing to be in charge of marketing of charcoal through cooperative societies
- Community Based Organizations to be in charge of organizing the charcoal marketing produced at community level and to comply with standards set by the Kenya Bureau of Standards
- Private Sector to market their products in established outlets but also to comply with set standards
- Ministry of Trade & Industry (Kenya Bureau of standards to oversee quality of charcoal, compliance with defined packaging standards)
- Local Authority to advise on the levels of taxation for charcoal and wood extracted from areas within their jurisdiction, collection of revenue from charcoal
- KFS for issuance of movement permits for charcoal? (see next bullet)
- Ministry of Energy (ERC for Policy and regulation of the charcoal trade. ERC is also supposed to issue permits. There is need to harmonize regarding which permits are issued by the ERC and which ones by the KFS). The regulation under the ERC should tie up with what is already being undertaken by KFS on charcoal regulations. ERC will also enforce standards.

#### 5.4.5 Consumption Level

- Ministry of health to deal with health aspects of utilization of charcoal
- Ministry Environment & Natural Resources –(NEMA for standards on emissions from the stoves)
- Ministry of Energy (Promotion of efficient technology for burning charcoal at different consumer levels, creating awareness on the standards of stoves, testing of stove prototypes and making appropriate recommendations, training of stove producers on stove making and quality, training on costing and pricing etc.)
- Ministry of Science & Technology to co-ordinate research undertaken by different research bodies on charcoal utilization technology
- Research institutions to liaise with Ministry of Science and Technology when undertaking research;
- Universities to undertake research on emissions and stove technologies;
- NGOs for creation of awareness on efficient charcoal stoves and promotion of stove designs recommended by the Ministry of Energy;
- Consumer organizations to promote the utilization of improved stove designs recommended by the Ministry of Energy;
- Ministry of Trade & Industry:
  - KIRDI (Research on new designs of stoves)

- KEBS (setting standards for improved charcoal stoves)
- KIPI (for patenting of innovations)
- ERC (enforcement of standards)
- Kenya Private Sector Alliance to coordinate private sector activities on the production of improved charcoal stoves

## **5.5 Capacity Building**

Adequate information and technical capacity was identified as an important overarching factor to facilitate the attainment of the aims of the woodfuel strategy. This embraces a range of aspects including technical capacity, awareness raising and training.

### **5.5.1 Capacity Development**

Capacity building is an integral cross-cutting issue and will need to be strengthened in order to enable for successful implementation the proposed integrated woodfuel development strategy. It will serve the following purposes, among others:

- i. improving implementation capabilities of various relevant agencies to implement activities that positively impact on woodfuel management;
- ii. Establishing and/or strengthening institutions for wood energy development; design extension and investment programmes to integrate wood energy into development programmes of related sectors;
- iii. Developing and strengthening capabilities to build and maintain a wood energy data base;
- iv. Strengthening capacities to analyze, formulate and monitor woodfuel policies and plans,
- v. Build capacity among communities in technologies for farm forestry development. These include blending indigenous farm forestry techniques with modern agro-forestry approaches in the promotion of select tree species and in specific locations to increase biomass production.
- vi. Revitalize existing energy centres,
- vii. Carry out a study of efficient woodfuel conversion and end-use devices; and
- viii. Micro-enterprise development through transfer of skills such as business planning, and fundraising

## Chapter 6

### 6. Implementation of the Strategy

The implementation of the proposed integrated woodfuel strategy will deliver benefits that fit directly into a range of sectoral policies as discussed earlier. Important elements of the implementation strategy are time scheduling, monitoring and evaluation plan and financing.

The implementation of the plan involves the identification of activities and tasks, computation of resource requirements, assigning responsibilities and scheduling sequence of activities over time. It also involves the actual undertaking of activities identified in the implementation plan. In addition, project implementation involves the preparation of a monitoring and evaluation plan. In the monitoring and evaluation plan, indicators of achievement are set and checked at the various levels of the project. Finally, the project plan implementation also includes receiving feedback and adjusting accordingly.

#### *6.1 Implementation schedule*

The proposed woodfuel strategy will be implemented during the period 2008/09 to 2012/13. Specific activities to be implemented are being formulated and are to be presented in Appendix 2.

#### *6.2 Monitoring and evaluation*

Monitoring and evaluation will be undertaken at all stages during implementation. Quarterly, half-year and annual reports will be mandatory reporting regimes. During the course of implementation, annual workplans shall be prepared. Alongside the workplans, monitoring and evaluation criteria, indicators as well as a monitoring work programme will be prepared to form the basis for the monitoring and evaluation assessment. This will be formulated along the deliverable outputs and key milestones. Effectively, the activities under the monitoring and evaluation function will include:

- Development of M&E criteria & indicators
- Develop a monitoring programme
- Implementation of the monitoring programme
- Periodic evaluation of implementation outcomes

#### **6.3 Financing**

The role of micro-credit schemes in increasing access to efficient wood energy technologies cannot be overstated. The financing modalities will be informed by current successful financing models. For instance, the Global Environmental Facility- Small Grant Programme (GEF-SGP) implemented by RETAP, a local NGO, .

The main obstacle to financing the woodfuel market is the reluctance of banks to manage numerous small loans and to lend without collateral or other guarantees against loan defaults. To mitigate this, a range of approaches are suggested. They include:

- Financing through energy service companies. These companies can replace dealers as the financing intermediary. Companies typically require greater efforts to establish higher funding levels, because they provide a more comprehensive installation and back-up service to clients.

- Revolving funds (with grant support): A bank takes on the risk of operating a revolving loan fund, usually with start-up capital provided by a grant.
- Loan aggregation through cooperatives: To avoid the high costs of servicing many small loans, prospective borrowers form a community association (or enlarge the functions of an existing village or farmer cooperative). Banks lend to the cooperative or lease the energy systems but retain ownership of the equipment in case of payment defaults.
- Concessional funding for public sector objectives: The government contracts and pays a local company to provide energy services that meet development objectives, such as photovoltaic lighting for schools. This provides entry capital for the company to offer credit and expand its business to other local markets, such as photovoltaic for households, health clinics, and community centres.

The activities under the financing component of the proposed integrated woodfuel development strategy will, among other things, to:

- Promote access to micro-finance facility or other innovative financing mechanisms for the rural and urban poor.
- Mobilize financial resources to support woodfuel programmes
- Promote innovative financing mechanisms that allow women to access credit for modern energy services and technologies;

The cost of implementing this strategy has been estimated at Ksh. 41.5 million as shown in Appendix 2. It is observed that there are current programmes/projects that are contributing towards the achievement of the strategy objectives. Notable among these include: Kenya Energy Sector Environment Programme (KEEP), which is a ten year project funded by the government through the Ministry of Energy and its parastatals, Woodfuel resources development programme where woodfuel supply and demand side management interventions are being implemented by Ministry of Energy through the Energy Centres Programme. There are also emerging international funding initiatives from which this woodfuel strategy could leverage funding. Examples of such initiatives include: AFD's finance to be channeled through local banks and other financial institutions, the GVEP energy access fund, among others.

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## APPENDICES

### Appendix 1: Terms of Reference

#### The Project

The Ministry of Energy through its partners UNDP and RETAP is implementing the GEF Biomass Energy Project whose aim is to transform markets for highly efficient biomass stoves for institutions and medium-scale enterprises in Kenya by (i) promoting highly efficient improved stoves (ii) establishment of woodlots owned and managed by the institutions and private sector and (iii) removing policy and financial barriers to the widespread adoption of stoves. The project aims to reduce carbon dioxide equivalent emissions by an accumulated total of between 400,000 and 960,000 tonnes by 2020 and to contribute to a wide range of other social, environmental and economic benefits.

#### Background of the Project Component on Policy Strengthening

A major outcome of the GEF Biomass Energy Project is the strengthening of supportive policies and legal framework for sustainable biomass energy business. Overall, biomass energy policies provide a framework within which business operates. However sometimes there are barriers that prevent the realization of favourable policies as in the case of biomass energy policy development in Kenya. The need for a policy dialogue arose from identified policy barriers as listed below:

5. Insufficient coordination between the relevant Ministries;
6. Lack of enabling market-oriented policies for the development of local (commercial & high value) markets for improved biomass targeting productive end-uses for income generation and poverty reduction;
7. The absence of strategies for future expansion & transformation of biomass energy in light of the knowledge of the potential and benefits from biomass energy utilization; and
8. Limited availability of information related to diverse issues on biomass energy markets, including how to create sustainable biomass energy markets, leading to insufficiently informed policies.

The GEF Biomass Energy Project proposes increased coordination between government sectors in implementing policy as well as dialogue between business and government; and coordination and strengthening of parliamentary support for market-oriented biomass energy legislation. The indicator for this outcome of the Project is *an Integrated biomass energy strategy that brings together Forestry, Energy, Environment and Industry, Health, Agriculture and Education sectors.*

#### Purpose of the Consultancy

The purpose of this consultancy is to implement key recommendations from the public sector workshop held on the **26 March 2008**, which inter alia called for:

- a.) The preparation of a wood fuel strategy and action plan
- b.) Formulation of a research strategy for biomass energy research
- c.) Definition of the disharmony between existing policies, legislation and institutions
- d.) Incorporation of plans to address the disharmony in the woodfuel strategy and action plan, and
- e.) Developing a clear implementation plan for the drafting of rules and regulations for the woodfuel sub sector

The consultant is therefore invited to develop for publication the **Integrated Woodfuel Development Strategy 2008-2012** incorporating the forestry, agriculture, education, industry and energy sectors. This should also incorporate an R&D strategy and action plans. The Strategy should

aim to address the special interests of SMEs involved along the woodfuel value chain (mainly in improved stove production and marketing and tree nursery operators and commercial growers). The Strategy should also address key sustainability (social, economic and environmental) considerations.

### **Activities**

1. hold focused consultations with KFWG, ESDA, Thuiya Enterprises/RELMA and any other relevant stakeholders involved in past charcoal policy work with a view to documenting and incorporating their progress and experience in the current work;
2. Review GEF Biomass Energy Project document (PRODOC) and other relevant outputs and raw documents (e.g. policy audit report and public sector workshop proceedings) so far generated;
3. Prepare a draft integrated woodfuel strategy that integrates inputs from all the sectors studied and additional provisions that seal any identified gaps; and
4. Convene a small roundtable meeting of stakeholders from key public sectors to review the draft strategy so far developed;
5. Present the draft **Integrated Woodfuel Development Strategy 2008-2012** to the private-public sector stakeholders dialogue workshop to be held in late May 2008.

### **Deliverables**

1. A draft **Integrated Woodfuel Development Strategy 2008-2012** complete with R&D strategy and workplans.

Appendix 2: Strategy Implementation Matrix

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timeframe	Key Assumptions
1. Woodfuel supply	1. Intensify promotion of small and large scale growing fast-maturing woodfuel tree species	i) Identify woodfuel production zones ii) Provide technical support to commercial woodfuel production iii) Link CDM and other global initiatives to woodfuel production iv) Develop and implement short and long term plans for massive tree plantings.	300	Report of woodfuel production zones, Additional Area under woodfuel production	MOE, rural households, private sector	2008/09, Continuous	Adequate planting material available, Willingness of households and private entities to participate
	2. Encourage commercial production of woodfuel	i) Identify and remove barriers to commercial woodfuel production ii) Facilitate formation of woodfuel production co-operatives iii) Commercialize tree seed/seedling production	600	Reports of Activities	MOE, Private sector, KFS, Consultants	2008/09	Availability of funds to grow woodfuel
	3. Promote reforestation of areas cleared for charcoal production through appropriate incentives	i. Strengthen national reforestation and Afforestation efforts ii. Initiate and/or strengthen Community woodlots development and management iv) Prepare reforestation/ Afforestation plans	2000	Area reforested/ afforested; No. of community woodlots established	KFS, MOE, Rural households	2009/10	Availability of funds

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timeframe	Key Assumptions
	4. Strengthen capacity for agroforestry and on-farm woodlot development	i. Strengthen social forestry ii. Training on nursery establishment and management iii. Tree-crop selection and management iv. Agro-forestry species agro-ecological zoning	2000	Training reports, Activity reports	KFS, KEFRI, MOA, MOE	2009/10	Availability of adequate resources
		<b>Sub-Total</b>	<b>4900</b>				
<b>2. Woodfuel Demand side Management</b>	1. Increase the rate of adoption of efficient charcoal stoves from 47 per cent currently to 85 per cent by 2012.	i) Promote private sector participation in biomass energy production, distribution and marketing ii) Promote introduction of efficient charcoal kilns in charcoal producing iii) Ecolabelling of charcoal iv) Promote inter-fuel substitution iv) Certification and registration of Eco-charcoal producers v) Training on the construction and use of improved charcoal kilns	5000	No. of stoves disseminated per year,	MOE, MOA	2008/09, continuous	
	2. Address inherent market barriers to faster adoption of improved stoves	i) Identify current barriers and prepare response action plans ii) Implement the action plans iii) Address marketing barriers iv) Create awareness on benefits of adopting improved	2000	Activity reports,	MOE, REA, MOA	2009/10	

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timeframe	Key Assumptions
		stoves					
	3. Increase efficiency of woodfuel production, transformation and end-use	i) Promote the wider use of improved kilns	1000	No. of improved kilns constructed	MOE	2008/09	
	4. Increase the rate of adoption of efficient fuel wood stoves from 4 per cent currently to 15 per cent by 2012	i) Promote private sector participation in improved woodstove production and distribution ii) Promote wider use of efficient kilns for improved woodstove liner production iii) Monitor the quality of stoves in the market	2000	Activity reports, No. of improved kilns constructed	MOE, MOA	2009/10	
	5. Promote woodfuel substitutes such as kerosene and LPG and RETs	i) Provide technical advisory and support services ii) Provide incentives to allow faster adoption of improved efficient stoves iii) Promote RETs	2000	Reports of incentives provided, Activity reports	MOE	2008/09	Ministry of Finance will agree to allow fiscal incentives
	6. Adoption of other energy conservation measures	i) Sensitization on energy conservation practices ii) Promote the use of fireless cookers	200	Activity reports	MOE, MOA	2008/09	
		<b>Sub-Total</b>	<b>12200</b>				

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timeframe	Key Assumptions
<b>3. Woodfuel research, Demonstration and Development</b>	1. Formulate woodfuel research and development plan	<ul style="list-style-type: none"> <li>i) Undertake woodfuel research needs assessment</li> <li>ii) Research priority setting</li> <li>iii) Commissioning of research activities to various selected researchers and/or research agencies</li> <li>iv) Research monitoring and evaluation plan</li> <li>v) Communication of research findings</li> <li>vi) Research financing plan</li> <li>vii) Research coordination</li> </ul>	12,500	Survey report, Effective participation of key stakeholders, Activity reports	MOE, KFS, Universities, National Research Institutes, NCST, KEFRI	2008/09 - 12	
	2. Establish a national wood energy research fund to facilitate targeted woodfuel research activities	<ul style="list-style-type: none"> <li>i) Mobilize research funds</li> <li>ii) Prepare a research and development plan for woodfuel sub-sector as a key priority</li> <li>iv) Inventory of completed woodfuel related research and major findings</li> <li>v) Formulate and implement a proactive research programme aimed at increasing the efficiency of improved stoves from current 35 to 40 per cent by 2012</li> </ul>	200	Amount of funding mobilized	MOE, Private sector	2009/10	Partners willingness to support the initiative

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timeframe	Key Assumptions
	3. Establish a standing inter-agency committee to review the woodfuel research needs and set research agenda	i) Organize a stakeholder forum to identify woodfuel research gaps ii) Set woodfuel research priorities iii) Assign responsibilities to appropriate research institutions iv) Co-ordinate woodfuel research activities	300	Activity reports	MOE, KFS, NCST, Academia, other research institutions	2009/10	
	4. Strengthen research collaboration between academia, research institutions, private sector and research users	i) Undertake an inventory to take stock of concluded research on woodfuel issues ii) Information dissemination and networking iii) Mobilize woodfuel research funds	300	Inventory report of concluded research, amount of funds mobilized	MOE, NCST, Universities, National & Regional Research Organization	2010/11	Willingness of relevant institutions to collaborate
	5. Establish Renewable energy Centre of excellence to showcase emerging technologies and	i) Identify site ii) Appoint inter-agency steering committee iii) Formulate a comprehensive development and operational plan iv) Procure technology	5000	Activity report, Hardware procured, development and operation plan in place	MOE, Development Partners	2011/12	Approval by relevant authorities

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timeframe	Key Assumptions
	best practices	Hardware					
	6. strengthen research on key wood energy issues in the context of global and national emerging issues	i) Research on environment, energy and health perspectives ii) Tree species selection and site marching iii) Research on energy efficiency improvement and conservation	300	Activity reports	MOE, Universities, Research Organizations, NCST	2011/12	Research activities will be completed in time
		<b>Sub-Total</b>	<b>18,600</b>				
<b>4. . Woodfuel sub-sector regulation</b>	1. Develop charcoal regulations, rules and guidelines	i) Formulate and enforce charcoal production and distribution regulations, rules and guidelines ii) Identify current charcoal trade barriers iii) harmonize with other charcoal regulations initiated other stakeholders including KFS	200	Charcoal rules, regulations & guidelines, Activity report	ERC, MOE, KFS	2009/10	
	2. Enforce improved woodfuel stove standards	i) Education and awareness creation on available stove standards ii) Quality control monitoring to ensure compliance with the standards	300	Activity reports	KEBS, MOE, MOA	2009/10	

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timeframe	Key Assumptions
	3. Promote adoption and wider use of improved charcoal production kilns and practices	i) Public awareness and education campaigns ii) Technical support to improved stove producers and distributors iii) Training of private sector artisans and stove marketers	5000	Activity reports, No. of people trained,	MOE, MOA, Households,	2008/09	
	4. Remove information and other barriers to the adoption of efficient wood fuel stoves and kilns	i) Identify and address inherent barriers ii) Technical support to stove production centres and women and youth groups	300	List of barriers addressed, No. of groups assisted	MOE, Women Groups, Youth Groups	2009/10	
	5. Develop comprehensive energy policy and legislation	i) Formulate appropriate woodfuel tree species and site matching guidelines ii) Harmonize sectoral laws that affect woodfuel production, distribution and consumption iii) Disseminate and enforce woodfuel sub-sector rules and regulation iv) Review of existing policies and laws affecting woodfuel	300	MOE, ERC	Report of sectoral laws harmonized, Activity reports	2011/12	

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timeframe	Key Assumptions
	6. Establish Kenya Wood Energy Development Authority (KWEDA) to manage woodfuel	<ul style="list-style-type: none"> <li>i) Establish committee to formulate the functions of the institution</li> <li>ii) Prepare cabinet memorandum to explain the intended objectives</li> <li>iii) Draft a Sessional Paper for tabling in Parliament</li> <li>iv) Setting the right framework conditions including continued market reforms, consistent regulations, and targeted policies in order to minimize woodfuel markets imperfections, reduce the cost of woodfuel services to end users, and protect important social and environmental benefits;</li> <li>v) Removing obstacles or providing incentives, as needed, to encourage greater woodfuel utilization efficiency and the development and diffusion to wider markets of new sustainable woodfuel technologies.</li> </ul>	2000	Committee established, Cabinet approval granted, necessary legislation enacted	MOE, State law office, Cabinet, Parliament	2011/12	

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timeframe	Key Assumptions
	7. Facilitate the formation and/or strengthening of woodfuel sub-sector associations in order to enhance self-regulation and advocacy	i) Hold regular consultative meetings with registered associations with view to evaluating their effectiveness ii) Facilitate formation and establishment of necessary associations to spearhead their effective participation in the woodfuel sub-sector activities	1,000	Activity reports, Associations supported	MOE, Jua Kali Federation, Relevant associations	2009/10	
	8. Strengthen public information dissemination through various stakeholders including relevant woodfuel sub-sector associations such as KENNISA, National Federation of Jua Kali Association and NGOs, among others.	i) Organize roundtable meetings with national Jua Kali leaders involved in woodfuel sub-sector ii) Organize joint activities with woodfuel-relevant associations in order to strengthen collaboration	2,000	Information dissemination events held, Activity reports	MOE, MOYA, National Jua Kali Associations	2009/10	
		<b>Sub-Total</b>	<b>11,100</b>				

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timeframe	Key Assumptions
<b>5. Woodfuel substitution</b>	1. Promote increased use of renewable energy sources including solar, wind, biogas and small hydropower, among others;	i) Intensify the schools' and health institutions' solar PV electrification ii) Increase access outlets for LPG and kerosene for rural households iii) Public awareness and education on renewable energy options iv) Implement pilot projects to demonstrate the efficacy of renewable energy applications v) Expand training of renewable energy technology support capacity vi) Extend cleaner fossil fuel (Kerosene and LPG) and renewable energy technology distribution infrastructure to rural areas vii) Expand access to micro-credit to the rural and urban poor viii) Strengthen private sector and civil society participation	10,000	No. of schools/health centres electrified, No. LPG/Kerosene outlets opened	REA, MOE, Private consultants Petroelum fuel traders	2011/12	

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timeframe	Key Assumptions
	2. Increase access to modern and cleaner fuels such as kerosene, liquid petroleum gas to the rural and poor urban households	i) Develop fiscal incentives to make LPG and kerosene more affordable ii) Provide technical assistance to SMEs in delivery of modern energy services	200	List of incentives provided, No. of SMEs supported	MOE, Households, MOF, MOT&I	2009/10	
		<b>Sub-Total</b>	<b>10,200</b>				
		<b>Grand Total</b>	<b>57,000</b>				

Appendix 3: Woodfuel Research and Development Plan

Strategic Objective	Strategies	Activities	Cost Ksh (000)	Performance Indicators	Actors	Timing	Key Assumptions
To develop an integrated woodfuel research and development plan	Undertake woodfuel research needs assessment	i) Woodfuel surveys, ii) Multi-stakeholder research planning and execution, iii) Strengthening stakeholder participation	5,000	,	MOE, KFS, Universities, National Research Institutes	2009	Sufficient funds available
	Research priority setting	i) Setting periodic woodfuel research themes	1,000	Workshop report, List of research priorities	MOE, NCST, Universities, relevant National Research Institutes	2009	

		ii) Hold Planning workshops/seminars					
	Commissioning of woodfuel research activities to various selected researchers and/or research agencies	i) Assignment of research Tasks to researchers/research agencies ii) Disbursement of research funds	1,000	List of assigned tasks	MOE, Selected researchers/research organizations	2010/11	
	Research monitoring and evaluation plan	i) Developing M& E indicator ii) Undertake M & E	500	M&E indicators	MOE, Inter-Agency Woodfuel Committee	2008/09	
	Communication of research findings	i) Prepare a research results dissemination strategy ii) Organize workshops to receive research findings iii) Publish research results iv) Prepare policy briefs	1,000	Communication strategy, Workshop reports, Number of published research reports	MOE, researchers, publishers	2011/12	
	Research financing plan	i) Establish a woodfuel research fund ii) Mobilize funds iii) Formulate funds disbursement criteria iv) Disburse funds	2,000	Amount of funds mobilized	MOE, NCST, KFS, KEFRI	2009	
	Research coordination	i) Establish inter-agency coordination committee ii) Hold regular coordination meetings	2,000	Activity reports	MOE, NCST	2008/09	

Table 1: Percentage distribution of households by primary type of cooking appliance

	Traditional stone fire	Improved TSF	Ordinary jiko	Improved jiko	Kerosene stove	Gas cooker	Electric cooker	other
Kenya	60.8	8.4	7.1	6.5	12.8	3.4	0.4	0.6
Nairobi	1.5	0.2	4.8	5.2	65.3	19.6	2.0	1.4
Central	63.5	7.5	5.6	7.8	11.7	2.8	0.2	1.0
Coast	53.2	2.6	11.2	6.0	22.9	3.0	0.6	0.4
Eastern	79.4	8.1	4.5	2.9	3.6	0.8	0.1	0.6
N/Eastern	89.2	2.3	3.2	4.7	0.2			0.4
Nyanza	76.0	3.7	7.3	8.8	2.9	0.9	0.2	0.2
R/Valley	49.7	21.4	11.5	8.6	6.2	1.8	0.4	0.4
Western	86.6	1.5	1.9	4.2	2.0	0.5	0.2	0.1
Rural	78	10.9	4.0	3.9	2.3	0.6	0.2	0.3
Urban	9.1	1.0	16.6	14.2	44.7	11.7	1.2	1.3

Source: Integrated Household Budget Survey KNBS, 2007.

Table 2: Percentage distribution of households by main cooking fuel and Region

	Firewood	Grass	Paraffin	Electricity	LPG	Charcoal	Biomass Residues	Biogas	others
Kenya	68.3	0.1	13.2	0.6	3.5	13.3	0.3	0.0	0.6
Nairobi	1.8	0.1	63.5	3.0	20.2	10.5	0.1		0.8
Central	6.9	0.1	11.6	0.5	3.1	14.2	0.7		0.8
Coast	54.5	0.2	24.1	0.7	2.9	16.9	0.1	0.3	0.4
Eastern	87.4	0.1	3.8	0.1	1.0	6.8	0.0		0.7
N/Eastern	90.2	0.4	0.6	0.1		8.2			0.4
Nyanza	79.8	0.0	3.6	0.2	0.9	15.1	0.2		0.3
R/Valley	70.2	0.2	7.0	0.5	1.8	19.3	0.4	0.1	0.7
Western	88.5	0.1	2.3	0.2	0.5	7.1	0.8	0.0	0.4
Rural	87.7	0.1	2.7	0.2	0.7	7.7	0.4	0.0	0.4
Urban	10.0	0.2	11.9	1.8	11.9	30.2	0.1	0.1	1.1

Source: Integrated Household Budget Survey KNBS, 2007.