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Netherlands Enterprise Agency (RVO)
The RVO is part of the Ministry of Economic Affairs of The Netherlands and works at the instigation of ministries and the European Union. The main aim of RVO is to improve opportunities for entrepreneurs and strengthen their position. Within the clean cooking sector, the RVO has provided diverse support to key stakeholder organisations in Kenya, Ghana, Uganda, Ethiopia and Bangladesh.
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Netherlands Development Organisation (SNV)
SNV is an international not-for-profit development organisation, funded from public and private sources, with a long-term, local presence in over 30 countries in Africa, Asia, and Latin America. SNV’s global team of local and international advisors works with local partners to equip communities, businesses and organisations with tools, knowledge and connections needed to increase their incomes and gain access to basic services in Agriculture, Renewable Energy and WASH.
http://www.snv.org/

Centre for Energy, Environment and Sustainable Development (CEESD)
CEESD supports dissemination of technologies that promote sustainable development through advocacy, R&D, capacity building, and project development in clean energy, environmental friendly technologies, and climate change adaptation and mitigation in Ghana and Africa.
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<td>African Clean Cooking Energy Solutions</td>
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<td>AEA</td>
<td>Austrian Energy Agency</td>
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<td>AGI</td>
<td>Association of Ghana Industries</td>
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<td>BARADEP</td>
<td>Bamboo and Rattan Development Programme</td>
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<td>CEESD</td>
<td>Centre for Energy, Environment and Sustainable Development</td>
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<td>CHASS</td>
<td>Conference of Heads of Assisted Secondary Schools</td>
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<td>CSIR</td>
<td>Council for Scientific and Industrial Research</td>
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<td>CSOs</td>
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<td>EC</td>
<td>Energy Commission</td>
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<td>ECREEE</td>
<td>ECOWAS Centre for Renewable Energy and Energy Efficiency</td>
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<td>EnDeV</td>
<td>Energizing Development Program</td>
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<td>EPA</td>
<td>Environmental Protection Agency</td>
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<td>EREP</td>
<td>ECOWAS Renewable Energy Policy</td>
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<td>FAO</td>
<td>Food Agricultural Organisation</td>
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<td>FC</td>
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<td>FORIG</td>
<td>Forestry Research Institute of Ghana</td>
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<td>Global Alliance for Clean Cookstoves</td>
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<td>Group for the Environment, Renewable Energy and Solidarity</td>
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<td>ICs</td>
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<td>ICEED</td>
<td>International Centre for Energy, Environment, and Development</td>
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<td>IIR</td>
<td>Institute of Industrial Research</td>
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<td>IWs</td>
<td>Improved Woodstoves</td>
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<td>MESTI</td>
<td>Ministry of Environment, Science, Technology and Innovation</td>
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<td>MLGRD</td>
<td>Ministry of Local Government and Rural Development</td>
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<td>MLNR</td>
<td>Ministry of Land and Natural Resources</td>
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<td>MMDAs</td>
<td>Metropolitan, Municipal and District Assemblies</td>
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<td>MoA</td>
<td>Ministry of Agriculture</td>
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<td>Ministry of Food and Agriculture</td>
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<td>MOTI</td>
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<td>UNDP</td>
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<td>UNICEF</td>
<td>United Nations International Children’s Emergency Fund</td>
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<td>WACCA</td>
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1.1 Background

Woodfuel, in the form of firewood and charcoal, is the main fuel of more than 70% of households in Ghana. According to the Ghana Statistical Service (2014), firewood was the main cooking fuel for 41.3% of households, with 31.5% using charcoal as main fuel in 2013. With regards to supply, about 40% of Ghana’s total primary energy came from biomass (mainly woodfuels) in 2015 (Energy Commission, 2016a). Total woodfuel consumption in Ghana was estimated at 3,618,000 tonnes of oil equivalent (toe), translating into approximately 10.96 million tonnes, with firewood constituting 56% of the total (Energy Commission, 2016a). In order to avert the negative environmental and health effects of using fuelwood, Ghana has ascribed to many regional and global conventions and programmes – UN Sustainable Energy for All (SE4ALL), Sustainable Development Goals (SDGs), Economic Community of West African States (ECOWAS) White Paper on Energy, ECOWAS Renewable Energy and Energy Efficiency Policies, etc. – that calls for promotion of improved cookstoves (ICs).

There have been efforts over the past two decades to introduce and promote the adoption of improved and energy efficient firewood and charcoal stoves in Ghana. The initiatives started in the 1990s by the Government of Ghana who introduced the first improved and energy efficient charcoal stove, the ‘Ahibenso’ stove. This stove was reported to have fuel saving efficiency of about 35-40 per cent compared to the traditional coalpot which is known to have less than 18% fuel efficiency (Ahiekpor, et al., 2016). Other past initiatives also include the Council for Scientific and Industrial Research improved woodstove project and the Volta River Authority’s climate stove initiative, which resulted in the introduction of ‘improved’ firewood stoves in households across the country.

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Since then, significant progress has been made, facilitated mainly by the private sector in the dissemination of improved stoves to Ghanaians. Notable among them is the training workshop initiative by Enterprise works/Vita in 2002 which resulted in the establishment of a number of improved cookstove manufacturers. Reasonable effort has also been made by the Global Alliance for Clean Cookstoves (GACC) and the Ghana Alliance for Clean Cookstoves (GHACCO) in campaigns to change the way people cook. However, the improved cookstove market of Ghana is currently dominated by ceramic lined charcoal stove products (brands include Gyapa, Toyola and Holy Cook Stove) and non-ceramic lined charcoal stove products (like Cookclean stove and Envirofit stoves) which are used mostly in urban centres (Bensah et al., 2015). Plate 1 shows some of the improved charcoal stoves in the Ghanaian market.

Plate 1 Improved cookstoves in Ghana

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About 280,000 improved charcoal stoves were produced in 2015 (SNV, 2017)\(^5\) representing about 13% of the charcoal stove market of 2.1 million households (GSS, 2014)\(^6\), assuming a household uses one charcoal stove. In rural communities, nearly eight out of ten households depend on fuelwood (GSS, 2014)\(^7\) using traditional, inefficient fuelwood stoves. In a recent study, SNV identified some critical challenges facing the sector, notably, lack of concrete actions and plans, lack of decentralisation in implementation of national policies, lack of innovation in design of stoves, lack of incremental stove improvement through research, cost of distribution, absence of business models without donor support, financial viability of testing centres, absence of standards, and difficulty in obtaining data from stove manufacturers (SNV, 2017)\(^7\). The penetration of improved woodstoves is generally low, almost non-existing and the market lags behind improved charcoal stoves. Further, local fabrication and distribution of ICs are tilted in favour of charcoal stoves in contrast to fuelwood stoves where the market does not exist at the household level. However, few artisans and enterprises have been building and promoting institutional woodstoves in educational institutions and agro-based companies such as cassava processing (gari making) and fish smoking as shown in Plate 2.

Going forward, the draft Renewable Energy Masterplan of Ghana (REMP) has targeted the dissemination of 1.3 million improved domestic stoves by 2020. This is even modest, compared to GHACCO, which as part of its vision, is aiming to distribute 5 million cookstoves by 2020. Achieving these targets would require that major barriers hindering the marketing and dissemination process are dealt with.

It is thus noteworthy that SNV under the framework of the ‘Energizing Development (EnDev) Programme’ is supporting this study to develop a strategy and roadmap to enable penetration of improved woodstoves in rural areas resulting in the development of a sustainable market. If this initiative is successful, it will contribute significantly to the achievement of national developmental targets with respect to the Sustainable Development Goals (SDGs) via the myriad benefits from IW – health promotion, reduction in household expenses, reduction in drudgery, reduced pressure on forest resources, biodiversity benefits, transfer of know-how and technology to rural artisans, rural job creation, reduction in rural-urban migration, and emissions reduction, among others.

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Plate 2 Institutional and agro-processing stoves in Ghana
1.2 Objectives of the study

The main objective of this study is to develop a roadmap detailing strategies and actions for building a viable woodstove market for rural households in Ghana. The specific objectives are to:

I. Highlight current policies, laws, action plans and directives related to Woodstove and Woodfuel market development in Ghana;

II. Identify and characterize the types of woodstoves available in Ghana and its geographical distribution in the country;

III. Assess the market potential for improved woodstoves in Ghana;

IV. Identify consumer preferences and factors that affects the adoption of improved woodstove in (rural) Ghana including end-user willingness to switch and pay;

V. Identify major sources of fuelwood in rural Ghana;

VI. Investigate the sustainable usage and production of fuelwood in Ghana;

VII. Assess of end-user perception of fuelwood usage and its effect on human health, environment and socio-economic development;

VIII. Identify the bottlenecks hindering easy adoption of improved woodstoves and market entry in rural areas, possible risk and mitigation strategies to address bottlenecks, etc.;

IX. Assess of the possibilities and preconditions for creating a market for wood-fuel based cooking solutions for rural Ghana;

X. Develop a strategy for the building a rural woodstove market in Ghana; and

XI. Develop a strategy for creating linkages with other national Sector Associations and Alliances in other (ECOWAS) countries aiming at knowledge exchange and possibly creation of a regional woodstove market.

1.3 Methodology and study area

The study adopted the use of the mixed methods involving quantitative study, qualitative study and desktop review. The mixed method approach helped to generate comprehensive data for the study. This method also helped to triangulate the various designs and output to enhance the credibility of the study conclusions.

1.3.1 Quantitative component

The quantitative component of the study adopted a cross-sectional survey. The study population was defined as households who utilized fuel wood for domestic cooking from selected districts. Heads of household or adult household members with adequate knowledge of the households cooking arrangements were interviewed. The study area included selected districts drawn from the three ecological regions in Ghana – coastal, forest and savannah. The coastal ecological zone is found in the south whilst the forest ecological zone is located in the middle belt. The Savannah ecological zone is found in the three
northern regions as well as northern Volta and Brong Ahafo regions. The sampling areas are shown Figure 1.
The sampling and sample size for the study was based on non-probabilistic sampling. Non-probabilistic sampling was used for the study because of the absence of credible household register on the study population. Two levels of sampling were used. The first level of the sampling process involved purposive sampling of districts with remarkable rural characteristics. This was followed by the second level which involved selection of households who utilized fuelwood for cooking.

At the first level of sampling a total of 8 districts were selected from the three ecological zones. At second level all households who utilized woodstoves and were willing to be part of the study were interviewed in the selected districts. A total of 1430 households were sampled from 60 communities. See Appendix A.

The measurement instrument for the survey was a structured questionnaire. The questionnaire was designed and piloted by the research team to strengthen its applicability. After the pilot study, all the necessary changes were effected for effective data collection. Questionnaire administration was conducted using face-to-face interview. By this, field personnel were trained and assigned supervisors to collect accurate and reliable data for the survey. Ten interviewers and three supervisors were trained for the task of data collection.

1.3.2 Qualitative component

Under the qualitative component of the research, personal and key informant interviews were conducted. The personal interviews method was used to collect data from distributors and retailers of woodstove. The issues covered in the personal interview were identification of the types of woodstoves available in the market, consumer preferences and challenges facing retail distribution of woodstoves. With regards to the key informant interviews conducted for the manufacturing firms, the issues covered include identification of woodstoves availability, consumer preferences and product sales challenges. Data analysis was generally descriptive and was conducted by use of SPSS version 21 and Microsoft Excel.

1.3.3 Desk review component

In order to obtain a better picture of the empirical analysis, secondary information was obtained from relevant literature to augment available information. The desktop review components of the study were focused on realizing this study objective and fine-tune the context of the study. Various technical reports and peer review journals formed the basis for this task. The technical reports were obtained from relevant Ministries, civil society organizations and academia. Other sources of the information included relevant Legislative Instrument, international conventions and national and global surveys. A list of documents used in this report is given in the reference section of this report.
2.1 Summary

Box 1: Highlights of the literature study

- Over the years, Ghana has put in place laws, polices, action plans and directives to encourage the use of efficient technologies for cooking and heating.
- All these policies, laws, action plans and directives are aimed at promoting sustainable woodfuel usage, thus promoting woodlot cultivation, promoting improved cookstove development and use, reducing forest degradation, raising awareness of the various issues and promoting research and development in the sector.
- One of the major achievements to date is the reduction of biomass share in the national final energy mix. Latest data from the Energy Commission shows that woodfuels share in the final energy mix has reduced from 90-95% in 2000 to 39% in 2015, five clear years ahead of the target of 40% by 2020.
- Policy implementation has been a challenge, as the case has been in several other sectors in the country.
- Despite the numerous policies and associated plans in the sector, very little has been implemented, and achievements have been minimal.
2.2 Introduction

Achieving sustainable energy development in Ghana will go hand-in-hand with applications of energy efficiency and renewable energy, thus underscoring the necessity for a dynamic and efficient legislative and regulatory system. The high consumption of woodfuel, for instance, results in over-exploitation of forest trees, which has a negative toll on the environment. In an attempt to guard against indiscriminate practice and produce wood fuel in sustainable fashion, Ghana has put in place laws, polices, action plans and directives to encourage the use of efficient technologies for cooking and heating and thereby reduce woodfuel usage. Some of the notable policies, laws, action plans and directives that relate to woodstove and woodfuel market development are discussed below.

2.2.1 Renewable Energy Masterplan (draft)

The goal of the Renewable Energy Masterplan (REMP) is to provide investment-focussed framework for the promotion and development of renewable energy resources for economic growth, improved social life and minimise the adverse effects of climate change. One of the specific objectives of the REMP is to ‘reduce the dependence on biomass as main fuel for thermal energy applications’ (Energy Commission, 2017).

To this end, the REMP has targeted the adoption of three million improved domestic cookstoves by 2030. The key strategies for woodfuels and end use devices for households are summarised below:

i. Provide Business Development Supports (BDS) to artisans for improved cookstove manufacture;

ii. Fast-track the development of standards and labelling for cookstoves;

iii. Develop mobile kiln technologies and promote artisanal interest in improved kiln development;

iv. Collaborate with relevant stakeholders to implement a national programme for woodlot cultivation;

v. Collaborate with Ministry of Lands and Natural Resources to make seedlings widely accessible and affordable for afforestation and reforestation;

vi. Support MMDAs to earmark land banks for afforestation and reforestation;

vii. Facilitate establishment of woodlot clubs in basic, secondary and tertiary schools; and

viii. Raise awareness among households.

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2.2.2 Energy for Poverty Reduction Action Plan

The Energy for Poverty Reduction Action Plan (EPRAP) was developed by the Ministry of Energy, in the same year as SNEP. The goal of EPRAP was to provide a roadmap for the targeted delivery of energy services to support the realisation of national developmental / poverty reduction goals and strategies (Ministry of Energy, 2006). While there wasn’t a very comprehensive plan for the woodfuel sector, EPRAP recommended the following woodfuel interventions for the household sector:

i. Promote fuel-switching from woodfuel to LPG;
ii. Promote the establishment of woodlots and improved charcoal kilns; and
iii. Promote the adoption of improved cookstoves.

2.2.3 National Energy Policy

In 2010, a National Energy Policy outlining Government’s policy direction for the energy sector (including woodfuels) was developed (Ministry of Energy, 2010). With regards to woodfuels, the focus of the National Energy Policy is somewhat similar to SNEP:

i. Support sustained regeneration of woody biomass resources through legislation, fiscal incentives, and attractive pricing;
ii. Promote the establishment of dedicated woodlots for wood fuel production; and
iii. Promote the production and use of improved and more efficient biomass utilisation technologies.

The National Energy Policy was accompanied by an Energy Sector Strategy and Development Plan (ESSDP). The ESSDP echoed the woodfuel policy statements in the policy document but did not provide any detailed development plan. One key point is to promote LPG use in order to minimise the health effects of cooking on women. A new energy policy is currently being drafted by the Ministry of Energy.

2.2.4 Sustainable Energy for All Action Plan/Action Agenda

The Sustainable Energy for All (SE4All) Action Plan which was prepared at the turn of this decade, is focused on improving access to modern fuels for cooking and productive uses of energy in Ghana by introducing improved cookstoves, supporting market establishment,

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and investing in small and medium sized enterprises that will manufacture them (Government of Ghana, 2012). Here again, the main policy issues re-echo the policies and strategies in the 2010 National Energy Policy. However, the SEforAll action plan provided some detail and recommended a range of incentives and market development strategies to promote improved cookstoves. Some of the key issues suggested by the SEforAll action plan to scale up the adoption of improved cookstoves include:

i. Ensuring that cookstove designs are based on needs and preferences of the users;

ii. Ensuring high quality control and standards;

iii. Facilitating access to credit for SME manufacturers of cookstoves and ensuring affordability for majority of household consumers, including consumer credit;

iv. Ensuring active participation of the private sector, banks, communities, community-based organizations, government and NGOs;

v. Sustaining education, awareness and outreach activities to accelerate adoption; and

vi. Ensuring that relevant investment and marketing partners are in place for commercialization and scaling up.

2.2.5 Renewable Energy Act

The Renewable Energy Act, 2011 (Act 832) was enacted to provide for the development, management, utilisation, sustainability and adequate supply of renewable energy for generation of heat and power and for related matters. The RE Act does not provide details of support for specific technologies per se.

With regards to woodfuels and cookstoves, the Act aims to support the use of improved cookstove technologies so as to diversify energy supply, generation and demand in an environmentally sustainable manner. The Energy Commission is to collaborate with relevant institutions to ensure the development and implementation of programmes to sustain woodfuel production and consumption.

2.2.6 Ghana Forest and Wildlife Policy

The Ghana Forest and Wildlife Policy aims at the conservation and sustainable development of forest and wildlife resources for present and future generations whilst fulfilling Ghana’s commitments under international agreements and conventions. The strategic direction of the Forest and Wildlife policy with regards to woodfuels development, is to ‘sustainably manage and develop commercial woodfuel supplies and other non-timber forest products

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on both on and-off-reserved forest areas’ (Ministry of Lands and Natural Resources, 2012). The policy strategies to achieve this include the following:

i. Enact the necessary legislation to support and ensure that forests and trees on private and communal lands are managed according to the national forestry development objectives and resource owner’s priorities;

ii. Develop criteria and indicators and a chain of custody to ensure that commercial production of woodfuels in all types of forests are sustainable;

iii. Promote the establishment of commercial and small holder woodfuel plantations both on and off forest reserves;

iv. Develop a national regulatory framework for the commercial exploitation of defined non-timber forest products at district levels; and

v. Promote research and development programmes for commercially viable non-timber forest products.

2.2.7 Forestry Development Master Plan

The Forestry Development Master Plan (FDMP), which draws inspiration from the Forest and Wildlife Policy, aims to ‘ensure the conservation and sustainable development of forest and wildlife resources to create a balance between forest products, services and marketing to satisfy domestic and international demands whilst ensuring good governance and transparent forestry enterprises development, biodiversity conservation and ecotourism development.’ Some of the key woodfuel issues to be addressed by the FDMP include:

i. Sustainably manage and develop commercial woodfuel supplies;

ii. Build capacities and create incentive schemes to support community supplementary livelihoods for woodfuel;

iii. Enact the necessary legislation and build the necessary institutional support to ensure that woodfuels from forest reserves, private and communal lands are managed according to the national forestry development objectives;

iv. Develop standards to ensure that commercial production and trading of woodfuels conforms to sustainable forest and woodland regulations by 2020;

v. Enact the necessary legislation and build institutional capacities to ensure that commercial productions of woodfuels are certified by the Forestry Commission by 2025;

vi. Improve efficiency of wood fuel production by adopting kilns and other improved technologies for sustainable energy supply by 2025; and

vii. Promote research and development programmes for commercially viable wood fuels by 2025.

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2.2.8 Bioenergy Policy (draft)

Ghana’s draft bioenergy policy document has remained in the draft stage since 2010. The draft policy document has strategies for woodfuel supply, demand side management, and research & development. The key strategies covering these three issues are:

i. Provide technical support to commercial woodfuel production;
ii. Promote private sector participation in cooking stoves distribution and marketing;
iii. Create awareness on health impacts of woodfuel stoves;
iv. Support awareness creation programme in the use of efficient charcoal stove;
v. Research on energy efficiency improvement and conservation; and
vi. Facilitate research that would lead to the development of efficient and affordable kilns.

2.2.9 Strategic National Energy Plan

In 2006, the Strategic National Energy Plan (SNEP) was prepared by the Energy Commission to, inter alia, stimulate economic growth, and accelerate the development and utilization of renewable energy and energy efficiency technologies.\textsuperscript{14} As part of the renewable energy and energy efficiency technology development component, SNEP has a broad plan for the woodfuels sector. Key strategic woodfuel targets for the residential demand sector in SNEP are:

i. To reduce the average woodfuel energy intensity per urban household by 30% by 2015 and by 50% by 2020;
ii. To reduce firewood intensity per rural household by 10% by 2020; and
iii. To achieve improved cookstove penetration of 5% by 2015 and 10% by 2020.

With regards to woodfuel supply, SNEP aimed at ensuring that ‘the energy share of traditional biomass (woodfuels) in the national final energy mix is reduced from about 60 percent in 2006 to at least 50 percent by 2015 and eventually to 40 percent by 2020’. To meet woodfuel supply projections, SNEP recommended:

i. Expanding forest plantation cover;
ii. Promoting fuel substitution in households and commercial cooking; and
iii. Setting up a national agency dedicated solely to woodfuel production and marketing issues along the same lines as Volta River Authority (VRA) and Electricity Corporation of Ghana (ECG) for Electricity, and Ghana National Petroleum Corporation (GNPC) and Ghana Oil Company (GOIL) for petroleum issues.

2.3 Achievements and gaps

As the review above shows, governments over the years have promulgated a number of polices, prepared plans and implemented programmes to promote woodfuel and cookstoves development. Three key issues could be summarised from the reviews: (1) promotion of woodlot development to manage the supply of woodfuels; (2) promotion of improved cookstoves to minimise demand for woodfuels; and (3) promotion of improved charcoal kilns. Awareness creation and market development is also common to many of the policy documents and plans. Generally, a lot has been written and planned in the sector, but very little has been implemented, and achievements have been minimal.

2.3.1 Achievements to date

One major achievement to date, is the reduction of biomass share in the national final energy mix. Even though SNEP has targeted a reduction of the energy share of woodfuels in the national final energy mix from the estimated 90-95 % in the year 2000 to 40 percent by 2020, latest data from the Energy Commission (2016b)\textsuperscript{15} shows that woodfuels share in the final energy mix is 39 % in 2015, five clear years ahead of the target date of 2020. This may be misleading though, because the absolute figures for woodfuels consumption increased between 2010 and 2014, but decreased slightly in 2015 as shown in Figure 2. The reduction in its share is as a result of corresponding increases in the share of petroleum and electricity, though the electricity crisis caused a little dip in the 2015 electricity consumption.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Figure2.png}
\caption{Total final energy consumed in Ghana (2005-2015)}
\label{fig:energy_consumption}
\end{figure}

Efforts to promote woodlot planattion developments have been ongoing but there is little official data to indicate the scope of achievement. To safeguard forests from charcoal exporters, there is a ban on the export of charcoal produced from unapproved sources, that is, sources other than sawmill residue or forest planted for that purpose. Thus, exporting charcoal produced from direct wood sources, i.e., wood harvested from the natural forest, is not allowed. Since July 2003, all exporters of charcoal are required to obtain a permit or license from the Energy Commission.

2.3.2 Policy and implementation gaps

The following are the major policy and implementation gaps that were identified from the review.

i. In many of the policy and regulatory frameworks, woodfuel and cookstoves are glossed over, and not given much attention. The SEforAll Action Plan is an exception here.

ii. Where some detail has been provided, a major challenge for rural domestic woodstove is that, the strategies and targets are lumped together into a general cookstove programme without specific plans for the rural wood users. Since charcoal users are predominant in the urban areas, the implementation of these cookstove programmes tend to be biased towards the urban and ‘peri-urban’ areas thereby leaving out rural woodstove users.

iii. The SEforAll action plan provides a detailed programme for the cookstove sector, perhaps because improved stove promotion forms a major component of the overall programme. However, performance indicators to track the success of the action against the listed goals and targets are not defined. A well defined implementation mechanism to encourage the adoption of the actions for achieving its specific goals and targets has not been clearly spelt out.

iv. Although the 2010 National Energy Policy calls for the adoption of improved cookstoves, targets are missing in the document. There is also missing from the policy document, data collection, evaluation and reporting mechanisms.

v. Many of the policy documents and actions share the gap identified above with the national energy policy, with no clear timelines, goals and targets. In addition, there is no mention of any plans for evaluating outcomes or details on data collection, reporting and implementation mechanisms.

vi. In instances where implementation dates have been specified, these dates have passed and there is little evidence to show what progress have been made. For example, the following key activities in the SEforAll Action Plan were to have been achieved by dates shown against them, but there is no evidence to show this:

   a. Develop policy and legislation for promotion and development of the clean cookstove sector – 2014;
b. Pilot advanced biomass cookstoves for cooking in public institutions, hotels and restaurants and ensure uptake by 1000 institutions – 2014;
c. Set up research and development fund – 2014;
d. Establish website as repository of ‘clean’ cookstove technologies and designs, and update regularly – 2013; and
e. Others, such as the establishment of woodlots in 3000 communities by 2020 are approaching but there is little evidence of progress being made.

vii. Unlike improved charcoal stoves, very little, by way of actual stove development, has been achieved for improved woodstoves. A lot of effort has gone into improved charcoal stove development and it is not uncommon therefore, to find improved charcoal stoves (including Toyola, Gyapa, and Man and Man) on sale in urban markets. However, improved woodstoves for households have seen very little development and this was evident in our survey. Generally, woodstove is more prominent in rural communities where incomes are low, and access to wood is relatively easier.

viii. On the supply side, efforts to increase forest cover and promote the development of woodfuels have been minimal.

ix. On the issue of institutional development, SNEP recommended the setting up of a national agency dedicated solely to woodfuel production and marketing issues along the same lines as VRA and ECG for Electricity, and GNPC and GOIL for petroleum issues. Unfortunately, this has not been done even though the plan is in its eleventh year. This means that woodfuel issues are still driven by the Ministry of Energy, with very little decentralisation. As noted by SNV (2017) most of the policies and regulations developed for the woodfuel and stove sector are mainly at the national level with little decentralisation into the various development plans at the regional and district levels where many of the issues related to clean cooking are felt most.

x. Generally, policies and plans aimed at increasing access to improved cookstoves have not been implemented.

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3 MARKET ASSESSMENT OF RURAL WOODSTOVES

3.1 Summary

Box 2: Highlights of market assessment of rural woodstoves

- 75% of rural households use firewood. This translates to about 2.2 million total available rural woodstove market.
- 1430 rural wood users were interviewed in 60 communities across the forest, coastal and savannah zones for this study.
- 95% of respondents were self-employed with 80% into either farming or trading.
- 77% of respondents were female
- 51% use three-stone, 38% use mud stove, 9% use tyre rim stove while 2% use metal sheet stove.
- 69% of all users use their current stove because it is either available or affordable.
- 41% of conventional stove users want stove with less smoke and 15% want the stove to be portable.
- 90% of rural wood stove market are willing to buy and use an improved woodstove.
- 36% of rural households buy their wood fuel.
- 10% of rural woodstove users bought their current stove. This gives an indication of a possible initial target market of about 220,000 households for IWs.
- An average of GHC 23 is spent on conventional rural woodstove by households
- Households are willing to pay an average of GHC 29.5 for an improved woodstove. Majority wish to pay GHC 20.
- Average monthly rural household income is about GHC 950 and per capita monthly household income is about GHC 275.
- To promote the market for improved woodstoves and to cause rural households to prioritize the adoption of improved woodstoves, issues such as awareness creation on health impacts and other related issues must be vigorously pursued.
3.2 Introduction

3.2.1 Social environment

Ghana is one of the sixteen countries in West Africa, with an estimated population of 28 million (GSS, 2016) which is growing at an average rate of 2.2 % (WorldBank, 2016). It has witnessed political stability and has successfully changed governments through democratic elections since 1992. Rural population has shrunk from about 53 % in 2010 to about 45 % in 2015 (WorldBank). About 70 % of cooking in households is done by females while about two thirds of household heads in Ghana in 2010 were males, with 62.1 % and 69.4 % in urban and rural localities respectively. Table 1 provides some demographic facts about Ghana.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Ghana</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female Population</td>
<td>14.4 Million</td>
<td>GSS (2016)</td>
</tr>
<tr>
<td>Total Households</td>
<td>7.07 Million</td>
<td>Estimated</td>
</tr>
<tr>
<td>Rural Household</td>
<td>2.945 Million</td>
<td>GLSS (2014)</td>
</tr>
<tr>
<td>Rural Head of Household (Female)</td>
<td>27 %</td>
<td>FAO (2012)</td>
</tr>
<tr>
<td>Average Household size</td>
<td>4</td>
<td>GLSS (2014)</td>
</tr>
<tr>
<td>Average Rural Household Size</td>
<td>4.5</td>
<td>GLSS (2014)</td>
</tr>
<tr>
<td>Population Growth (2016)</td>
<td>2.2</td>
<td>WorldBank (2016)</td>
</tr>
<tr>
<td>Fertility Rate</td>
<td>4.12 births per woman</td>
<td>WorldBank (2016)</td>
</tr>
<tr>
<td>Life Expectancy</td>
<td>61.5 years</td>
<td>WorldBank (2016)</td>
</tr>
</tbody>
</table>

3.2.2 Economic environment

Ghana’s economy has grown rapidly since the early 2000s. Ghana’s GDP growth rate accelerated significantly during the 2000s, reaching an average of 8.7 % per year between 2008 and 2012. GDP growth outstripped population growth, and the per capita GDP growth rate peaked at 14.5 % in 2011—the second-highest rate in the world that year. Ghana was

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upgraded from low-income to lower-middle-income country in 2011. GDP Annual Growth Rate in Ghana reached record low of -3.80% in the first quarter of 2014.

The economic performance during 2016 was mixed. Progress was made to decrease the fiscal deficit down from 10.2% of GDP in 2014 to 9% in 2016. The economy started recovering with a GDP growth at 3.6% in 2016. However, inflation remained above 17% in most part of 2016 until December 2016 where it fell to 15.4% and further to 11.9% in July 2017, closer to the central bank’s target range of 8% (±2%). Table 2 provides information on some economic indicators.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Ghana</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP (2016)</td>
<td>42.69 Billion (USD)</td>
<td>WorldBank (2016)</td>
</tr>
<tr>
<td>GDP Per Capita</td>
<td>1513.46 USD</td>
<td>WorldBank (2016)</td>
</tr>
<tr>
<td>GDP Growth Rate</td>
<td>3.6%</td>
<td></td>
</tr>
<tr>
<td>Policy Rate (Q3, 2017)</td>
<td>21%</td>
<td>BoG (2017)</td>
</tr>
<tr>
<td>Inflation Rate (Q2, 2017)</td>
<td>11.9%</td>
<td>BoG (2017)</td>
</tr>
<tr>
<td>Average Lending Rate (Banks)</td>
<td>29.5%</td>
<td>BoG (2017)</td>
</tr>
<tr>
<td>USD/GHS</td>
<td>4.4</td>
<td></td>
</tr>
</tbody>
</table>

### 3.3 Types of rural woodstoves in Ghana

Rural households in Ghana generally adopt similar cooking style and habit. Traditionally, Ghanaians cook with high fire power. The cooking pots also have similar designs across the country and are usually round-bottom by design to allow for easy driving of most indigenous foods.

However, the type of woodstoves used varies from one geographical location to the other and are made with different materials including stones, concrete blocks, clay, and metals and come in different designs (Plates 3 - 6). The rural woodstoves can generally be categorized as follows:

- Three-stone stoves
- Clay/mud stove
- Tyre rim stoves
- Metal sheet stoves

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20 Bank of Ghana
Plate 3 Types of household mud stoves in Ghana
<table>
<thead>
<tr>
<th>Stove Type</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Stove in Brong Ahafo Region</td>
<td></td>
</tr>
<tr>
<td>Mud stove in Volta Region</td>
<td></td>
</tr>
<tr>
<td>Portable mud stove in Volta Region</td>
<td>Uses both wood and charcoal</td>
</tr>
<tr>
<td>Double chamber woodstove in Upper West Region</td>
<td></td>
</tr>
<tr>
<td>Wood stove in Northern Region</td>
<td></td>
</tr>
<tr>
<td>Mud stove in Upper West</td>
<td></td>
</tr>
</tbody>
</table>

Plate 4 Other designs of household mud stoves in Ghana
<table>
<thead>
<tr>
<th>Tyre rim woodstove</th>
<th>Metal Sheet woodstove</th>
<th>Metal Stove</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal stove (Uses both wood and Charcoal)</td>
<td>Metallic stove for dual cooking</td>
<td>Metallic stove</td>
</tr>
<tr>
<td>Metallic stove</td>
<td>Metallic stove</td>
<td>Metallic stove</td>
</tr>
</tbody>
</table>

Plate 5 Types of metallic woodstoves in rural Ghana
The three-stone stove is predominant in rural households. About half of all households who use firewood use this type of stove for cooking as shown in Figure 3. The mud stove (FAO, 2015)\textsuperscript{21} which is considered as an improvement over the three-stone constitutes about 40 percent of rural woodstoves. If the three stone and mud stove are placed under the same

category of conventional woodstoves then they make up 89% of the type of stove used by rural household.

![Figure 3 Proportion of types of domestic woodstoves in rural Ghana](image)

This is comparable to the finding of SNV (2017) which reported 82% usage of three stone and mud stoves combined. Some households also use stoves made from tyre rim (9%) and metal sheet (2%), similar in structure to rocket stove but without insulation and proper design consideration. This finding underscores the need to prioritize the promotion of improved woodstoves in rural Ghana, as there seems to be a large plausible untapped market.

The ecological distribution of the stoves is presented in Figure 4. It is important to note that households in the Savannah belt use more of the tyre rim woodstove for cooking as compared to the forest and coastal belts. About a fifth of all respondents in the savannah belt use this type of stove. The tyre rim and other forms of metallic woodstoves are not free as with the three-stone and mud stoves. These stoves are bought by the households as will be seen in the next sections.

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3.4 Reason for using woodstove

Availability and affordability are two very important issues when discussing access to modern energy systems. When end-users were asked why they are using their current stove, availability (39 %) was an important consideration followed by affordability (30 %). Other reasons given include; durability (5 %), speed of use (4 %), ease of maintenance (4 %), safety (3 %), inheritance (3 %), portability (2%) and others.
The reasons for using specific type of stove given in Figure 5. It is found that the three stone stoves are used because it is either easy to maintain (75 %), portable (58 %), available (57 %) and considered durable by the respondents. The mud stove is considered to be attractive (88 %), safe (88%), and cooks faster (67 %).

3.5 Consumer preference and willingness to pay for IW

The consumers would want certain features of the current stoves changed if they had the opportunity. Out of the 1430 respondents, 41 percent want smoke from the stove reduced or eliminated, 19 percent want the stove to be portable, 15 percent want it to be fuel efficient, and for those using metallic stoves want it to be rust free. A very few end-users (1 %) want to stop using the woodstove entirely if they have an alternative as shown in Figure 6. From the rural end-user perspective, the top five features to consider when designing an improved stove for rural consumption are efficient combustion (less smoke), portability, fuel saving, anti-rust, and durability.

Figure 6 Features of current stove to improve

In order to identify the factors which would influence the consumer’s willingness to adopt an improved woodstove, the consumers who would like to have and are willing to pay for an improved woodstove, were asked to rank some stove attributes believed to influence consumer decision as reported by Added Value (2014). These factors include material quality, speed-of-use, aesthetics, portability, and versatility (grilling and baking options), etc.

---

According to this study, the factors to consider for improved woodstoves in order of priority are; fuel saving, less smoking stove, durability, affordability, versatility, portability, and speed of use. It must be recalled that, end-users had already indicated the five most important attributes of their current stove that they wish could be improved in Figure 6. The attributes are less smoke, portability, fuel saving, anti-rust (material quality), and durability.

**Willingness to pay for improved woodstove**

About 90% of rural households got their current stove for free. The remaining 10% who paid for their current stove paid in the range of 1-10 cedis (23%), 11-20 cedis (17%), 21-30 cedis (49%), 31-40 cedis (6.5%) and a very few households paid above 40 cedis (4%) as shown in Figure 7. This means about 90% of rural household who bought their stoves paid not more than 30 cedis for the stove. The price point is an important consideration for any market penetration. According to SNV (2017) the average price of improved charcoal stove in Ghana is about 25 cedis.

![Figure 7 Cost of rural woodstove](image)

A detailed analysis of the amount paid for existing stoves is shown in Table 3.

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The savannah belt could be an important market for improved woodstoves as 70% of all respondents who bought their current stove come from this belt followed by coastal belt (22%) and forest belt (8%), as shown in Figure 8. Note that only 10% of all rural woodstove users bought their current stove.

![Figure 8 Households who bought their current woodstove across ecological zones](image)

### Table 3 Breakdown of cost of rural woodstove

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Amount, GHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>23.14</td>
</tr>
<tr>
<td>Modal</td>
<td>30</td>
</tr>
<tr>
<td>Maximum</td>
<td>80</td>
</tr>
<tr>
<td>Minimum</td>
<td>2</td>
</tr>
</tbody>
</table>

According to the survey conducted, only 6% of households knew about improved cookstoves (Figure 9 Knowledge of improved stove). However, when asked if they would be willing to pay for an improved woodstove (after describing an improved woodstove to them and showing them pictures of some improved woodstoves), 9 out of 10 households, out of the entire respondents, responded in the affirmative (Figure 10 Willing to buy improved stove).
), however, only 70% of the respondents indicated how much they could pay for an improved woodstove.

![Figure 9 Knowledge of improved stove](Image)

Households surveyed in this study were ready to pay from as low as 1 cedi to 180 cedis for an improved woodstove. However, about 90 percent of the household indicated readiness to pay up to 50 cedis. While most of the respondents were willing to pay 20 cedis, the average amount for all respondents is 29.5 cedis as presented in Table 4. Note that the average amount rural households are paying for their existing stove is about 23 cedis as presented in Table 3.

![Figure 10 Willing to buy improved stove](Image)

Table 4 Amount consumers are willing to pay for an improved wood stove

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Households who bought present stove</th>
<th>How households who use free stove</th>
<th>All households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount, Cedis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>28.87</td>
<td>29.49</td>
<td>29.46</td>
</tr>
<tr>
<td>Mode</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Minimum</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Maximum</td>
<td>120</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>25th Percentile</td>
<td>15</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>50th Percentile</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>75th Percentile</td>
<td>30</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>
3.6 Rural woodstove market size estimation

There are about 3 million rural households in Ghana. Seventy-five percent of this number uses wood for cooking. This gives a possible (addressable) market size of about 2.2 million wood users in rural Ghana. In this study, it was discovered that 90 percent of respondents were willing to buy and use an improved woodstove after explaining and showing pictures of improved woodstoves. Assuming the study is representative of rural population of Ghana, this means our available market is about 2 million households using fuelwood. If conditions for creating the market are addressed as discussed in chapter 4 of this report, then the 2 million end-users could be reached. Since it may take sometime to address all the bottlenecks to create favourable market conditions for the rural woodstove sector, it is important to identify and target the easiest market entry point which could activate the larger market.

From this study, we discovered that there are about 10 % of households who paid for or bought the woodstove they are currently using. Also about 40 % of households buy their fuel wood as discussed in Chapter 5 of this report. These households present opportunity for an improved woodstove market entry. With little marketing effort and appropriate preconditions the rural household stove business could grow from about 220,000 stoves to about 800,000 stoves in the short to medium term and possibly get to over 2 million stoves in the long term. Strategies for developing the improved rural woodstove market are discussed in Chapter 6 of this report.
4 CONDITIONS FOR CREATING WOODSTOVE MARKET IN RURAL GHANA

4.1 Summary

Box 3: Highlights of bottlenecks and conditions for creating woodstove market

- Bottlenecks that hinder the adoption of improved woodstoves and their market entry in rural areas have been categorised into four main areas: socio-cultural, access to market, financial and technical bottlenecks. Some of the key bottlenecks include:
  - Improve woodstoves not considered a priority household item
  - Low awareness/knowledge about the benefits of improved woodstoves
  - Weak supply chain channel for improved woodstove distribution
  - General lack of improved woodstoves on the market

- The following conditions and factors are thus considered critical if the market is to be developed:

  **i. Improved woodstoves**
  - Vigorous market promotion and awareness creation to cause households to prioritise IWs purchase and use.
  - Development and deployment of well-engineered, user-satisfactory, standardised, and marketable woodstoves for rural communities
  - Development of effective distribution networks
  - The price of stove models should be affordable
  - Funding for stove development should be sourced from national actors and development partners
  - Follow-up services and after-sales support

  **ii. Fuelwood**
  - Enforcement of regulations on harvesting, distribution and sale of fuelwood
  - Enactment and enforcement of legislation on registration and licencing of commercial fuelwood vendors
  - Establishment of standards and operational procedures for fuelwood
4.2 Bottlenecks hindering adoption of IWs and market entry: global perspective

Despite the potential benefits and the efforts of national, regional and global initiatives, programmes and projects, the rate of improved woodstoves adoption has fallen behind expectation due to different factors (Puzzolo et al., 2013; Lewis and Pattanayak, 2012). A study conducted in sub-Saharan Africa by the World Bank (2014), identified four demand drivers (stove design, awareness, trust, and access) that translate into the consumer’s willingness to adopt a new solution. The fifth driver, affordability, equates to the consumer’s ability to pay, in terms of both providing upfront payments for a new stove and the ability to afford fuelwood purchases and stove maintenance costs relative to disposable income. In Table 5, we have categorised the bottlenecks that hinder the adoption of improved woodstoves and their market entry in rural areas into four main areas: socio-cultural, access to market, financial and technical bottlenecks.

Table 5 Bottlenecks / factors hindering improved woodstove adoption and market entry

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Description</th>
</tr>
</thead>
</table>
| Socio-Cultural      | • Relatively easy access to woodfuels in rural communities, which does not provide incentive for fuel savings  
                      | • Improved woodstoves not considered a priority household item since there are cheaper traditional alternatives  
                      | • Low awareness/knowledge about the benefits of improved woodstoves  
                      | • Lack of confidence / trust in new and untested stoves |
| Access to market    | • Weak supply chain channel for improved woodstove distribution  
                      | • General lack of improved woodstoves on the market |
| Financial           | • High cost of improved woodstoves (especially metallic-based rocket stoves) and lack of consumer financing options  
                      | • Absence of subsidies on improved woodstoves |
| Technical           | • Low technical expertise to improve on existing designs and models |

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4.2.1 Socio-cultural factors

Awareness of clean and improved cooking solutions and their benefits is an important demand driver that has been demonstrated to boost adoption and sustain use of new cooking technologies. Except for those households who may have been exposed to it, households are often unaware of the benefits they could gain from improved woodstoves, such as for example, reduced smoke emissions and fuel savings. In rural households, consumer awareness of clean cooking solutions is low and consumers are often suspicious of new technologies designed to replace traditional cooking methods (Troncoso et al, 2011). This leads to a lack of confidence on the new stove’s performance and scepticism about the durability of the stove, which become important bottlenecks to the adoption of improved woodstoves.

Poor rural consumers are by nature risk averse when it comes to the adoption of new consumer technologies (World Bank, 2014). This risk aversion expresses itself in scepticism about the stated benefits of stove adoption (e.g., stove seller promises of quick break-even periods due to fuel savings), and in a lack of confidence about stove durability and after-sales support. This is not entirely unwarranted, given the quality issues affecting general consumer items sold to rural consumers. It is also often the case in most rural communities, and this is true in Ghana, that rural dwellers do not often cost fuelwood as it is usually not a good they purchase from the market.

Another very important bottleneck is the issue of priority. Rural households are faced with many competing demands in relation to spending their income. A study by Debbi et al. (2014) has indicated that ‘many potential rural users don’t prioritize the acquisition of improved woodstoves over other “developmental” needs notwithstanding their awareness of negative consequences associated with the use of the traditional cook stoves.’ For such households, getting their children to school, acquiring everyday necessities such as food, shelter, clean water as well as obtaining good health care is among their priorities. From an economic perspective, the lower the income, the greater the influence these competing priorities have on consumer behaviour than acquiring a new cook stove. The type of stove used for cooking is rarely prioritised as a need most notably when its acquisition ought to be balanced amidst such a large and pressing set of priorities.

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4.2.2 Access to market and financial factors

The socio-cultural factors discussed above, may in addition to other factors, have an influence on the market for stoves in rural communities. For improved woodstove manufacturers, there may be potential for business growth but this is accompanied by uncertainty about demand. A study in India (Simon, 2007) reported anxiety among stove builders related to enterprise sustainability, inability to plan for large-scale production and balancing high-quality craftsmanship with administrative and sales tasks. This anxiety is expressed by some Ghanaian manufacturers when interviewed in this study, indicating that they do not have motivation to invest into the rural woodstove market.

One other principal market bottleneck hindering the adoption of improved woodstoves is the fact that the stoves are simply not available in rural communities where they are needed. Generally, improved woodstoves are not common, compared to improved charcoal stoves, for instance, which are becoming more common in urban communities. This results in a situation where even if rural households are aware of improved woodstoves, it is often unavailable or difficult to access. Access to stoves is therefore another important factor in many rural communities. Manufacturer’s uncertainty of the rural woodstove market may result in stove unavailability, creating somewhat of a cyclical challenge. This calls for the need for a good marketing strategy that prioritises awareness creation.

Beyond these, the majority of enterprises across the woodstove value chain are small and medium enterprises (SMEs). Some of the challenges they face in the sector are similar, such as a lack of access to capital, while others are specific to their role in the value chain. As observed in the survey and other studies conducted in the past (Bensah et al., 2015), lack of capital play both ways: manufacturers lack access to capital to start or expand businesses and rural consumers are unable to purchase stoves. Across the demand drivers, assuming that the cookstove design meets end users’ requirements, the lack of willingness to adopt and pay are the overarching constraints to the initial uptake of improved woodstoves.

In all of these, there is presently a lack of incentives to promote the improved woodstove sector. Perhaps because the industry isn’t well structured, incentives such as import duties and tax waivers on manufacturing components (i.e. where components are imported) are not offered to improved stove manufacturers in general. Even when materials are sourced locally, there is little motivation from state actors and other partners for enterprises to enter into such a difficult market.

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4.2.3 Technical constraints

Even though improved woodstoves are generally not available in Ghanaian rural communities, there are technical constraints in the industry. There is limited variety of improved woodstoves to choose from to support local needs and varied consumer segments. Also, new solutions often do not meet consumers’ expectations for key stove features, such as time savings, or fit with cooking preferences (World Bank, 2014). There is a general lack of adequate testing and monitoring mechanisms resulting in poor performance and low durability. In Ghana today, there are two recognised testing laboratories in the country, but there are no standards in place and testing isn’t mandatory to sell improved woodstoves. While that per se should not stop stove sales, ensuring good standards will build consumer confidence in the improved woodstove market.

4.3 Critical factors and conditions for creating woodstove market in Ghana

The market for IWs and fuelwood in rural areas can be created if the right conditions (commitment to implementation of policies and laws, access to funds to manufacturers, well-planned awareness strategies, etc.) are put in place with the support of relevant sector leaders, policy makers and stakeholders. The factors and conditions identified as critical for the creation of rural IW market are: institutional and regulatory framework, technical, funding, price of IWs, promotion, distribution, and follow-up services. The factors are discussed below.

4.3.1 Institutional and legal framework

In order for an IWs programme to be successful, there is the need to have an enabling environment with favourable institutional and legal framework. Institutional and legal preconditions and factors required to build a rural-based woodstove market include:

- Support of government bodies (ministries, departments and agencies);
- Intersectoral collaboration;
- Clear regulations on import / taxing of raw materials; favourable conditions for starting a business etc
- Clear regulations on the harvest and use of fuelwood; and
- Active participation of civil society organisations.

**Support of government bodies**

The administrative structure for forest biomass in Ghana involves several organisations at both central and local levels. Government institutions having a major stake in the harvesting and use of forest biomass resources are shown in Figure 11.

![Figure 11 Government institutions with an interest in forest resource including fuelwood](image)

The responsibility for the management of forest biomass rests with FC based on policies developed by Ministry of Lands and Natural Resources (MLNR). To ensure sustainable harvesting and application of forest biomass, the various government entities should have well defined responsibilities, to avoid bodies carrying out the same tasks. Clearly, there is overlapping of roles in management of forest resources resulting in confusion and fragmentation of responsibilities, resulting in targets not being met. Intersectoral cooperation is thus critical in dealing with challenges facing the promotion of fuelwood as a marketable commodity.

**Intersectoral cooperation**

Intersectoral partnership is important owing to the multisectoral nature of the collection, distribution and use of fuelwood. Several government ministries and agencies have interest in forest biomass as well as fuelwood utilisation. These include organisations involved in forestry, environment, agriculture, energy, employment and rural development as previously listed. Cooperation between personnel from key and relevant bodies is needed to effectively plan and execute a successful rural programme on woodstoves. Presently, there
is an ad-hoc committee of key stakeholders that meets and shares information regularly at Energy Commission with funding support from Global Alliance for Clean Cookstoves (GACC), however, there is no legal backing and decisions cannot be enforced.

Intersectoral cooperation is required for effective coordination of activities of relevant organisations at all levels – national, regional and local, allowing for mutual exchange of information on fuelwood harvesting and use. Further, it will enable the design and development of effective action plans and strategies on fuelwood while better engaging the public (including end-users) at all sectors and all levels. This will make awareness creation programmes effective since a bigger fraction of target population will be reached along various angles in a coordinated manner.

It should also be mentioned that any form of cooperation among the relevant bodies should clearly have lead ministries. It is proposed that steps are taken to formalise the ad-hoc committee already in existence, with full backing by various institutions involved. The committee should as part of its mandate coordinate all aspects of woodfuels development and marketing, to avoid fragmental implementation of fuelwood-related programmes while enabling policy alignment across the various ministries. It is further recommended that issues related to fuelwood production is supervised by FC while transport, marketing and use of fuelwood are handled by EC.

**Regulatory and legislative preconditions for fuelwood**

Though Ghana has developed several national policies and plans related to fuelwood, there are still no legally binding arrangements to enforce provisions on production, supply and marketing of fuelwood. The forestry sector is perhaps one of the most difficult areas to monitor and regulate owing to its informal nature and the large numbers of stakeholders who have interests in forestry resources, and the complexity of relationships among the various stakeholders. Among other factors, the unsustainable production of woodfuel especially in the fragile ecological areas of the savanna regions is listed among the driving forces of deforestation and forest degradation in the last three decades (MLNR, 2016). As stated earlier, the challenges facing the forestry sector can partly be attributed to communities’ perception that forestry and woodland resources are public goods available for free and unrestricted use.

In relation to forest biomass, the forestry masterplan has been developed by MLNR, with interventions to address the challenges facing the rapid depletion of forestry and woodland resources, including the enactment and enforcement of regulatory and licensing regimes.

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The following interventions can help promote fuelwood production and marketing as a commercial commodity:

- Development and enforcement of legislation on the registration and licencing of commercial fuelwood operators by both national and district level authorities;
- Standards and operational procedures for fuelwood operators should be established and enforced, with the involvement of relevant stakeholders; and
- Enforce regulations on the harvesting and sale of the fuelwood in forest reserves by fringe communities and commercial operators.

### 4.3.2 Development of tested and standardised woodstoves

Ghana’s cookstove sector is characterised by manufacturers comprising mostly single person enterprises with small production capacities. Most have not grown their businesses to serve large markets in the country and the sub-region. Moreover, many artisans fabricate and sell stoves as a supplementary income option with little financial resources to invest in new technology or expand production.

Unlike improved charcoal stoves, IWs for households are not available in the market. There are no IW brands and most households in rural communities are not aware of such stoves even if they do exist. Though a few companies and organisations such as Relief International are making attempt to develop local models, their prototypes require considerable technical improvements in the face of limited financial support.

There is therefore the need to develop, test and promote standardised models in rural communities, with full private sector participation. Well-engineered prototypes of woodstoves should be adopted or developed and tested for efficiency, emissions reduction, usability and durability involving both laboratory and field tests as well as pilot studies. Other factors to be considered include: household sizes, cooking styles and times, intensity of heat required, and different types and shapes of cooking pots, among others. As observed in previous chapters, some artisans and organisations are already building various mud-based stoves for rural households though those models have not been subjected to stove test. Local models can be selected and improved or foreign woodstoves (mud-, ceramic-, rocket-type stoves, etc.) that have been successfully disseminated in other countries such as Kenya (under the EnDev programme) can be adopted and contextualised. Models that meet expected criteria should be selected and standardised, enabling easy adoption by local enterprises for production and distribution. Funding for this exercise is critical towards the achievement of rural-based woodstove market.
4.3.3 Price

In a large dissemination program on IWs in rural communities, the price of the stove will be among the important factors that will drive adoption by rural families. The income levels of rural households in Ghana are lower than their counterparts in urban communities, owing to the lack of business opportunities. Further, households in the Northern and Upper Regions earn the lowest incomes on average (GSS, 2014). It is therefore necessary to consider poverty profiles of rural areas in developing IW programmes aimed at mass adoption.

The cost of stove will vary depending on the model, materials of construction, complexity of construction, skill level required, electricity requirements, production scale, transport cost and distribution channels. One way of dealing with the cost issue is to develop models for specific geographic areas where most materials are sourced locally, with production firmly in the hands of local artisan entrepreneurs. This can avoid situations where rural-based artisans are trained to fabricate IWs but are dependent on raw materials from the cities, resulting in prices beyond the financial capabilities of households.

In conclusion, the purchasing power of rural families in a specific region or area should be considered in selecting stoves models disseminated. Further, variations in incomes and purchasing power of rural communities within the 10 regions as well as differences within rural areas of the agro-ecological zones of the country should be considered in development of stove models and pricing mechanisms. Thus, households should be able to acquire an IW irrespective of the income group which they belong to, thus the need to promote both low cost stoves as well as relatively expensive rocket stoves.

4.3.4 Funding

The IW sector can flourish if an enabling environment is created with active support and participation of relevant government institutions and development partners. Financial support in the form of subsidies to manufacturers or end-users is a major factor for mass adoption as evidenced in countries where successful uptake of IWs have taken place.

When subsidies are given to manufacturers, it results in the production of affordable stoves. In China, government subsidised stove production to the tune of 10% of the average cost,

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enabling end-user families to enjoy subsidised price (Anhalt and Holanda, 2009). However, in India, national programme on IWs (known as Chulhas) in rural communities were supported using subsidies ranging from half to two-thirds of the cost of the stove, with subsidy directed at the end-user (Anhalt and Holanda, 2009). The choice of the incentive structure is linked to the model of stove promoted (metal, home-made mud-type stoves, etc.), with home-made ones favouring subsidy support at the end-user side.

For Ghana to witness an accelerated, market-based distribution of IWs, a subsidy scheme should be developed considering factors such as cookstove production cost structure, income levels of target areas, promotion strategies and local interest. The availability of subsidy depends on central/local government interest and interest of donor partners.

Availability of government and/or donor funding at the initial stages of IWs dissemination programme can be used to support manufacturers and/or end-users/local builders. In the absence of funding to kick-start the project, a selection of manufacturers and artisan entrepreneurs with proven skills in stove construction could be trained on accepted/standardized IWs, and the rest of activities such as production and distribution become the responsibilities of the entrepreneurs. This model was used by Enterprise Works/VITA in 2002 where about 78 artisans received training in efficient Jiko-type charcoal-based stoves with support of United States Agency for International Development (USAID) and Shell Foundation. Funding to develop and adopt standardised models for promotion is critical since any promotional activities on woodstoves in the absence of tested, affordable and user-friendly stoves are bound to fail.

4.3.5 Promotion

Well-planned promotion and awareness creation will greatly influence the success of an IW dissemination programme in Ghana. A promotion strategy should consider, among others, resources available, target areas, language and means, stakeholder involvement and expectations of households. Since many rural households are not aware of the benefits of IWs as confirmed from the field study, a well-planned strategy capable of reaching different segments of the target areas is a necessity.

Promotion strategies should consider different forms and media of creating awareness such as radio and television, posters/flyers, community fairs and meetings, traditional durbars and festivals, religious meetings, public jamborees, education of pupils, and use of local champions, among others. In some cases, the adoption of the stove by an opinion leader and other influential members of a community can have positive effects on adoption.

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The cost of advertising and development of promotional materials is high and should be borne by government or donors, at least in the initial years of developing the market. In the long run, manufacturers should take the lead in awareness creation as part and parcel of their marketing strategies. High impact materials should be developed to reflect favourable views that rural communities have on IWs.

4.4.6 Distribution networks

Efficient distribution channels are a necessity to the success of a market-based programme on IW. Distributors and retailers who are passionate and are highly motivated will naturally create avenues for rapid awareness creation in targeted areas. This however is premised on the fact that distributors and retailers can enjoy earnings commensurate to the efforts invested in the business. Some form of training of distributors and retailers on technical and other specifications that are strongly linked to stove benefits would be required. Capacity building on business skills, management, sales and related themes to vendors will enable them to penetrate the rural market thereby building the market.

It will be necessary to build networks of vendors that have financial resources to pay for upfront costs in volumes from manufacturers. If funds from the market is made readily available to distributors and retailers, it would result in stock build-up and enable them to enjoy financial rewards from economy of scale.

4.3.7 Follow-up and after-sales services

Follow-up and after-sales services extended to end-users by manufactures can ensure a successful roll-out of an IW programme. The availability of warranties in the initial stages of the programme will build confidence among end-users in manufacturers and enable patronage of the products.
5 SUSTAINABLE USAGE AND PRODUCTION OF FUELWOOD

5.1 Summary

Box 4: Highlights of sustainable fuelwood production

- We define sustainable fuelwood to mean the production and consumption of fuelwood in such a manner that future generations would also have access to it. On the supply side, this means, inter alia, cultivating woodlots, relying on waste wood, and regenerating forest resources from which woodfuel is obtained. On the demand side, this would entail the use of higher efficiency cookstoves that ensure demand side management of the woodfuel resource.
- Using indicators developed by the FAO, our assessment is that woodfuels industry in Ghana is not sustainable.
- Most woodlot cultivation programmes are on a small scale, compared to the amount of woodfuel consumed in the country annually.
- Due to high demand and unsustainable practices in production and marketing, woodfuel resources are depleting at a faster rate. If the current consumption continues, Ghana is likely to consume more than 25 million tonnes of woodfuel by the year 2020, with most of the woodfuel supply to come from standing stocks, i.e. 15 million tonnes from standing stock and the remaining 10 million tonnes from regeneration or yield. This is alarming for the country’s forest resources.
- 90% of households source firewood from farmlands and roadside according to this study.
- Two-thirds of rural households obtain fuelwood freely while the remaining one-third purchase fuelwood. Of the households that collect fuelwood freely, only three percent cultivate trees for the supply of fuelwood.
- For every ten households, the number that purchase fuelwood are eight, four and two for coastal, forest and savannah zones, respectively.
5.2 Source of fuelwood in rural Ghana: Outcome of field study

Fuelwood is gathered from many sources, notably, virgin and degraded forests, savannah (shrub lands) or mangroves, woodfuel/forest plantations, farmlands, pasturelands, offcuts of timber processing, roadsides, etc. (Heruela, 2003). Woodfuel production can come from sustainable management of existing forests or from dedicated plantations. Sustainable sources of woodfuel are legally obtained from plantations, farms, homesteads and other planted sources, without causing negative environmental, social and economic impacts. Over-exploitation of fuelwood by local communities leads to degradation of natural vegetation resulting in deforestation. According to MLGRD (2016), over 90% of fuelwood comes from the natural forest and farmlands while the remaining is obtained from logging residues, sawmills and plantations or woodlots.

It is observed that two-thirds of rural households obtain fuelwood freely while the remaining one-third purchase fuelwood for heating and cooking. Out of the numbers that do not pay for fuelwood, only three out of 100 respondents cultivate trees for the supply of fuelwood. There are however significant differences on the source of fuelwood across the vegetational zones show in Figure 12. Over eight out of every 10 households purchase fuelwood in rural coastal areas which is more than twice the national average.

On the other hand, households in the Savannah and Forest belts that buys their own fuelwood averages about 36% and 22% respectively. Thus, there are more free wood available for collection and use in these zones than in the coastal environment based on the data gathered. Perhaps this could also explain why the wood users in the coastal belt are lower than the national average. According to GSS (2014), 57 percent of rural households in the coastal belt use wood as compared to a national average of 75 percent. From the graph, the forest areas provide abundance of free fuelwood for collection and use by most rural households, indicating that wood scarcity is yet to become a problem in communities located within the forest environment.

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It is also observed that majority of households (two-thirds) obtain their fuelwood resources from their farms while every two out of nine households obtain fuelwood from bushes along roadsides. In general, households collecting fuelwood from the natural forest constitute less than a tenth of the respondents which indicates less intrusion into community or national forests. About 14% of households source for fuelwood in the natural shrub lands indicating the need to enforce regulations on harvesting of fuelwood in protected lands. In addition, woodlots contribution to fuelwood is very low (< 1%) as presented in Figure 13.

Figure 12 How rural wood users obtain wood across ecological zone of Ghana

Figure 13 Source of fuelwood in rural Ghana
From the survey, farmlands are major sources of fuelwood thus allowing rural folks to depend on their farms while avoiding or reducing unsustainable collection from community and national forestry resources (Figure 13). Consequently, one strategy for increasing sustainability of fuelwood harvesting and use is to promote agroforestry especially in the Savannah and Coastal communities where about 57% of households practice farming. Agroforestry should be promoted among farmers using. This can be achieved by introducing fast growing tree species to farmers, while training is offered in planting skills that maximise fuelwood production.

When considering households that do not purchase fuelwood, the coastal areas appear to source wood in the most unsustainable manner. As high as 74% of households that do not purchase wood partly obtain their fuel from community lands (Figure 14). This study did not ascertain the sources of commercial fuelwood sold in the coastal communities, nonetheless, some studies (e.g. Coastal Resources Centre, 2015) have shown the rapidity with which mangroves have been harvested by individuals and sold as fuelwood in coastal Ghana. It is recommended that the coastal ecological zones are considered during the piloting of any IW programme as conditions are more favourable to building the market.

![Figure 14 Source of fuelwood across ecological zones](image)

5.3 End-user perception of fuelwood usage

From our study, it is evident that about 60% of rural wood users get their firewood for free. This represents an apparent zero financial cost to these group of beneficiaries. There is a

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38 Coastal Resources Center (2015). The USAID/Ghana Sustainable Fisheries Management Project (SFMP), Post-harvest processing of fish (scoping studies, energy audit and process characterisation) validation workshop, 2015, Narragansett, RI: Coastal Resources Center, University of Rhode Island.
global believe that the use of firewood has other economic implications emanating from associated health issues, drudgery, deforestation, etc. To be able to develop a sustainable market for improved woodstoves and successfully promote the adoption of improved woodstoves, there is the need to understand how the end-users perceive the effect of using firewood on their health and socio-economic development. Studies elsewhere have shown that promoting ICs based on reduction on fuelwood with additional benefits from reduced drudgery and/or cash savings resonated better with end-users than campaigns based on health aspects (Anhalt and Holanda, 2009).39

According to GSS (2014),40 27.7% of females and 15.5% of males of over 7 years in rural areas spend about 22 minutes daily to collect firewood, with time spent being highest in the savannah and lowest along the coast (Figure 15). The report further states that children (7-14 years) and teens (15-19 years) spend on average about 19 and 21 minutes daily on firewood collection, respectively.

Clearly, women and children suffer from drudgery and are exposed to attacks of dangerous animals such as scorpions and snakes through fuelwood collection. Time spent by women on fuelwood collection can be used on more productive or income generation activities while children can spend such time in school or use it to do their class assignments. Also, the use of fuelwood especially in enclosed kitchens creates health risks such as pneumonia, heart diseases, lung cancer, stroke and other respiratory illnesses, cataracts and burns.41 WHO estimates at least 4 million premature deaths from illnesses attributable to household

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air pollution from cooking with solid fuels in a year. The use of open fires and poorly functioning woodstoves produces lots of gaseous pollutants and particulate matter due to incomplete combustion which is injurious to the health of women and children who are mostly responsible for food preparation in Ghana.

As shown in Figure 16, a third of respondents are aware of the linkage between fuelwood use and eye infections. Awareness on smoke inhalation causing headache, cough and breathing problems was lower, between 22 and 25%. Though awareness on the impacts of smoke on human life is low, households see reduced smoke emissions as a positive attribute of a good woodstove as was shown in Section 3.5.

![Figure 16 Perceived health problems and health problems experienced by end-users](image)

It is observed that respondents who suffered health problems in the past year are able to link their challenges to inhalation of smoke from fuelwood use. Over 90% of respondents who have suffered eye-related ailments believe smoke emissions from fuelwood burning might have contributed to their health challenges (Figure 17). Most of them also believe that smoky environments from fuelwood use can cause headache, cough and shortness of breath. Respondents who have suffered headache and breathing problems are less able to link their health issues to fuelwood usage. Nonetheless, at least half of them view fuelwood use as a contributory factor to health problems.
In rural communities, improved woodstoves can offer many health benefits since such areas usually have limited access to modern energy forms such as LPG. Thus, a market-based improved woodstove distribution can have positive impacts on the health of women and children since IWs reduce smoke concentrations and consequently indoor air pollution while reducing resources such as time and money invested in gathering fuelwood. IWs reduce fuelwood consumption, further reducing pressure on forest resources which serve as the main source of fuelwood. There are also external benefits realised in IWs adoption such as reduced greenhouse emissions and improvements in local environment, skill acquisition and employment opportunities from stove construction and distribution within rural communities.

Owing to the large number of rural households depending on woodfuel (firewood), a successful woodstove project will produce great gains in in-door pollution reduction, drudgery reduction while reducing rate of deforestation.

5.4 Sustainable fuelwood production and utilisation

The term ‘sustainable woodfuel’ has been used in a number of documents but it is difficult to find a precise definition. The FAO (2010)\(^{42}\) defines Sustainable Forest Management as ‘the management of forests for maximum social and economic benefits without compromising (and, ideally, even enhancing), over time, environmental values such as forest health, productive capacity, biodiversity, soil, water and carbon sequestration.’ Inferring

from this, sustainable woodfuel would mean the production and consumption of woodfuels in such a manner that future generations would also have access to it. On the supply side, this means, inter alia, cultivating woodlots, relying on waste wood, and regenerating forest resources from which woodfuel is obtained. On the demand side, this would entail the use of higher efficiency cookstoves that ensure demand side management of the woodfuel resource.

5.4.1 Assessment of sustainable fuelwood production in Ghana

Table 6 shows a summary of selected principles, criteria and indicators for sustainable woodfuels outlined by the FAO (2010). If the indicators are used to roughly assess Ghana’s woodfuel industry, the industry can hardly be said to be sustainable. Apart from some level of commitment to policy development, which in most cases is shallow and lack meaningful detail, Ghana fails in most of the other indicators. As noted in a recent study by SNV (2017), the role of Metropolitan, Municipal and District Assemblies and institutional coordination for harvesting of woodfuel is not clearly defined at the national level and there is no clear policy guiding the process for the domestic fuelwood market.

Contrary to findings from the survey conducted in this study, estimates in official Ghana government documents suggest that about 90% of woodfuels consumed in Ghana is obtained directly from the natural forest, with only 10% coming from wood waste, i.e. logging and sawmill residue, and planted forests (Government of Ghana, 2012). This is true for fuel wood consumption in urban households, institutions, commercial and industrial facilities. Historically too, Ghana has not fared well with regards to the management of its forest resources, which raises concerns going forward. Data available shows that Ghana’s forest cover reduced from 8.2 million hectares in 1990 to 4.2 million in 1950, and 1.5 million hectares by 1999 (Addo-Fordjour and Ankomah, 2017). This translates to an 80% loss of forest cover between 1990 to 1999. It has also been reported by the Forestry website Mongabay that reduction in forest cover between 1990 to 2005 is approximately 25.93%, with the FAO (2014) estimating the country’s forest degradation rate at 45,931 ha per year. Most woodlot cultivation programmes are on a small scale, compared to the amount of woodfuel consumed in the country annually.

46 https://rainforests.mongabay.com/deforestation/archive/Ghana.htm
Table 6 Principles, criteria and indicators for sustainable woodfuels

<table>
<thead>
<tr>
<th>Principles</th>
<th>Criterion</th>
<th>Some indicators</th>
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| Policies, laws, institutional frameworks and capacity exist and are clear and consistent | Woodfuel production is consistent with international commitments and follows domestic laws | • Where governments have acceded to sustainable forest management or energy-related agreements at an international level, the existence of specific domestic laws and policies to support these commitments  
  • The existence of specific laws and policies to provide for sustained woodfuel supply |
| Forest and energy policies address woodfuel issues | | • The extent to which forest management policies recognize woodfuel production as one of the uses of forests and trees  
  • The extent to which energy policies include components specific to woodfuels |
| The instruments of woodfuel policies are consistent across and within ministries, agencies and levels of government | | • The extent to which applicable policies at the national, regional and local levels are consistent with each other.  
  • The extent to which local or traditional knowledge informs management planning and is consistent and compatible with national, regional and local policies. |
| Information on the status and use of woodfuel resources is available | | • The extent to which accurate forest-cover and land-use data are available  
  • The extent to which woodfuel production and consumption data are available |
| The capacity to manage and regulate woodfuel production and consumption exists | | • The extent to which national, regional and local agencies have the human and financial resources to implement existing policies and laws affecting woodfuel  
  • The extent to which woodfuel producers are trained in sustainable woodfuel production practices |
| Human and labour rights are respected and social and cultural values | Land-use rights and ownership are clearly defined and established | • The extent to which stakeholder tenure rights are stated and acknowledged, and are secure  
  • The existence of mechanisms for land acquisition, and the extent to which they
Woodfuel production is planned and implemented in a transparent and participatory manner involving all relevant stakeholders.

- The existence of communication mechanisms for dialogue and conflict resolution between various stakeholders, and their effectiveness.
- The extent to which the needs of the population are taken into account by woodfuel producers.

Woodfuel production contributes to the social and cultural development of local, rural and indigenous communities.

- The extent of improvement in community access to energy.
- The extent of involvement and representation of stakeholders in decision-making processes involving woodfuel production.
- The extent to which programmes designed for women and marginalized communities are developed and implemented.

Source: Modified from FAO (2010)

Not many studies have been conducted in the country on the harvesting pattern of woodfuels. The few studies available point to unsustainable practices in the harvesting of woodfuel. A survey conducted by Amoh-Anguh (2016) found that most households fetched their firewood, gathering from their own farm and/or community forest at no cost. This is consistent with results obtained in this study where about 92% of fuelwood was found to come from farms and community lands while a little below 1% is harvested from woodlots as presented in Figure 13.

With regards to commercial production of firewood, fees are sometimes charged against operators. According to Coastal Resources Center (2015), chiefs may give out community lands to be harvested at a fee, imposing regulations on species and quantities of fuelwood to be harvested as a way of protecting the resource. The Forestry Services Division of the Forestry Commission also issues permits for fuelwood harvesting and conveyance certificates for transporting fuelwood. Taxes are collected by district assemblies, especially if

49 Coastal Resources Center (2015). The USAID/Ghana Sustainable Fisheries Management Project (SFMP), Post-harvest processing of fish (scoping studies, energy audit and process characterisation) validation workshop, 2015, Narragansett, RI: Coastal Resources Center, Graduate School of Oceanography, University of Rhode Island. PW002.
the resource is leaving the district. Ironically, fuelwood cultivation and harvesting is less undertaken in Savannah and Coastal areas where larger numbers of households purchase fuelwood or where household fuelwood market is more prominent. In the GLSS6 report of the GSS, it is estimated that about 3.2% and 2.9% rural folks in savannah and forest regions respectively, reported unavailability of firewood, which was interestingly higher than the urban figure of about 0.7%. This could present situation where firewood is gathered in rural areas but carted and sold to urban dealers.

Over the past decade there has not been any significant change in the status of fuelwood harvesting and use in rural communities. The reasons that have accounted for this include:
- Wood is accessible physically, economically, and socially to most rural communities; and
- Most rural communities do not have access to or cannot afford the cost of gas and electricity for cooking and heating.

### 5.5 Options to promote sustainable fuelwood production

Ghana’s woodfuel consumption is beyond sustainable harvesting levels, with the Upper East reaching as high as 60% over the sustainable level (MLNR, 2016). Since woodfuel harvesting and supply from well managed forests are limited in quantity, it necessitates the need to meet shortfalls with plantations and other sources. Planted trees in crop lands, roadsides, homes, etc., have the possibility to support the supply of fuelwood, reducing pressure on forests.

In the survey carried out, only 1 out of 100 respondents obtained fuelwood from woodlots. The establishment of fuelwood plantations is known to face several challenges, notably, land availability, unsupportive land tenure systems, tenure insecurity, and unregulated access. Further, the possibility of prioritising wood from plantations for applications such as construction wood and electric poles is higher relative to woodfuel which are under-priced. Further, land for woodfuel plantations may likely be converted to farmlands for cultivation of food and cash crops, bringing in higher returns.

Activities designed to tackle challenges in the sustainable harvesting and supply of fuelwood in rural areas should reflect the existing social structures in addition to the views and concerns of the communities. When such activities are integrated with the needs and livelihoods of the communities, with clear responsibilities placed on local actors, they yield

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52 Sepp and Mann (2009).
the expected results. For example, encouraging agroforestry among farmers allows them to practice sustainable land-use systems with higher productivity and profitability.

In communities close to protected forests, inhabitants have no access to forest resources and thus have limited access to fuelwood. There is the need to identify areas where reforestation and woodfuel production are practiced. Community members should be sensitised on the long-term benefits that can be derived from planting of trees for firewood. Private owners of plantations as well as farmers should be encouraged to form associations, to enable them engage policy makers. Moreover, members of the associations can take advantage of joint production and sale of fuelwood in order to introduce price controls.

The focus of policy interventions should be directed to support activities that are capable of presenting woodfuels as appropriately priced and marketable energy goods, thereby removing factors that lead to undervaluation. Such policy-based interventions include discouraging informal harvesting, supply and use of woodfuel, enhancing managerial capacity of forestry staff, encouraging registered businesses to move into fuelwood value chain, and creating favourable conditions for informal actors to register their operations. Removal of the challenge of fuelwood under-pricing can trigger the growth of plantations. Clear guidelines on key issues to consider in establishing forest plantations such as siting, species selection, management system, etc. should be developed and supported with policy.
This section presents a strategy and a roadmap for the development of a woodstove and fuelwood market in rural Ghana. It outlines support required and specific functions expected of key actors. Since IW business for households does not exist in the country, the proposed strategy and roadmap also considers the stages of development of the market with reference to a five-year timeline. The five year timeline allows for achievement of targets via concrete actions in the short-to-medium term while presenting opportunities to reviewing the strategy at the fifth year, allowing for changes that will enable goals of the plan to be met in the long-term.

6.1 Summary

Box 5: Highlights of the strategy

- A five-year timeline is recommended for realising a rural market for IWs, beginning 2018.
- Actions, measures and specific activities are outlined under three phases of development within the timeline, detailing expectations from stakeholders and actors.
- The first phase (2018-19) focusses on market creation and development through promotional campaigns, advocacy, research and development. This should include:
  - Adoption/development of well-engineered, technically-tested, socially-acceptable, and standardised woodstoves for promotion and dissemination for different segments of target rural population in the regions of Ghana. Stove models successfully promoted in similar countries, for example under Energising Development programme, can be adopted and contextualised, and subsequently piloted;
  - Focus on lobbying and advocacy for the creation of an enabling environment for IWs and fuelwood: formalisation of the ad-hoc intersectoral coordination, streamlining of fragmented policies as well as development of regulatory and certification frameworks;
The most promising areas to pilot programmes are in the coastal zones where about 80% of rural dwellers purchase fuelwood. Programmes can be extended to other areas if they are successful in the coast.

- Testing of stove performance in thermal efficiency, fuel savings, greenhouse gas emissions and particulate reduction, durability and affordability; and
- Market assessment, distribution models and dissemination strategies.

**Strategies:**

- Create awareness on IW adoption through a series of nation-wide demonstration activities and promotional campaigns.
- Form an advocacy group of enterprises, and CSOs with interest in clean cooking.
- GHACCO should lead advocacy campaigns.
- SNV should advise and provide technical, logistical and financial support as well as general guidance for marketing, advocacy and lobbying campaigns.

- In the second phase (2020-21), efforts should be made to grow and scale-up the market. This period should witness the outcome of interventions initiated in the first phase, notably:
  - Policy and regulatory regimes initiated/developed;
  - Fully-tested and acceptable models are promoted in selected rural communities in the various ecological zones of the country;
  - Special programmes with financial backing are designed and implemented for low income rural households; and
  - Incremental improvements in technology and dissemination strategies.

**Strategies:**

- Advocacy group should continually monitor progress in relation to achievement of targets; and
- Group should review advocacy strategies to reflect changing environment.

- By the end of the third phase (2022), Ghana should have achieved accelerated market development and promotion. The achievements of advocacy campaigns and interventions should include, among others:
  - Full policy support for IWs and fuelwood;
  - Intensive promotional activities and marketing of large quantities using several distribution and promotion channels without financial packages for manufacturers and end-users;
  - Extensive penetration of IWs in rural communities across all geographical areas, with strategies and actions implemented to ensure sustained patronage and use of stoves, with further improvements in technology; and
  - Follow-up services as well as monitoring & evaluation of progress.

**Strategies:**

Same as in the second phase.
6.2 Description of proposed strategy and actions

The proposed strategy to create and develop IW market for households in rural Ghana is presented in the Theory of Change (Figure 18).

Improved woodstoves

It is observed that a market for IWs cannot be created without the availability of well-designed and engineered, tested, socially-compatible and useable stoves for various rural population segments across the ecological zones of the country. Currently, there are no locally made household IWs which have been tested, certified and accepted by Ministry of Energy, Energy Commission or GHACCO for dissemination. The attention has been on improved charcoal stoves for households and woodstoves for institutions.

The goal is to build a sustainable market for IWs in rural households. Funding (B) is needed to develop and commercialise IW models including ceramic- and metal-based stoves and various combinations thereof. Similar to the approach used by Enterprise Works in initiating commercialisation of the Kenyan Jiko charcoal stoves, successful household IWs in other African countries can be adopted and contextualised to fit the Ghanaian environment. There are vast experiences on IW market development in rural communities in the sub-region (Burkina Faso, Benin, Senegal, etc.) as well as other parts of Africa (Kenya, Malawi, etc.) and beyond under EndeV and other programmes, which can provide valuable lessons to Ghana. Fuelwood stoves that have been developed and successfully marketed in rural households in other countries (Plate 7) should be be included among stoves selected for consideration, re-engineering and contextualisation if necessary. Premium should be given to stoves that can be manufactured or assembled in large quantities at a single location to meet increasing demand, allowing for quality control and monitoring.

<table>
<thead>
<tr>
<th>Burkina mixte stove</th>
<th>Country(ies) promoted: Burkina Faso</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type: One-pot stove with fixed diameter</td>
</tr>
<tr>
<td></td>
<td>Material: Metal</td>
</tr>
<tr>
<td></td>
<td>Fuel: fuelwood and charcoal</td>
</tr>
<tr>
<td></td>
<td>Cost: Moderate</td>
</tr>
<tr>
<td></td>
<td>Attributes: good for small-to-medium pots, can be made from scraps, user satisfaction high</td>
</tr>
</tbody>
</table>

Source: GIZ HERA Factsheet

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Country(ies) promoted:</th>
<th>Type:</th>
<th>Material:</th>
<th>Fuel:</th>
<th>Cost:</th>
<th>Attributes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ouaga Métallique Stove</td>
<td>Burkina Faso</td>
<td>One-pot stove with fixed diameter</td>
<td>Metal</td>
<td>fuelwood and charcoal</td>
<td>Low</td>
<td>portable, good for small-to-medium pots, can be made from scraps, user satisfaction high</td>
</tr>
<tr>
<td>Tulip clay stove</td>
<td>Benin, Burkina Faso</td>
<td>One-pot stove</td>
<td>Clay</td>
<td>fuelwood</td>
<td>Low</td>
<td>portable, efficient and affordable, easily standardised. Breaks easily</td>
</tr>
<tr>
<td>Chitetezo Mbaula</td>
<td>Malawi, Kenya, Zambia</td>
<td>One-pot stove</td>
<td>Clay</td>
<td>fuelwood</td>
<td>Low</td>
<td>portable, efficient and affordable, easily standardised. Breaks easily</td>
</tr>
<tr>
<td>Multimarmite stove</td>
<td>Burkina Faso</td>
<td>One-pot stove but flexible for handling up to 3 different pot sizes</td>
<td>Metal</td>
<td>fuelwood and charcoal</td>
<td>Low-to-moderate</td>
<td>supports different size pots, high user satisfaction, portable. Size flexibility however affects efficiency</td>
</tr>
</tbody>
</table>

56 Jagger P., Jumbe C. Stoves or sugar? Willingness to adopt improved cookstoves in Malawi, Energy Policy 2016 (92), 409-419
<table>
<thead>
<tr>
<th>Stove Type</th>
<th>Country(ies) Promoted</th>
<th>Type</th>
<th>Material</th>
<th>Fuel</th>
<th>Cost</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tikikil stove</td>
<td>Ethiopia</td>
<td>One-pot stove with skirt</td>
<td>Metal cladding with ceramic liner</td>
<td>fuelwood</td>
<td>Moderate</td>
<td>Portable, fast cooking, low emissions, cladding can be made of scraps, parts replaceable. Pot size is fixed.</td>
</tr>
<tr>
<td>Shielded fire stove with bypass air inlet</td>
<td>Uganda</td>
<td>One-pot stove (shielded with bypass air inlet)</td>
<td>Clay, organic materials (saw dust, dry banana leaves, etc.)</td>
<td>fuelwood</td>
<td>Low</td>
<td>Portable, efficient, cheap, reduced possibility to burn users, readily replicable, easily made for different pot sizes. Effective quality control required, regular maintenance, requires shelter from rain.</td>
</tr>
<tr>
<td>Shield stove with shelf, Uganda</td>
<td>Uganda</td>
<td>One-pot stove</td>
<td>Clay, organic materials (e.g. grass)</td>
<td>fuelwood, agricultural residues</td>
<td>Low</td>
<td>Portable, efficient, affordable, shielded fire (low possibility of burning users). Shelter from rain is required, quality control difficult, shelf not usually used.</td>
</tr>
<tr>
<td>Stove suitable for up to 4 pot sizes</td>
<td>Senegal, Benin, Kenya</td>
<td>One-pot stove</td>
<td>Metal stove with ceramic liner</td>
<td>fuelwood</td>
<td>High</td>
<td>Portable, efficient, high quality production, liner production creates additional jobs. Stove fits only one pot size, lack of skirts leads to heat losses.</td>
</tr>
</tbody>
</table>

58 http://catalog.cleancookstoves.org/stoves/170
| **Jambar stove**<sup>61</sup> | - Country(ies) promoted: Senegal  
- Type: Mono-marmite (fixed pot) and multi-marmite (flexible pot size)  
- Material: Metal  
- Fuel: fuelwood and charcoal  
- Cost: high  
- Attributes: portable, efficient, high quality production |
| **Sakkanal stove**<sup>62</sup> | - Country(ies) promoted: Tanzania  
- Type: One pot  
- Material: Metal cladding with clay liner  
- Fuel: fuelwood and charcoal  
- Cost: moderate  
- Attributes: portable, efficient |
| **Tanzanian Jiko-Matawi stove**  
*Courtesy: Alex Donyina, SNV-Ghana* | - Country(ies) promoted: Tanzania  
- Type: One pot  
- Material: Metal cladding with clay liner  
- Fuel: fuelwood and charcoal  
- Cost: moderate  
- Attributes: portable, efficient |

Plate 7 Well-engineered woodstove models promoted in other countries

Prototypes can then be tested, contextualised and piloted (J) for feedback in selected rural communities (e.g. coastal areas where firewood purchasing is relatively high) after which controlled dissemination using effective business models and awareness creation (N) is planned with the involvement of interested private companies, CSOs and other stakeholders. It is expected that local enterprises and artisan entrepreneurs would receive technology improvement support as well as business capacity building to enable them play the role expected of them in the initial phase of developing the market (L). Dedicated research for incremental stove improvement (K), training support to actors in the value chain (M), and improved distribution networks (O) are necessary to building the market and maintaining confidence in products delivered to end-users.

If the northern Ghana is selected for initial roll-out of a stove programme, then there would be the need to set-up a training programme where enterprises and/or artisan entrepreneurs with potential receive technical and know-how support. Further, a ceramic liner production facility will be needed, with liners readily available to producers, for cases where improved metal stoves with liners are selected for promotion. Liner production units are already available in the middle and coastal belts of the country.

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<sup>62</sup> https://energypedia.info/images/1/13/GIZ_HERA_2011_Sakkanal_Senegal.pdf
Awareness raising should aimed at behavioural change by highlighting socio-economic and health benefits of using IWs in target rural coastal areas and the need to prioritise IWs in household expenditure. It may be necessary for advocates to meet local financial institutions and lobby for favourable payment terms for consumer loans especially in situations where the market price of the stove is found to be considerably higher than the average household income of the target community.

In conclusion, the strategy proposed for the creation of a long-term market for IWs is as follows:

- Secure funds to develop appropriate IWs for promotion in rural households in Ghana;
  - In selection of IWs for tests and field trials, models that have been successfully marketed in similar jurisdictions in sub-Saharan Africa should be considered, leveraging on rich experience from Endev and other programmes. In particular, low-cost models with high user satisfaction such as Multimarmite, Ouaga Métallique Stove and Mixte stove from Burkina Faso may likely appeal to many rural households in Ghana;
  - Priority should be given to stoves that can be produced and transported en masse (in a production or assembling facility) in order to reach target rural segments. Further, it must be possible to increase production of selected stoves to meet increased demand from within or outside the country, without compromising on quality. Thus, stoves that are constructed on site mostly by artisans are not recommended due to difficulty in monitoring in addition to quality control issues since not every artisan would be expected to observe standards. Further, extended time is required to respond to the needs of the target market and scale-up to meet demand is difficult;
  - Selected models should be assessed for thermal efficiency, emissions reduction, etc., in the lab followed by field trials involving a number of rural households across the ecological zones. Feedback from field trials should be used to select models to be promoted and to make improvements, if necessary, before controlled piloting is undertaken. It is recommended that intial pilot trials are conducted in the coastal communities where at least 80% of rural households purchase fuelwood for cooking.

**Fuelwood**

The strategy is centred on the use of advocacy and lobbying (A) under sustained funding (B) and backed by research and development for data gathering and evidence creation, to trigger actions and measures expected of key stakeholders, with the aim to ensuring sustainable production, transport, marketing and use of fuelwood. It is proposed that the
advocacy is coordinated under GHACCO, with clearly defined roles and responsibilities of the members of GHACCO especially the CSOs. GHACCO will be expected to develop a detailed plan for the advocacy outlining roles of various CSOs and other members of GHACCO while development partners such as SNV provides technical, advisorial and logistical support. GHACCO should also be supported to prepare proposals to access international funds for advocacy, evidence creation and awareness raising whenever such opportunities present themselves.

The fuelwood market is among the most unregulated activities in the country owing to its informal nature. Further, the complexity of harnessing of fuelwood for energy purposes is also as a result of the many stakeholders involved at both national and local levels. In order to deal effectively with the gaps and challenges in the harvesting, transportation, marketing and usage of fuelwood, a cross-sectoral solution model is imperative but with a clear lead body. The focus of such an intervention is to find appropriate means of preventing fuelwood undervaluation by bringing operations under formal controls. This will ensure that fuelwood is appropriately priced.

The advocacy campaign should therefore target policy makers on the need to formalise the ad-hoc intersectoral committee (D) involving key Ministries and sector agencies that regularly meet at the Energy Commission, with financial backing from GACC. As earlier stated, issues related to fuelwood cultivation and harvesting should be led by Ministry of Lands and Natural Resources while transport, marketing and usage are handled by Ministry of Energy.

The formalisation of the ad-hoc inter-sectoral committee will ensure proper coordination of policies, projects and interventions of individual agencies, prevent poor performance due to overlapping of roles, fragmentation of responsibilities and poor performance. Through the influence of advocacy campaigns, the committee could play a lead role in streamlining various actions on fuelwood which are fragmented in various sector policies as well as developing certification framework for fuelwood (F). Medium-to-long term funding is required to train actors in the value chains – fuelwood producers/entrepreneurs, farmers, woodlot entrepreneurs, distributors, etc. – (G) and to raise awareness on policy trends and general fuelwood issues, while enforcing laws on the harnessing of forestry resources (H). Interventions should support existing woodlot projects with technical and managerial training while woodlot and agroforestry start-ups are promoted in target rural communities (I). The enactment and enforcement of fuelwood certification guide along side with other measures can partly contribute to formalisation of the sector and gradual removal of fuelwood underpricing, eventually resulting in fuelwood market.
Figure 18 Theory of change showing approach and strategy for achieving market for IWs and fuelwood
6.3 Responsibilities of key stakeholders

Many measures and interventions are required for the development and growth of the market for fuelwood and IWs, with the involvement of stakeholders. The main organisations that will be expected to drive the implementation of the roadmap include GHACCO, SNV, Energy Commission and Forestry Commission, while relevant ministries will be expected to provide policy direction. The expectations and responsibilities of the key bodies are outlined in Table 7.

Table 7 Responsibilities of key institutions

<table>
<thead>
<tr>
<th>Institution</th>
<th>Expected role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana Alliance for Clean Cookstoves (GHACCO)</td>
<td>GHACCO is an umbrella body founded to coordinate the promote ICs and allied applications in Ghana along national and global targets via the involvement of all actors in the value chain. GHACCO will be expected to lead advocacy campaign and coordinate activities, taking advantage of its large membership and presence in all Regions in Ghana.</td>
</tr>
<tr>
<td>SNV</td>
<td>SNV is the leading development partner on promotion of ICs in Ghana. In the proposed strategy, SNV should direct and provide technical and/or financial backing to advocacy programmes targeting sector bodies to enact and implement appropriate policy and regulatory frameworks for IWs and fuelwood market development. Further, SNV should guide GHACCO and other actors to access national, regional and international funds for specific activities as outlined in the roadmap.</td>
</tr>
<tr>
<td>Ministry of Energy (MoEn)</td>
<td>MoE is the policy making body for RE, with a primary responsibility of ensuring policy development and implementation. MoE must ensure the passage of the draft bioenergy policy and see to the setting-up of a special fund for IC promotion. It should also take leading and coordinating role in fuelwood transport, marketing and use.</td>
</tr>
<tr>
<td>Ministry of Land and Natural Resources (MLNR)</td>
<td>MLNR formulates and see to the implementation of forest and wildlife policy. The Ministry should be the lead body on issues related to fuelwood cultivation and harvesting.</td>
</tr>
<tr>
<td>Ministry of Environment, Science, Technology and Innovation (MESTI)</td>
<td>MESTI formulates and executes policies and regulatory frameworks that promote the use of environmentally friendly, scientific and technological practices and techniques for accelerated socio-economic development. MESTI should support all activities outlined in the roadmap.</td>
</tr>
<tr>
<td>Ministry of Local Government Rural</td>
<td>MLGRD is responsible for the efficient administration of all local government institutions including the Metropolitan, Municipal,</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
and District Assemblies (MMDAs). The Ministry should mandate MMDAs to include IW and fuelwood interventions in their medium-term development plans.

MoGCSP ensures gender equality and equity, promote survival, social protection and development of children, vulnerable persons, and support them to contribute fully to society. The ministry should support awareness raising campaigns targeting women and children.

MoE should support awareness creation programmes in health centres, highlighting the health benefits of using IWs to women and children.

MoE should play a major role in awareness raising campaigns through the School Health Education Programme (SHEP), focussing on the health benefits of using IWs to children.

MoA should promote agro-forestry and other sustainable practices through their extensive network of extension officers.

EC licenses operators in the RE sector and sets technical standards for their performance. It also carries out sector planning and policy advice to Minister of Energy. EC should develop specific projects and set-aside funds to carry out specific activities as outlined in the roadmap, while supporting GHACCO and other actors to undertake their responsibilities. Further, EC should create an enabling platform that will motivate IWs producers to register.

FC is responsible for the implementation of forest policies and the management of the utilization of forest resources in the country. FC should develop specific projects and set-aside funds to carry out activities as outlined in the roadmap, while supporting GHACCO and other actors to undertake their responsibilities. Further, FC should create an enabling platform that will motivate fuelwood producers to register.

The EPA is the lead national body responsible for the protection and improvement of the environment and for ensuring that the air, land and water resources are protected from all manner of adverse changes.

### 6.4 Roadmap

The roadmap with timelines and institutional responsibilities is shown in Table 8.
<table>
<thead>
<tr>
<th>Action</th>
<th>Existing/current interventions</th>
<th>Specific activities</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>Criteria for evaluation</th>
<th>Priority</th>
<th>Key responsible bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Carry out advocacy, research and development</td>
<td>Forestry masterplan, bioenergy policy (draft)</td>
<td>Conduct cost-benefit analysis of rural household energy and health benefits with respect to IW adoption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>Extent of evidence available</td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>SNV Voice for Change Partnership</td>
<td>Lobby government to develop and implement biomass specific energy policy and regulatory framework</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Government agrees to develop biomass policy/regulatory framework</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Push for tax reliefs and incentives for IWs and sustainable fuelwood producers</td>
<td>Sensitise MLGRD and MMDAs to include IW targets in medium-term development plans</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IW and fuelwood targets in MTDPs</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GSGDA(^{63}) II</td>
<td>Engage NDPC to prioritise IW and fuelwood in Ghana’s long-term development plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IW and fuelwood targets included</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Advocate for passage of standards for biomass stoves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ghana Standards Authority agrees to develop standards</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lobby donors to support development of IW standards and certification</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No. of donors willing to support</td>
<td>H</td>
<td></td>
</tr>
</tbody>
</table>

\(^{63}\) Ghana Shared Growth Development Agenda
<table>
<thead>
<tr>
<th>Action</th>
<th>Existing/current interventions</th>
<th>Specific activities</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>Criteria for evaluation</th>
<th>Priority</th>
<th>Key responsible bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td>II. Develop policy, regulatory framework and certification for fuelwood</td>
<td>Woodfuel regulation (draft)</td>
<td>Develop standards on fuelwood and pass standards for biomass stoves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Standards on fuelwood and biomass stoves</td>
<td></td>
<td>MLNR, MoEn, GSA</td>
</tr>
<tr>
<td>III. Ensure sustainable production, marketing and use of fuelwood</td>
<td>Forestry masterplan, REDD+ strategy</td>
<td>Promote efficient management of the natural forests, woodlands and mangroves for sustainable production and supply of fuelwood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Decrease in fraction of non-renewable biomass (currently at 99%)</td>
<td>H</td>
<td>MLNR, FC</td>
</tr>
<tr>
<td></td>
<td>Fraction of non-renewable biomass – 99%</td>
<td>Promote fuelwood production as byproduct of multi-purpose forestry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Decrease in non-renewable fuelwood at national level</td>
<td>H</td>
<td>FC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Encourage set-up of woodlots and agroforestry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Acreage of woodlots; % farmers practising agroforestry</td>
<td>H</td>
<td>MLNR, MOFA, FC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Support replanting of degraded forests, shrublands and mangroves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
<td>MLNR, FC,</td>
</tr>
<tr>
<td></td>
<td>Promote use of non-traditional tree species (rubber, coconut, bamboo, etc.) as fuel for IWs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No. of initiatives</td>
<td>H</td>
<td>MLNR, FC</td>
</tr>
<tr>
<td></td>
<td>Forestry development</td>
<td>Support fuelwood production, management and supply interventions in Forestry</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Action</td>
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<td>2018</td>
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</tr>
<tr>
<td></td>
<td>masterplan</td>
<td>Development Masterplan</td>
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<td>IV.</td>
<td>Carry out R&amp;D</td>
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<td></td>
<td>No approved (by EC) locally-made IW</td>
<td></td>
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<td></td>
<td>No. of standardised certified for mass promotion</td>
<td>H</td>
<td>SNV, GHACCO,</td>
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<tr>
<td></td>
<td>No manual exist</td>
<td>Prepare training manuals on IWs adopted or developed for promotion</td>
<td></td>
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<td></td>
<td></td>
<td>Training manuals available</td>
<td>H</td>
<td>SNV</td>
</tr>
<tr>
<td></td>
<td>Undertake incremental improvements of IW models</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>Evidence on technical improvements</td>
<td>H</td>
<td>EC, Universities, CSIR-IIR</td>
</tr>
<tr>
<td></td>
<td>Develop new IWs using new materials</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>New IWs and innovations</td>
<td>H</td>
<td>EC, Universities, CSIR-IIR, etc.</td>
</tr>
<tr>
<td></td>
<td>Investigate appropriate methods for integration of selected species into agricultural landscape for woodlot development</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Number of appropriate methods</td>
<td>M</td>
<td>FC, FORIG, Tropenbos, Universities, etc.</td>
</tr>
<tr>
<td></td>
<td>Develop low cost methods for fuelwood storage</td>
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<td>Low cost methods for fuelwood storage</td>
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<td>FC, FORIG, Tropenbos, Universities, etc.</td>
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<tr>
<td>V.</td>
<td>Develop appropriate distribution models and after-sale services</td>
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<td></td>
<td>Support establishment of IW production clusters in northern sector</td>
<td></td>
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<td></td>
<td></td>
<td>IWs production cluster in northern regions</td>
<td>H</td>
<td>MoEn, GHACCO, SNV</td>
</tr>
<tr>
<td></td>
<td>Identify and develop appropriate distribution models to support producers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>New markets created in rural areas</td>
<td>H</td>
<td>GHACCO, SNV</td>
</tr>
<tr>
<td></td>
<td>Connect IW producers and distributors to new markets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Number of new markets</td>
<td>H</td>
<td>MoEn, GHACCO, MOTI</td>
</tr>
<tr>
<td>Action</td>
<td>Existing/current interventions</td>
<td>Specific activities</td>
<td>2018</td>
<td>2019</td>
<td>2020</td>
<td>2021</td>
<td>2022</td>
<td>Criteria for evaluation</td>
<td>Priority</td>
<td>Key responsible bodies</td>
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<tr>
<td>IV.</td>
<td>User guidelines not included</td>
<td>Encourage producers to include clear user guidelines for their IWs</td>
<td></td>
<td></td>
<td></td>
<td>User guidelines included</td>
<td>H</td>
<td>GHACCO</td>
<td></td>
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<tr>
<td></td>
<td>No organised awareness raising initiative</td>
<td>Raise awareness on fuelwood resources and potential as agro-based livelihood venture</td>
<td></td>
<td></td>
<td></td>
<td>No. and coverage of awareness raising programmes</td>
<td>H</td>
<td>FC, GHACCO</td>
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<tr>
<td>VI.</td>
<td>Prepare awareness raising materials – flyers, manuals, brochures, stickers, radio adverts, etc. targeting population segments, including women groups</td>
<td>Types of promotional materials developed</td>
<td>H</td>
<td>GHACCO, SNV</td>
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<tr>
<td></td>
<td>Inform target population on IW benefits, products and services, vendors and end-user financing (if available)</td>
<td>No. of rural population reached</td>
<td>H</td>
<td>GHACCO</td>
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<tr>
<td></td>
<td>Train focal points in district assemblies to act as local resource points for awareness creation</td>
<td>No. of officers trained</td>
<td>H</td>
<td>MLGRD, MoEn, EC, GHACCO</td>
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<tr>
<td></td>
<td>Organise meetings on women participation in IW and fuel value chain</td>
<td>No. of meetings or women</td>
<td>H</td>
<td>MoGCSP, GHACCO, Queen Mothers Ass.</td>
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<td></td>
<td>Encourage schools and health centres to support awareness creation</td>
<td>No. of meetings with schools</td>
<td>H</td>
<td>GHACCO</td>
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<td></td>
<td>Enhance networking of stakeholders with others in the sub-region</td>
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<td>Action</td>
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<td>Criteria for evaluation</td>
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<tr>
<td>VII. Promote training of actors in IW and fuelwood value chain</td>
<td></td>
<td>Identify and train motivated improved cookstove producers willing to market IWs</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>No. of beneficiaries trained</td>
<td>H</td>
<td>MoEn, GHACCO</td>
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<td></td>
<td></td>
<td>Build capacity of producers/distributors on business and marketing skills</td>
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<td></td>
<td>No. of producers/distributors trained</td>
<td>M</td>
<td>MoEn, GHACCO, SNV</td>
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<tr>
<td></td>
<td></td>
<td>Provide training to women on marketing of IW and fuels</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>No. of women trained</td>
<td>M</td>
<td>SNV, GHACCO,</td>
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<td></td>
<td></td>
<td>Provide training on appropriate fuelwood storage systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No. of beneficiaries</td>
<td>M</td>
<td>FC, EC, FORIG, Universities</td>
</tr>
</tbody>
</table>
7 CREATING LINKAGES WITH SECTOR ASSOCIATIONS AND ALLIANCES IN OTHER (ECOWAS) COUNTRIES

7.1 Summary

Box 6: Highlights

- Efforts underway to create linkages in the ECOWAS sub-region through ECREEE as the coordinating agency.
- EREP targets 100% improved cookstoves by the year 2020 by banning inefficient stoves by 2020.
- There are currently a number of ongoing improved woodstove projects, programmes and sector associations.
- Existing alliances include; African Clean Cooking Energy Solutions (ACCES), Global Alliance for Clean Cookstoves (GACC), Energizing Development Program (EnDev) and West African Clean Cooking Alliance (WACCA).

7.2 Improved stove programmes in the ECOWAS Region

There are currently a number of ongoing improved woodstove projects, programmes and sector associations (henceforth generally referred to as ‘programmes’ in this report) in the ECOWAS sub-region. These include African Clean Cooking Energy Solutions (ACCES), Global Alliance for Clean Cookstoves (GACC), Energizing Development Program (EnDev) and West African Clean Cooking Alliance (WACCA). Table 9 presents an overview of these programmes. Most of these programmes takes place in at least two ECOWAS countries and may also include countries from other sub-regions in Africa.
One of the strategies to link up is through participation in regional programmes. This section of the study seeks to review the various ongoing programmes and how to create linkages in the ECOWAS sub-region.

### 7.2.1 Africa Clean Cooking Energy Solutions (ACCES)

The objective of the Africa Clean Cooking Energy Solutions (ACCES) initiative is to promote enterprise-driven, large-scale adoption of clean cooking solutions throughout sub-Saharan Africa (SSA), with the goal to reduce poverty, health-related risks, and adverse environmental impacts associated with traditional cooking technologies and practices (World Bank, 2012). The programme started in 2012 and is expected to end in 2019. ACCES was established through a consultative approach to identify the main barriers that impede market-based development of the clean cooking sector in SSA. It builds on experiences and lessons learned from donor, government, public, and private investments in clean cooking solutions; the World Bank’s operations; as well as the Lighting Africa, off-grid lighting market-transformation programme. ACCES has designed a set of tools and mainstreaming approaches that reflect varying country priorities and sector policies to help build momentum and economies of scale needed for market transformation. It operates using the following three main lines of support: delivering products, managing quality, and activating customers. One of the focus of the programme is to establish regional quality assurance and technical support system.

### 7.2.2 Global Alliance for Clean cook stoves

Global Alliance for Clean Cook stoves (GACC) which is the leading global platform for clean cooking energy promotion, is present in some countries in SSA countries including Ghana, Nigeria, Uganda and Kenya. One of the main targets of GACC is to ensure that, local clean cooking alliances are established in key geographies and market development activities are launched. These efforts resulted in the formation of GHACCO to coordinate the operations of stakeholders and to arrange for various forms of support to the industry to achieve the goal of universal adoption of clean cookstoves and fuels. Other sister organisations are the Nigeria Alliance for Clean Cookstove (NACC) in Nigeria and Uganda National Alliance on Clean Cooking (UNACC) in Uganda. The presence of these organisations in other ECOWAS countries can significantly strengthen the linkages between the countries and to develop programmes and initiatives to ensure the development of improved woodstoves in the region.

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7.2.3 Energizing Development Program

Energizing Development Program (EnDev) started in 2005 and it is expected to end in 2019. The programme seeks to support energy-business entrepreneurs with knowledge transfer, technical assistance, and capacity building. Ghana, Benin, Burkina Faso, and other African countries are the beneficiaries of this programme. As at 2014, one of the outputs of the project was the distribution of about 1.5 million improved cookstoves in African households (World Bank, 2014).  

7.2.4 West African Clean Cooking Alliance

The West African Clean Cooking Alliance (WACCA) was launched to ensure strong linkages between African countries in the clean cookstove sector. The overarching objective of WACCA is to help coordinate initiatives in various countries to ensure regional integration and efforts to promote improved cookstoves. WACCA was formed in line with the ECOWAS Centre for Renewable Energy and Energy Efficiency’s (ECREEE) objectives to promote energy access, renewable energy and energy efficiency in the ECOWAS sub-region. The programme is jointly implemented with several technical partners, including Austrian Energy Agency (AEA), International Centre for Energy, Environment, and Development (ICEED), Group for the Environment, Renewable Energy and Solidarity (GERES) GACC, GIZ and ETC-ENERGIA.

The programme started in 2012 and is aiming to reach 13 million households in the ECOWAS region with clean and efficient cooking energy by 2020. WACCA is set to build upon existing interventions on the various fuels and technologies, accumulate and share knowledge on available existing technologies and technical approaches. WACCA is expected to facilitate the adoption of standards for cooking technologies in accordance with international agreements as developed by GACC.

---

### Table 9  Current programmes on woodfuel and improved cookstove in the ECOWAS region

<table>
<thead>
<tr>
<th>Agency-Programme</th>
<th>Overview</th>
<th>Focus within the clean cooking sector</th>
<th>Funding Source</th>
</tr>
</thead>
</table>
| World Bank Africa Clean Cooking Energy Solutions (ACCES) (2012—ongoing) | The World Bank’s ACCES initiative promotes the enterprise driven, largescale adoption of clean cooking solutions throughout SSA | • Market intelligence  
• Creation of catalytic linkages between industry leaders and distributor  
• Targeted efforts to engage consumers in key segments  
• Establishment of a regional QA and technical support system. | Technical support funded by the Africa Renewable Energy Access Program and implementation funding leveraged through the World Bank’s energy investment projects in select countries |
| Global Alliance for Clean Cookstoves (GACC) | GACC is the leading global platform for clean cooking energy promotion with regional Africa activities | • Market intelligence in focus countries and additional geographies  
• Set-up of national alliances to coordinate local agenda  
• Targeted investments and market development activities | Grants and investments from governments, corporations, foundations, civil society, investors, non-governmental organizations, the United Nations, multilateral agencies, and the private sector |
| Energizing Development Program (EnDev) (2005-2019) | EnDev seeks to support energy-business entrepreneurs with knowledge transfer, technical assistance, and capacity building | Promoting only non-subsidized stoves so as to build sustainable markets | Funded by the Dutch and German governments, European Union, and Irish Aid; since 2011 also funded by the Norwegian government |
| West African Clean Cooking Alliance (WACCA) 2012-ongoing | WACCA aims to promote access to efficient, sustainable, and affordable cooking energy | Promotes the implementation of regional policies on clean cooking capacity building for clean cooking initiatives | ECOWAS |

Source: Summarised from World Bank (2014)
7.3 Creating linkages with other alliances and associations

The number of country-level African cookstove programmes has grown significantly over the past few years. Most countries in the ECOWAS sub-region have various national programmes to promote the utilisation of improved woodstoves. The underlining objective of these programmes is to reduce forest degradation and GHG emissions through the developing, distribution and utilisation of fuel-efficient wood and charcoal stoves with the main focus on rural and peri-urban areas. Through these programmes, governments and their sector ministries and agencies in the various countries play important and significant roles in the development of improved charcoal and woodstove.

The Global Alliances for Clean cookstove, with its partners in West Africa, could serve as platform to facilitate the development of fuelwood and improved cookstove initiatives. Even though the various countries in the ECOWAS region have varying national programmes with respect to national government role and approaches to ensure the use of improve cookstoves, there are similarities. The focus of early national programmes in Africa has almost exclusively been the environment (deforestation and climate change) and rural livelihoods, but improved health outcomes are increasingly becoming an important focus (Giffords, 2010).66

Many of the sector programmes and alliances are already linked through the many workshops and conferences that create a common platform for interaction. Going forward, linkages could be expanded through collective efforts to source for funding as well as technical support for initiatives. The regional programmes reviewed in Table 9 shows that most programmes draw their funding from traditional funding bodies including the World Bank, Africa Renewable Energy Access Program, European Union and individual European countries, EnDev and ECOWAS. The common funding bodies already ensure some level of interaction and linkage among the different sector bodies.

If the ECOWAS region is to realise a sustained woodstove market, then the promotion of regional knowledge sharing, technology transfer, financing arrangements among others can considerably support the cookstove market development. Lessons from woodstove projects under EnDev can be shared with Ghana and other countries in the sub-region that have low and non-existent market, enabling leapfrogging via the avoidance of mistakes. Figure 19 presents a scheme that could be adopted for increased partnership among regional associations and alliances to achieve regional targets in ECOWAS.

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A network of major stakeholders and relevant institutions including national cookstove alliances should be built in the sub-region, metamorphosing into a regional alliance, with a common goal of building the West African cookstove market. The network or future alliance, through the use of effective communication channels, knowledge sharing and learning platforms, workshops and awareness raising programmes, would need to roll out various activities targeting specific subsectors and themes in fuelwood and IW promotion. Where necessary, success stories and lessons from existing country initiatives and programmes can be used to promote transfer of knowledge and know-how among member countries. For example, woodstove designed and disseminated successfully in a particular country or area within that country can be adopted, contextualised and promoted in a sister country through platforms created by the network of actors in the sub-region.

In addition, regionally-planned awareness programmes tapping into the strengths of member country programmes and contextualised to meet respective local expectations, should be promoted. Such promotions should recognise regional-wide labelling, standards, directives and protocols whenever such arrangements are in place.
Figure 19 Strategies for linkages with regional associations and alliances

- National clean cookstove alliances
- Government agencies / representatives
- ECREEE focal persons in the sub-Region
- EnDev programme coordinators
- Knowledge holders
- Champions

**Institutions/actors**

**Strategies**

- Build on existing initiatives on fuelwood and IWs in the sub-Region
- Use consistent scheme for monitoring and evaluation
- Build network of key actors
- Form regional alliance
- Develop knowledge management and communication
- Organise regional workshops and symposia
- Streamline advocacy campaigns

**Activities**

**Technology and distribution**

- Promote knowledge sharing and technology transfer
- Replicate and contextualise innovative distribution models
- Provide professional and on-the-job training

**Promotion**

Plan and carry out regional awareness campaigns

**Standards**

Agree and apply common standards on fuelwood and IWs, e.g. Energy efficiency initiative of ECOWAS on standards and labelling

**Funding**

- Advocate for regional funding arrangements
- Push for innovative financing schemes including carbon funding (NAMA, green climate funds, etc.)

**Goal**

ECOWAS/ regional targets on fuelwood and IWs

Regional woodstove and fuelwood market
REFERENCES


Coastal Resources Center (2015). The USAID/Ghana Sustainable Fisheries Management Project (SFMP), Post-harvest processing of fish (scoping studies, energy audit and process characterisation) validation workshop, 2015, Narragansett, RI: Coastal Resources Center, Graduate School of Oceanography, University of Rhode Island. PW002.


Jagger P., Jumbe C. Stoves or sugar? Willingness to adopt improved cookstoves in Malawi, Energy Policy 2016 (92), 409-419


## APPENDIX A

<table>
<thead>
<tr>
<th>S.No</th>
<th>Community/Village</th>
<th>District</th>
<th>Region</th>
<th>Ecological Zone</th>
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<td>1.</td>
<td>Baseble</td>
<td>Nandom</td>
<td>Upper West Region</td>
<td>Savannah Belt</td>
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<td>2.</td>
<td>Dongkuolu</td>
<td>Nandom</td>
<td>Upper West Region</td>
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<td>Nandom</td>
<td>Upper West Region</td>
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