Field Test Report 1 – Lesotho

Developing a Woodfuel Survey Module for Incorporation into Existing Household Surveys in Developing Countries

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## Acronyms and Abbreviations

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<tr>
<th>Acronym</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>CAPI</td>
<td>Computer-Assisted Personal Interview</td>
</tr>
<tr>
<td>CSPro</td>
<td>Census and Survey Processing System</td>
</tr>
<tr>
<td>EA</td>
<td>Enumeration Area</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
</tr>
<tr>
<td>FAOLS</td>
<td>FAO Lesotho</td>
</tr>
<tr>
<td>FTP</td>
<td>Field Test Protocol</td>
</tr>
<tr>
<td>GLOBAL</td>
<td>Global Strategy for Improving Agricultural and Rural Statistics</td>
</tr>
<tr>
<td>STRATEGY</td>
<td>Statistics</td>
</tr>
<tr>
<td>HECS</td>
<td>Household Energy Consumption Survey</td>
</tr>
<tr>
<td>HQ</td>
<td>Headquarter</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>LBOS</td>
<td>Lesotho Bureau of Statistics</td>
</tr>
<tr>
<td>PAPI</td>
<td>Paper-and-Pencil Interview</td>
</tr>
<tr>
<td>R.O.</td>
<td>Reporting Officer</td>
</tr>
<tr>
<td>USD</td>
<td>US Dollar</td>
</tr>
<tr>
<td>WSM</td>
<td>Woodfuel Supplementary Module</td>
</tr>
</tbody>
</table>
Acknowledgements

The author, Mr. Andrea Borlizzi, would like to thank the people and institutions that made the field test possible: Ms. Molato, Ms. Thabane, Mr. Nzemene, Ms. Moalosi and the enumerators and drivers of the Lesotho Bureau of Statistics (LBOS), for implementing, supervising and coordinating the activities of the field test; Mr. Klompenhouwer, Mr. Nthimo and the colleagues of FAO Lesotho (FAOLS), for the logistics; Mr. Duhamel, Mr. Bolliger and Ms. Madrid Arroyo of the Global Strategy for improving Agricultural and Rural Statistics (Global Strategy), for coordinating the activities; Mr Mats Nordberg and Mr Arvydas Lebedys, of the FAO Forest Products and Statistics team, for co-funding this exercise.

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Introduction

Woodfuel\(^1\) plays a critical role in the economic and social wellbeing of many people around the world.

About 2.4 billion people use woodfuel as their primary energy source for cooking, predominantly in developing countries (FAO 2014). Fuelwood and charcoal, in fact, are the cheapest and most easily accessible source of energy in remote rural areas, where they allow poor people to meet their basic needs in the absence of other sources of energy.

Secondly, woodfuel is an important source of income and employment for rural households. There are, however, significant gender and social implications associated with its production and consumption. Women and children, for example, may spend several hours a day collecting fuelwood for domestic uses. This results in a lower amount of time available for activities that can improve their wellbeing, such as education and child nurturing. Furthermore, women and children are most likely to suffer from smokes and emissions from inefficient burning of wood with primitive stoves in unventilated kitchens.

Finally, the use of woodfuel has important and complex implications on the environment. Depending on the sustainability of their production and consumption, fuelwood and charcoal can be seen either as a source of carbon-neutral renewable energy, or as a driver of local forest degradation, deforestation and greenhouse gas emissions.

The provision of affordable and sustainable woodfuel and its improved use will contribute to the overall mission of poverty reduction and improve general human health and well-being in many developing countries. An important step towards this ultimate goal is to understand the magnitude and scale of its production and consumption: how much woodfuel is consumed each year, by

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\(^1\) According to the Unified Bio-Energy Terminology (UBET) wood fuels are a sub-category of biofuels, which in turn constitute a sub-category of renewable energy sources (FAO 2004). Biofuels comprise Woodfuel, Agro-fuels and municipal by-products. As to wood fuels, this category includes solid, liquid and gaseous products. To the aims of this study, only solid wood fuels (fuelwood and charcoal) are considered, while black liquor, pyrolytic oil and other liquid and gaseous products are not taken into account. As to fuelwood, it includes: i) wood in the rough; ii) wood chips; iii) sawdust; and iv) pellets and briquettes. Based on the source of wood, fuelwood can also be divided into direct wood (from forests and non-forest land), indirect wood (from wood industry) and recovered wood (from society).
whom, and for what purpose? Who is involved in the production of woodfuel, and to what extent? Where does the woodfuel mainly come from?

Unfortunately, despite the economic, social and environmental importance of woodfuel, many developing countries lack reliable data to estimate the patterns and trends of woodfuel consumption and production – and the labour associated with it – in their countries. Woodfuel, in fact, is predominantly produced and traded in the informal sector, which provides critical economic opportunities for the poor, but for which reliable information is seldom available.

As a result, the impacts of woodfuel production to local economy and livelihoods are largely underestimated and ignored. This partially leads to insufficient attention given to wood energy in national policies, strategies, and allocation of financial and human resources. Lack of reliable data on woodfuel also makes it difficult to assess its impact on forests and the environment, and to formulate effective policies to govern the woodfuel sector.

The costs associated with conducting a stand-alone national survey on woodfuel could be prohibitively high. Countries relying heavily on woodfuel for energy are often the poorest countries and thus lack the necessary resources to gather information on a regular basis. Therefore, most of the available data on production and consumption of woodfuel in developing countries come from models or consumption-based secondary data; discrepancies between them, however, are not uncommon.

A limited amount of systematically collected field data is available. However, they are mostly based on small-scale surveys conducted at the level of individual villages, towns or regions. Different patterns of woodfuel production and consumption across local communities, bias in selection and lack of valid statistical sampling often make it hard to extrapolate the results from local surveys to a regional or national scale. Accordingly, the results from these thematic studies cannot be used for cross-country comparisons and long-term trend assessments.

Conversely, there is a variety of national household surveys conducted regularly in many developing countries that collect internationally comparable data on a wide array of topics. These surveys, however, often lack questions on the amount of woodfuel consumed and its source, and fail to address socio-economic and environmental issues associated with woodfuel production and consumption. Incorporating a woodfuel module into these surveys could help national
statisticians to gain better evidence on the socio-economic impacts of woodfuel in a more cost-effective way.

The goal of the project “Developing a Woodfuel Survey Module for Incorporation into Existing Household Surveys in Developing Countries” is to develop a woodfuel module to be integrated in the questionnaire of national household surveys, allowing countries to collect reliable and comparable data on woodfuel production and consumption.

The scope of the project is limited to the informal production and consumption of woodfuel, which mostly occurs at the household level.

The project includes the following activities and outputs:


2. Review of current national surveys that could potentially incorporate the woodfuel module as a supplementary component – Technical Report 2 (Global Strategy 2017a).

3. Development of a Woodfuel Supplementary Module (WSM) and proposal of a methodology on how to include the WSM into existing surveys, with suggestions on data analysis and other relevant issues.

4. Organization of an Expert Group Meeting (EGM) to discuss the WSM and the proposed methodology.²

5. Finalization of the methodological proposal, which includes the inputs of the EGM – Technical Report 3 (Global Strategy 2017b)³ – and organization of a field test in two pilot countries.

6. Implementation of the field tests and writing of two technical reports including the findings of the field tests.

7. Preparation of the final Guidelines on how to incorporate a woodfuel survey module into existing surveys (to be done).

³ The three technical reports are available at: http://gsars.org/en/tag/forestry/
The expected outcome of the project is an improvement in national statistical capacity. This will ultimately benefit policy makers, economic entities and the livelihoods of forest dependent people through improved data availability and quality for evidence-based policies in the forest and agricultural sector. The target audience is the staff of national statistical offices and statisticians in charge of household surveys within national statistical offices of developing countries.

This report describes the outcome of step 6 of the project, i.e. the results of the field test of the WSM implemented in Lesotho in September 2017. Sections are as follows: section 1 describes the main objectives of the field test; in section 2 the main features of the survey module and the manual for enumerators adopted in Lesotho are discussed; the activities implemented in the first week of field work are described in section 3; the methodology of the field test is presented in section 4; section 5, finally, includes the main qualitative results of the field test and some preliminary conclusions.
Main Objectives of the Field Test

“Even after years of experience, no expert can write a perfect questionnaire”

(Sudman & Bradburn, 1982).

“Respondents’ experiences and attitudes are too multitudinous in nature. Survey questions created without thorough testing on members of the population for whom the questionnaire is intended will always miss this complexity”

(De Leeuw et al., 2008).

Testing the questionnaire is a necessary step in every survey design process. It is intended to identify potential problems for both respondents and interviewers with regard to, for example, wording of questions and skip patterns, and to evaluate alternative ways for measuring variables of interest and conducting the interview. The final goal is to find the best way to ask questions and measure variables of interest in order to collect good quality data under a given budget and time constraint.

There exist many different methods for testing a questionnaire, each with its own strengths and weaknesses. They can be roughly grouped in two categories: Pre-field methods and Field methods. In Pre-field methods the interviews are not carried out in the same way as later on in the field. For example, only small part of the questionnaire might be included or additional questions might be added with regard to how the respondent perceive the questions. These methods are generally used at a preliminary stage of the testing process and are generally qualitative in nature, often focusing on single questions rather than on the entire questionnaire. Expert group reviews and cognitive interviews are two examples of this category. Field-test methods aim to evaluate the entire questionnaire under field conditions: the interview is carried out in a way similar to the
subsequent fieldwork with regard to the setting of the interview, its length, and the choice and order of questions, among other things. The test is conducted during the data collection phase, either in conjunction with the actual data collection or in parallel to ongoing surveys. Compared to pre-test methods, field-test methods require a bigger sample size but also allow for quantitative analyses (Brancato et al., 2006).

To test the WSM in Lesotho, both pre-field and field-test methods have been used. The last version of the Long-Basic form— which includes adaptations suggested by the Lesotho Bureau of Statistics during the first week of training – has been pre-tested in a small number of households in the district of Maseru and then field-tested in a sample of 240 households in four districts of the country (see section 4 for a description of the sample).

Before going into the field, the enumerators were provided with a manual containing information on the goal of each question, the way in which questions should be asked and the methodology to be used to weigh woodfuel (see Section 2 and Annex 3). In both the pre-test and the field-test, questions have been asked to respondents through both CAPI and PAPI questionnaires. A more detailed description of the organization of the fieldwork and the methodology adopted is provided in sections 3 and 4.

It is important to note that the overall goal of the test was not to capture statistically significant data at the national or sub-national level, but rather to test the questions of the module and improve its design. Therefore, the sample was not extracted in such a way to be representative at any geographic level.\(^7\)

Quantitative data, however, have been collected and analysed by a data analyst provided by the Lesotho Bureau of Statistics (LBOS) in order to evaluate the questionnaire design, the phrasing of questions, and the methodology adopted to measure specific variables. These results and suggestions – described in Section 5 – will contribute to the development of the final version of the WSM and of the Guidelines on how to incorporate a Woodfuel Supplementary Module into existing surveys.

\(^{4}\) See Section 2 and Annex 1.
\(^{5}\) Computer-Assisted Personal Interview.
\(^{6}\) Paper-and-Pencil Interview.
\(^{7}\) See Section 4 for a more precise description of the methodology of the field test.
The WSM Tested in Lesotho and the Interviewer’s Manual

The WSM tested in Lesotho⁸ is an improved version of the WSM described in Technical Report 3 (Global Strategy 2017b).

First of all, what has been tested is only the long version of the module, which includes all the questions of the short form.

Secondly, while the module included in Technical Report 3 was developed with Microsoft Word, the module tested in Lesotho was developed with Microsoft Visio.⁹

Thirdly, the WSM tested in Lesotho included the suggestions provided by the statisticians of both LBOS and INEC.

Besides Lesotho, the WSM was also tested in Ecuador. In the two field tests, two different versions of the WSM-long were tested: the basic version and the modified version. The differences between the two were the following: while in the basic version – the one tested in Lesotho – quantities of fuelwood and charcoal used by a household were investigated for each single use, in the modified version – the one tested in Ecuador – only the total quantity used was sought; respondents were then asked for which purposes was the declared quantity used. This difference in the questionnaire design will enable us to

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⁸ See annex 1.
⁹ The use of M. Visio was suggested by the officers of the Ecuadorian National Statistical Office (INEC), who developed the Spanish version of the module with this software in the second field test.
understand which of the two options allows to collect more reliable data on quantities.

The other major difference between the basic and the modified versions regarded the reference period: while in the basic version it was a “fixed” period of time – last week for use of woodfuel, last month for collection, production, purchases and sales, and last year for woodfuel shortages – in the modified version respondents were asked about the frequency of use, purchase, collection, etc., with possible answers ranging from “daily” to “yearly”. Quantities reported were then referred to the declared frequency.

A CAPI questionnaire was also developed by an IT specialist of LBOS. The aim of this exercise was to try and understand which type of interview provided better results and required less time. The CAPI questionnaire was administered by enumerators through tablets running on the Android operating system provided by LBOS. A screenshot of its graphic lay-out is included in annex 2. The advantages provided by CAPI interviewing are many-fold. First of all, skip patterns are managed automatically, hence only relevant questions appear on the enumerator’s tablet display. Secondly, it is possible to introduce automatized quality control checks that create pop-up windows in case of inconsistencies between two or more answers provided by the respondents. Enumerators are also allowed to synchronize the tablet with their supervisor’s one when submitting the work done.

As to the interviewer’s manual, its main objective was to help the enumerators to ask questions and record information in the appropriate way. Its flow reflects the flow of questions of the WSM, with a description of the main goals and technical aspects of each section and question of the module. A particular emphasis was put on the description of how to measure woodfuel weight, volume and humidity, and how to record the type of charcoal kilns, which are among the key variables to be collected in this exercise.
The First Week of Fieldwork: Training of Enumerators and Pre-test

The organization of the test was the outcome of the collaboration between the Global Strategy, the FAO Forestry Department, FAO Lesotho and the Lesotho Bureau of Statistics. The allocated budget was provided by the Global Strategy and the FAO Forest Products Statistics team. The allowances for the enumerators, supervisors, drivers, software developer and data analyst were covered by the Global Strategy, while the costs of logistics (cars, venue of the training) and materials (printing of questionnaires, clothing, field bags, communications and measuring tools) were covered by FAO.

The first activity implemented in the field consisted in training the enumerators of LBOS and their supervisors on the main goals and technical aspects of the proposed WSM. The training took place in the capital, Maseru, from Monday 11 September to Wednesday 13 September 2017. Besides the main concepts related with woodfuel consumption and production and the questions of the WSM, the training focused on how to get a precise estimate of the variables under observation, with a particular focus on how to weigh wood and charcoal. The topics covered were the following:

- Background: woodfuel consumption and production at the household level;
- The Global Strategy/FAO project: main goals.

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10 See Annex 6 for the pictures taken during the training and the pre-test.
- Main goals of the field test.
- The WSM – PAPI version: sections and questions; the instructions for enumerators.
- The WSM – CAPI version: how to input the surveyed information into the tablet.
- Data analysis and indicators of woodfuel consumption and production at the household level.
- Mock interviews.

A total of twelve enumerators of the LBOS and the Departments of Forestry and Energy participated in the training and the field test, along with two supervisors and an IT specialist; the latter instructed the participants on the use of tablets and CSPro, the software used for CAPI interviewing. At the end of the training, enumerators received a template to record the main suggestions to improve the WSM based on the pre-test.

Following the training, a number of households were interviewed in the village of Likotsi – in the district of Maseru – on 14-15 September to pre-test the WSM. The goal was to identify potential problems in understanding the questions, in measuring variables of interest, and in the questionnaire design. The research questions underlying this exercise and the following field test were: are questions and technical terms well understood by respondents? Do the response categories of the WSM reflect the country-specific situation (types of cooking stoves, charcoal kilns, fuels and sources of energy, etc.)? Is the equipment provided to enumerators (scales, tablets) suitable for collecting reliable data? Is the proposed method to weigh wood and measure wood moisture feasible? Are there missing components that should be added to the module, or redundant parts that should be removed? Are skip patterns consistent with the flow of questions? What about alternative methods for measuring variables of interest, such as the use of local units of measurement and conversion factors? Do the different recall periods chosen for the variables of interest reflect patterns of production and consumption of woodfuel in Lesotho? How long does it take to complete an interview, and how many households can an enumerator reasonably interview per day? How long does it take to enter the collected data (for PAPI questionnaires) and tabulate the results?

11 Accuracy of translations, however, could not be tested, as both the CAPI and the PAPI questionnaire were written in English and only orally translated in Sesotho.
Suggestions on how to improve the module were obtained during both the training and the pre-test. They were used to develop the final versions of both the WSM used in the field test (see annex 1) and the interviewer’s manual. Some of the main suggestions and changes to the WSM are described below:

a. In order to obtain a precise figure of the number of people consuming fuelwood and charcoal in the recall period (the last week) it is important to take into account some specificities of Lesotho, where some “usual” household members may be absent due to migration, and other “non-usual” household members may have eaten or slept at home. Knowing the exact number of people eating and sleeping at home during the recall period is important to estimate per capita consumption correctly. The design of the roster section was modified accordingly.

b. Respondents might not be aware of the age of non-household members. It was therefore added the answer category “Don’t know” to the question on age of non-household members in the roster.

c. Another type of “Relationship to the household head” to be considered in Lesotho is “herd boy”; it was hence included as response category 8 of question 4 of the roster.

d. Picnics and barbecues should be considered as separate uses of fuelwood and not be included in the “Cooking” category. “Having picnic, barbecue” was therefore listed as a separate use in question 2 of Sections 2.A and 3.A. Among the “cultural and religious uses” of fuelwood, moreover, “Initiation” – a traditional ceremony that involves consumption of fuelwood – was added.12

e. The same bundle of fuelwood can be used for multiple uses. For instance, it can be used first to warm water and then to cook. It was therefore introduced a code (“888”) to be used in question 2 of Section 2.A of the module to identify quantities of wood that undergo multiple uses (see annex 1). In the example mentioned above, should “cooking” be the main use of a bundle, the quantity of wood used will be recorded in the “Cooking” category, while the value to be recorded in the line corresponding to “warming water” would be “888”. Such code will help the data analyst to avoid double counting of that quantity, without losing the information about the multiple use of that bundle.

12 Initiation is a ritual marking the passage into adulthood of boys and girls, typical of Lesotho.
A description of the methodology on how to measure the volume of wood was included in the interviewer’s manual.

Fuelwood may be collected by the members of a household for the members of another household and given to them for free. Therefore, relevant questions were added in section 2.C on fuelwood sales.

The questions on the “type of wood used” and the “type of energy source” for a given stove or heater were changed into multiple choice questions (Sections 4.A and 4.B of the module). The lists of stoves and heaters were also adapted in order to reflect the types available in Lesotho.

The phrasing of the question on health problems incurred by household members was changed in order to make it clearer that the health problems be due to “fuel burning”.

For wood received as in-kind payment or barter, it would be difficult to estimate a usual daily amount. The reference period was therefore changed from “daily” to “monthly”.

The graphic layout of a number of questions was changed as it could lead the enumerators to misunderstandings or mistakes.

Other suggestions provided by the participants in the training that will be considered in the development of the final version of the WSM are the following. It was suggested to delete the questions on the “estimated” weight, as they might generate confusion in the respondent, and to keep only the questions on the actual weight, measured in kg, or volume (in cubic meters). It will also be necessary to add boxes in the paper questionnaire to record the values of diameter and length of logs when volume is measured in place of weight. Finally, in Lesotho it is considered normal by pupils to collect fuelwood on their way back home from school; it was hence suggested to remove “schooling problems” from the list of possible negative consequences of fuelwood collection.
Testing the Module in the Field: Methodology

The field test of the WSM was undertaken by LBOS from Tuesday, 19 September, to Thursday, 28 September 2017 in four – out of ten – districts of Lesotho. A sample of 240 households was extracted from twelve Enumeration Areas (EA) (see Table 1).

In each selected district, three EA were chosen and assigned to three enumerators (one EA per enumerator). The twelve EA were selected with purposive sampling based on the presence of forest reserves and indigenous woodlots: communities surrounding these areas are supposed to be highly dependent on fuelwood. EA have been selected from both urban and rural areas, and from all the four main ecological areas of the country, in order to capture the different situations that can be encountered in Lesotho.

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13 This period marks the end of winter season and the beginning of the summer season: the temperatures tend to be cold and to change rapidly, with significant impact on the use of energy by the households.
14 Given the qualitative nature of the test, the sample was not extracted in a way to be representative of the entire country.
15 As per the 2016 Population and Housing Census, there are 5,776 Enumeration Areas (EA) in Lesotho.
16 The Department of Forestry of Lesotho has forest reserves which are gazetted under the Forest Act of December 1998; there are also indigenous woodlots which are recognized by the Department.
17 Lowlands, Foothills, Mountains and Senqu River Valley.
18 See Annex 4.
Table 1. Sample of Households Selected for the Field Test

<table>
<thead>
<tr>
<th>DISTRICT</th>
<th>EA CODE</th>
<th>TOTAL HOUSEHOLDS</th>
<th>SAMPLE SIZE</th>
<th>ECOLOGICAL ZONE</th>
<th>SETTLEMENT TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LERIBE</td>
<td>02140813040</td>
<td>162</td>
<td>20</td>
<td>Lowland</td>
<td>Rural</td>
</tr>
<tr>
<td></td>
<td>02140813041</td>
<td>122</td>
<td>20</td>
<td>Lowland</td>
<td>Rural</td>
</tr>
<tr>
<td></td>
<td>02140813043</td>
<td>134</td>
<td>20</td>
<td>Lowland</td>
<td>Rural</td>
</tr>
<tr>
<td>MASERU</td>
<td>04460923002</td>
<td>84</td>
<td>20</td>
<td>Foothills</td>
<td>Rural</td>
</tr>
<tr>
<td></td>
<td>04460923003</td>
<td>52</td>
<td>20</td>
<td>Foothills</td>
<td>Rural</td>
</tr>
<tr>
<td></td>
<td>04471031061</td>
<td>73</td>
<td>20</td>
<td>Mountain</td>
<td>Urban</td>
</tr>
<tr>
<td>MAFETENG</td>
<td>05500313014</td>
<td>152</td>
<td>20</td>
<td>Lowland</td>
<td>Rural</td>
</tr>
<tr>
<td></td>
<td>05530613026</td>
<td>154</td>
<td>20</td>
<td>Lowland</td>
<td>Rural</td>
</tr>
<tr>
<td></td>
<td>05530613045</td>
<td>116</td>
<td>20</td>
<td>Lowland</td>
<td>Rural</td>
</tr>
<tr>
<td>QUTHING</td>
<td>07660343001</td>
<td>108</td>
<td>20</td>
<td>Senqu River Valley</td>
<td>Rural</td>
</tr>
<tr>
<td></td>
<td>07660343002</td>
<td>140</td>
<td>20</td>
<td>Senqu River Valley</td>
<td>Rural</td>
</tr>
<tr>
<td></td>
<td>07660343009</td>
<td>177</td>
<td>20</td>
<td>Senqu River Valley</td>
<td>Rural</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,474</td>
<td>240</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The listing of all households pertaining to one EA was performed through a built-in listing form. Twenty households were randomly selected from the list in each EA, for a total of 240 households (220 rural and 20 urban). Half of them received the PAPI questionnaire and the other half the CAPI questionnaire. The paper questionnaire was developed by the consultant of the Global Strategy and printed with the support of FAOLS, while the CAPI questionnaire was developed, based on the PAPI version, by an IT specialist provided by LBOS. One of the aims of the test, in fact, was to compare the time needed for each type of interview and the reliability of results obtained in the two different modalities.

Each enumerator was provided with a tablet, a spring balance, a twine, a shopping bag and a measuring tape. The spring balance was used to weigh the wood used by households, while the twine was used to tie a head-load in preparation for the measurement. Cut pieces of wood were put into the shopping bags in order to take appropriate measurements. The measuring tape, finally, was used to measure the usable area of rooms which are heated. On average, each enumerator interviewed two to three households per day.
Enumerators were also provided with maps of the respective EA, showing their boundaries and the localization of human settlements (see annex 5). Each enumerator was given a unique ID to log on to the CSPro application, and the relevant Enumeration Code was attached to each enumerator’s credentials in the application so as to minimize errors of choosing a wrong EA. Once the data collection phase was completed, each enumerator entered the data of their questionnaires. Two supervisors had to synchronize with the enumerators so as to monitor their work. After synchronizing, each supervisor was responsible for checking the work of the enumerators by undertaking consistency controls, also helped by the data entry program that flagged inconsistencies in the data.

At the end of the survey, data were retrieved from enumerators’ tablets by the IT coordinator and stored on both her computer and the LBOS server for backup. CSPro does not have a database: it uses flat files for storing data. Therefore, after the completion of data entry, the CSPro Export Data Tool was used to export data from a CSPro input data file to tab or comma delimited text files that were imported into several IBM SPSS ® data files.

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19 Each supervisor was supervising the work of six enumerators.
Qualitative Analysis of Results and Main Conclusions

Data collected and entered by enumerators were analyzed by a data analyst provided by the LBOS. After a quality control check operated by the Global Strategy, data were re-entered by another data analyst in two separate SPSS datasets: one with household level\textsuperscript{20} data and one with the information on the household members.\textsuperscript{21}

Although, as discussed before, the sample was not selected to be representative at the national nor at the sub-national level, the collected data provided useful insights about the appropriateness of the woodfuel survey module as a whole and of each of its questions.

First of all, the average duration of both CAPI and PAPI interviews was about 45 minutes, including the time needed for weighing woodfuel. Considering that the WSM is a survey module to be incorporated in existing survey questionnaires - which already include several sets of questions on multiple topics - this duration is exceedingly long. Therefore, a reduced version of the module will most likely be incorporated into survey questionnaires. The long version tested in Lesotho could be considered for a stand-alone woodfuel survey, although for that purpose it should be integrated with additional sections such as – but not limited to – an introduction about the main goals of the interview and a section on the socio-economic characteristics of the household (income, etc.). The final

\textsuperscript{20} For example: total woodfuel consumption, purchases, etc.

\textsuperscript{21} For example: health problems due to fuel burning, members involved in fuelwood collection, etc.
version of the guidelines will include both a long and a short version of the WSM.

As to the intelligibility of questions, this aspect could not be tested in Lesotho – for example: by means of cognitive tests\(^{22}\) – since the module was written in English and only verbally translated into Sesotho by the enumerators. Due to budget and time constraints it was not possible to develop a version of the WSM in Sesotho in collaboration with LBOS. However, verbal translations of questionnaires written in English are a common practice in Lesotho for all types of surveys. During the training, moreover, enumerators conducted mock interviews in Sesotho to come up with a standard translation and get prepared for the interviews in the field. From the analysis of the data collected in the field test, the two questions that generated less reliable answers were those on the amount of time spent to go and collect fuelwood and on health problems due to fuel burning at home.

As to the graphic design of the questionnaire and the flow of questions, the following suggestions were provided by the supervisor of the field test.

First of all, the questions on the “estimated weight” should only be asked when no wood or charcoal are available for an actual measurement, and more precise details should be provided in the manual about how to “estimate” the weight of woodfuel. This is something that was already suggested by the enumerators during the training and that is going be considered in the development of the final version of the WSM to be included in the guidelines.

Another suggestion was to provide more space in the boxes of question 5, section 2.A (see Annex 1) about the quantity of fuelwood, in order to allow the recording of quantities for different types of wood used for a given purpose. Although relevant, this suggestion is not going to be taken into account because in the final version of the WSM only the main type of wood used for a given purposes will likely be asked.

It was advised to split question 2 of Section 5 – on the type of health problems occurred due to fuel burning – into five columns, one per type of problem, to allow a better recording of data. It was also suggested to include the response category ‘Not Applicable’ to question 1 of Section 6 – on the occurrence of

\(^{22}\) Cognitive tests have been undertaken in the other field test implemented in Ecuador.
woodfuel shortages over the last 12 months – and to include ‘None’ as a response category to question 3 of the same section.

As to the problems encountered in asking specific questions, one of the main challenges was to collect data on the quantities of used fuelwood by type of use, as respondents were often unable to clearly estimate the quantities used for each purpose. Another important issue to be addressed is related with the reference period of purchases and, more in general, of acquisition of fuelwood. Bulk purchases proved to be challenging to weigh; moreover, quantities were referred to periods longer than “the last month”. This occurred, for example, in households receiving fuelwood by the chief of the village once a year.

Both the issues will be addressed in the final version of the module, which will be most likely based on the modified version tested in Ecuador. In that version, in particular, quantities are not asked for each single use: total quantity used in a usual day is sought, and the types of uses are asked at a second stage. Reference periods, moreover, are not fixed\(^{23}\) as a question on the frequency (of purchase, of collection, etc.) is asked to respondents and quantities are referred to the reported period, which can assume values between one day and one year.

Weighing wood also proved to be difficult whenever enumerators had to cut wood in smaller pieces prior to the weighing procedure. On the other hand, questions like the one on the total area heated or on the type of cooking stove and heater used did not represent a challenge, due to enumerators’ prior experience in the Lesotho Household Energy Consumption Survey (HCES), which included similar questions.

The suggested timing for conducting the interviews in Lesotho is winter, corresponding to the months of June, July and August, due to the cold climate on mountain areas and the increased use of woodfuel for heating purposes.

Some logistic problems, finally, were encountered during the field test. In particular, due to the late procurement of wood hygrometers, wood humidity could not be measured and the relative question of the module could not be tested. \(^{24}\)

Testing the proposed WSM in Lesotho provided many useful suggestions on how to improve the questions, the flow of the module and the implementation of

\(^{23}\) Last week for use of woodfuel, last month for purchases, acquisition, collection and production, and last year for shortages.

\(^{24}\) This question was tested in Ecuador.
the survey. Whether or not these suggestions will be incorporated in the final version of the module will depend on the results of the other field test conducted in parallel in Ecuador. Some preliminary conclusions, however, can already be drawn.

First of all, based on the results of the test, it is very likely that the final version of the module for incorporation in existing household survey questionnaires will be the short-modified version, i.e. a reduced version of the module tested in Ecuador.

Secondly, the CAPI questionnaire proved to be much more flexible that the PAPI one. Besides the advantage of the much lower amount of time needed to enter data, CAPI questionnaires can also be more easily modified whenever last-minute changes have to be implemented in the module,\(^{25}\) which is a very common situation during a test.

The enumerator’s manual, finally, will have to include more detailed explanations on questions that proved to be difficult to understand, like those on the amount of time spent to go and collect fuelwood and on health problems due to fuel burning at home.

\(^{25}\) The PAPI questionnaire, once printed, cannot be modified unless all the questionnaires are printed again after being modified, with increased costs (and time needed) for the additional printing.
References


## Annex 1

The WSM tested in Lesotho

---

### FIELD TEST – WOODFUEL SURVEY MODULE

#### A. GEOGRAPHICAL LOCATION

<table>
<thead>
<tr>
<th>Location</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowland</td>
<td></td>
</tr>
<tr>
<td>Foothill</td>
<td></td>
</tr>
<tr>
<td>Mountain</td>
<td></td>
</tr>
<tr>
<td>Senqu River Valley</td>
<td></td>
</tr>
</tbody>
</table>

#### B. SETTLEMENT TYPE

<table>
<thead>
<tr>
<th>Type</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Area</td>
<td></td>
</tr>
<tr>
<td>Rural Area</td>
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</table>

#### C. HOUSEHOLD INFORMATION

<table>
<thead>
<tr>
<th>Field</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of household head</td>
<td></td>
</tr>
<tr>
<td>Name of respondent</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Number of children</td>
<td></td>
</tr>
<tr>
<td>Household number</td>
<td></td>
</tr>
<tr>
<td>Starting time day 1</td>
<td></td>
</tr>
<tr>
<td>Starting time day 2</td>
<td></td>
</tr>
</tbody>
</table>

#### B. RESPONSIBLE STAFF

<table>
<thead>
<tr>
<th>Role</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
</tbody>
</table>

#### B. IDENTIFICATION AND LOCATION OF THE DWELLING

<table>
<thead>
<tr>
<th>Field</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Village number and name</td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td></td>
</tr>
</tbody>
</table>

Version 1. Long Basic
## SECTION 1: HOUSEHOLD ROSTER - FOR ALL HOUSEHOLD MEMBERS

<table>
<thead>
<tr>
<th>CODE</th>
<th>1</th>
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<th>3</th>
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<th>5</th>
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<td>8</td>
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</tr>
</tbody>
</table>

**NON HOUSEHOLD MEMBERS**

<table>
<thead>
<tr>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SECTION 2. FUELWOOD

#### 2A. FUELWOOD USE

1. In the last week, did you or any member of your household use fuelwood for any domestic, agricultural, commercial, cultural or religious purposes?

   - YES ....... 1
   - NO ....... 2
   - Skip to Question 8

2. In the last week, did your household use fuelwood for:

   - YES ..... 1
   - GO TO Q. 3
   - NO ..... 2
   - NEXT ITEM

3. In how many days?

4. For (. Activity.) did your household use:

   - YES ....... 1
   - GO TO Q. 3
   - NO ..... 2

5. What was the usual daily amount of (. Activity.) used by the household for (. Activity.)?

   - YES ....... 1
   - GO TO Q. 3
   - NO ..... 2

---

### A. ESTIMATED WEIGHT

**Enumerators:**
- Observe and record the type(s) of wood used for each use.
- Ask the respondent to estimate the weight of the utilized type of fuelwood (record the unit).
- Multiply the number of bundles by the quantity in each bundle (by the number of bundles).

### B. MEASURED WEIGHT

**Enumerators:**
- Weigh fuelwood according to the proposed methodology.

---

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Cooking at home?</td>
</tr>
<tr>
<td>02</td>
<td>Having bonfire, barbecues (Brazil)?</td>
</tr>
<tr>
<td>03</td>
<td>Space heating?</td>
</tr>
<tr>
<td>04</td>
<td>Other domestic uses, such as lighting, warming water for bathing, baking, ironing, and smoking against insects?</td>
</tr>
<tr>
<td>05</td>
<td>Agricultural uses, such as roasting coffee, curing tobacco, preparing feed for animals, heating greenhouses, poultry houses or lime houses, or drying tea, herbs or cassava?</td>
</tr>
<tr>
<td>06</td>
<td>Commercial uses, such as baking bread, smoking fish, brewing alcoholic beverages, vending street food, heating lodges, running industrial workshops or micro-industries?</td>
</tr>
<tr>
<td>07</td>
<td>Cultural or religious uses, such as ceremonies, incense burning, or other religious rituals and cultural traditions?</td>
</tr>
</tbody>
</table>

---

### CODE

- **01**: Cooking at home?
- **02**: Having bonfire, barbecues (Brazil)?
- **03**: Space heating?
- **04**: Other domestic uses, such as lighting, warming water for bathing, baking, ironing, and smoking against insects?
- **05**: Agricultural uses, such as roasting coffee, curing tobacco, preparing feed for animals, heating greenhouses, poultry houses or lime houses, or drying tea, herbs or cassava?
- **06**: Commercial uses, such as baking bread, smoking fish, brewing alcoholic beverages, vending street food, heating lodges, running industrial workshops or micro-industries?
- **07**: Cultural or religious uses, such as ceremonies, incense burning, or other religious rituals and cultural traditions?

---

### NOTES

6. If the answer to Q. 4 was 1, 2 or 4:
   - Which type of tree was mainly used? (Use the local name of the tree)

   - Measure the humidity of fuelwood, if the answer to Q. 4 was 1, 2 or 4.
   - The two metallic tips of the provided hygrometer must be inserted into the wood.

7. Record the value of wood humidity as shown on the display of the hygrometer:

   - [ ] %
### SECTION 2. FUELWOOD

#### 2B1. FUELWOOD ACQUISITION

8. In the last month, did you or any member of your household purchase fuelwood, excluding wood to produce charcoal?

- YES 1
- NO 2

9. How many days?

10. In how many days?

11. What was the usual daily amount of (Q10) purchased by the household?

12. What was the total monthly expenditure on fuelwood?

<table>
<thead>
<tr>
<th>CODE</th>
<th>01</th>
<th>Wood from forests, forest plantations, tree crops (direct wood)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>Wood chips, sawdust, other industrial and artisanal by-products (indirect wood)?</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Full vs. briquettes</td>
<td></td>
</tr>
</tbody>
</table>

13. In the last month, did you or any member of your household acquire fuelwood, excluding wood to produce charcoal, by:

- YES 1
- NO 2

14. In how many days?

15. What was the total quantity acquired by your household in the last month?

<table>
<thead>
<tr>
<th>CODE</th>
<th>01</th>
<th>Payment in kind?</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>Barter?</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Gift?</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Other (________________)</td>
<td></td>
</tr>
</tbody>
</table>

#### NOTES

---

30
**2B. FUELWOOD COLLECTION**

15. In the last month, did you or any member of the household cut or collect fuelwood, excluding wood to produce charcoal?  
**YES** 1  
**NO** 2

16. Did you cut or collect:  
**YES** 1  
**NO** 2

17. In how many days?  

18. What was the usual daily amount of cut or collected by all household members, in total?  

<table>
<thead>
<tr>
<th>Code</th>
<th>Quantity</th>
<th>Unit</th>
<th>No. of bundles/f菩stree</th>
<th>Kg per bundle/f Barker</th>
<th>Total (Kg or M³)</th>
</tr>
</thead>
</table>

- **A. ESTIMATED WEIGHT**
  - Enumerator: Ask the respondent to estimate the weight of the fuelwood cut or collected (record the unit).
- **B. MEASURED WEIGHT**
  - Enumerator: Weigh fuelwood according to the proposed methodology.

19. Did you collect fuelwood in:  
- Natural forest?  
- Forest plantation?  
- Bush, river banks, other wild systems?  
- Own farm or yard?  
- Other agricultural land?  
- Urban area, village area, roadside?  
- Construction sites, dumps?  
- Other (Specify)?

20. How long does it take to:  
- Go from your house to the main collecting area?  
- Cut or collect fuelwood?  
- Code of the main collecting area:  

21. Code of the main collecting area:

22. Which household members were involved in fuelwood collection?  
- Yes 1  
- No 2

23. Did fuelwood collection have any of the following negative consequences on:  
- Health, injuries?  
- Assaults, violence?  
- Missed school days?  
- Other (Specify)?

24. In the last month, did you or any member of your household sell fuelwood?  
**YES** 1  
**NO** 2

25. What was the total quantity sold by your household in the last month?  

<table>
<thead>
<tr>
<th>Code</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
</table>

- **A. ESTIMATED WEIGHT**
  - 1. Urban households  
- **B. MEASURED WEIGHT**
  - 1. Rural households  

26. Did your household sell fuelwood to:  
**YES** 1  
**NO** 2

27. What was the total income derived by your household from fuelwood sales in the last month?  

<table>
<thead>
<tr>
<th>Maloti</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

28. In the last month, did you or any member of your household sell fuelwood for:  
- Fix or repair household for other household for initiation, etc?  
**YES** 1  
**NO** 2

- **A. ESTIMATED WEIGHT**  
- **B. MEASURED WEIGHT**  

29. Go to Section 3
### SECTION 3. CHARCOAL

#### 3A. CHARCOAL USE

1. In the last month, did you or any member of your household use charcoal for any domestic, agricultural, commercial, cultural or religious purposes?
   - YES... 1
   - NO..... 2 — Skip to Question 5

2. In the last month, did your household use charcoal for:
   - YES ..... 1 — Go to Q. 3
   - NO...... 2

3. In how many days?

4. What was the usual daily amount of charcoal used by your household for (Activity)?

   **How to weigh charcoal?**
   - Fill a sack with the actual quantity of charcoal used for each activity and weigh it with the provided scale.
   - If quantities are bigger than the capacity of one sack, ask the respondent to estimate the number of sacks like the one weighed, then quantify the total quantity in kg by multiplying the measured weight by the total number of sacks.

#### A. ESTIMATED WEIGHT

<table>
<thead>
<tr>
<th>CODE</th>
<th>Activity Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Cooking at home?</td>
</tr>
<tr>
<td>02</td>
<td>Having picnics, barbecues (beef)?</td>
</tr>
<tr>
<td>03</td>
<td>Space heating?</td>
</tr>
<tr>
<td>04</td>
<td>Other domestic uses, such as lighting, warming water for bathing, laundering, ironing, and smoking against insects?</td>
</tr>
<tr>
<td>05</td>
<td>Agricultural uses, such as roasting coffee, curing tobacco, preparing feed for animals, heating greenhouses, poultry houses or smoke-houses, or drying tea, herbs or cassava?</td>
</tr>
<tr>
<td>06</td>
<td>Commercial uses, such as baking bread, smoking fish, brewing alcoholic beverages, vending street food, heating lodges, running medicinal workshops or more industries?</td>
</tr>
<tr>
<td>07</td>
<td>Cultural or religious uses, such as cremations, incense burning, or other religious rituals and cultural traditions?</td>
</tr>
</tbody>
</table>

#### B. MEASURED WEIGHT

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Unit</th>
<th>No. of sacks</th>
<th>Kg per sack</th>
<th>Total (Kg)</th>
</tr>
</thead>
</table>

- 2.2 Pounds = 1 Kilogram

### NOTES
## SECTION 3. CHARCOAL

### 3B1. CHARCOAL ACQUISITION

5. In the last month, did you or any member of your household purchase charcoal?
   - YES .... 1
   - NO .... 2
   
   Skip to Q. 9

6. In how many days?

7. What was the usual daily amount of charcoal purchased by the household?
   - A. ESTIMATED WEIGHT
     - Quantity
     - Unit
     - No. of sacks
     - Kg per sack
     - Total (Kg)
   - B. MEASURED WEIGHT
     - Lot

8. What was the total monthly expenditure on charcoal?

9. In the last month, did you or any member of your household acquire charcoal by any other means?
   - YES .... 1
   - NO .... 2
   
   Skip to Q. 12

10. In how many days?

11. What was the usual daily amount of charcoal obtained by your household?
   - A. ESTIMATED WEIGHT
     - Enumerator: Ask the respondent to estimate the weight of the acquired charcoal (record the unit)
     - Quantity
     - Unit
     - No. of sacks
     - Kg per sack
     - Total (Kg)
   - B. MEASURED WEIGHT
     - Enumerator: Weigh charcoal according to the proposed methodology

12. In the last month, did you or any member of your household produce charcoal on your own account?
   - YES .... 1
   - NO .... 2
   
   Skip to Q. 21

13. In the last month, how many days did your household spend producing charcoal?
   - A. ESTIMATED WEIGHT
     - No. of days
   - B. MEASURED WEIGHT
     - Unit
     - No. of sacks
     - Kg per sack
     - Total (Kg)

14. What was the total quantity produced?

### 3B2. CHARCOAL PRODUCTION

15. The wood used to produce charcoal was:
   1. Cut by a household member?
   2. Purchased or otherwise acquired?
   3. Burn? Skip to Q. 17

16. Where is the wood used to produce charcoal mainly cut?
   - Natural Forests
   - Plantation Forests
   - Other

17. What is the type of tree mainly used to produce charcoal? (Use local names of trees)
### SECTION 3. CHARCOAL

#### 3B2. CHARCOAL PRODUCTION

18. Which household members were involved in charcoal production?

<table>
<thead>
<tr>
<th>Member code</th>
<th>At least one record if the household produced charcoal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19. Did charcoal production have any of the following negative consequences on (Fig. 18)?

<table>
<thead>
<tr>
<th>Code</th>
<th>Specify</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>1</td>
</tr>
<tr>
<td>NO</td>
<td>2</td>
</tr>
<tr>
<td>N/A</td>
<td>3</td>
</tr>
</tbody>
</table>

#### 20. What type of kiln was used to produce charcoal?

1. Earth pit
2. Earth mound
3. Cessation
4. Other traditional kiln
5. Brick kiln
6. Swail kiln
7. Portable steel kiln
8. Other improved kiln

#### 3C. CHARCOAL SALES

21. In the last month, did you or any member of your household sell charcoal?

YES ..... 1
NO ..... 2

Go to Section 4

22. What was the total quantity sold by your household in the last month?

- No. of sacks
- Kg per sack
- Total (Kg)

23. What was the total income derived by your household from charcoal sales in the last month?

Lotti

24. Did your household sell charcoal to:

<table>
<thead>
<tr>
<th>Code</th>
<th>Specify</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>1</td>
</tr>
<tr>
<td>NO</td>
<td>2</td>
</tr>
</tbody>
</table>

1. Urban households
2. Rural households
3. Industrial plants
4. Commercial activities
5. Charcoal producers
6. Transporters, Wholesalers
7. Retailers
8. Other (Specify)
SECTION 4.A COOKING

1. Which of the following types of stoves does your household use for cooking? [Select all that apply]

   - YES ... 1
   - NO ... 2

   No cooking at home = 777

   Go to Q. 2
   Next Item
   Skip to Q. 6

2. What is the utilized fuel or source of energy? [Multiple choice for a single type of stove is allowed]

   - Electricity ............... 1
   - Solar pane ............... 2
   - LPG ..................... 3
   - Biogas ................. 4
   - Gasoline/Diesel .......... 5
   - Kerosene/Petrol ........ 6
   - Coal, lignite ........... 7
   - Charcoal ............... 8
   - Firewood (including pellets, briquettes, wood chips, sawdust) ....... 9
   - Peat, briquettes .......... 10
   - Wood chips, sawdust ......... 11
   - Crop waste, sludge, straw .... 12
   - Animal waste, dung ........ 13
   - Garbage, plastic .......... 14
   - Other (Specify) ........... 15

   Fuel type: ____________

3. Where is the stove located? [Multiple choice for a single type of stove is allowed]

   - Indoor, in a dedicated kitchen .... 1
   - Indoor, in a room used also for sleeping .... 2
   - Indoor, in the living area ......... 3
   - In a separate building .......... 4
   - Outdoor .................................. 5

4. Are there windows, exhaust hoods, fans or chimneys in the cooking place?

   - YES ... 1
   - NO ... 2

5. Which of the selected stoves is used most of the times?

   RECORD THE STOVE CODE, ACCORDING TO Q.1

   CODE

   01 Electric stove
   02 Induction stove
   03 Gas stove
   04 Other improved stove
   05 Traditional/Homemade stove
   06 Fireplace
   07 Open fire
   08 Other, specify

   Enumerator:

   If the respondent selected more than one type of stove, ask also Question 5.
   If only one stove was selected, record the corresponding code in the box of Question 5.
### SECCIÓN 4.B. HEATING

8. What does your household use to heat home when needed? Select all that apply.

- **YES** .... 1
- **NO** .... 2

**CODE**

No space heating = 777

**Skip to Section 5**

**7. What is the utilized fuel or source of energy? (multiple choice for a single type of stove is allowed)**

- **Electricity** ..................................... 1
- **Solar panel** ..................................... 2
- **UFG** ............................................. 3
- **Bogas** ........................................ 4
- **Gasoline/Diesel** .................................. 5
- **Kerosene/Petrol** .................................. 6
- **Coal, Lignite** .................................... 7
- **Charcoal** ....................................... 8
- **Wood/wood charcoal, firewood** ................. 9
- **Pellets, briquettes** ............................. 10
- **Wood chips, sawdust** ......................... 11
- **Crop waste, olives, grass, straw** ............... 12
- **Animal waste, dung** .......................... 13
- **Garbage, plastic** .............................. 14
- **Other (Specify)** .................................. 15

8. Where is the [... Q. 7 ...] located? (multiple choice for a single type of stove is allowed)

- **Indoor, in a dedicated room** ................. 1
- **Indoor, in a room used also for sleeping** .... 2
- **Indoor, in the living area** ..................... 3
- **In a separate building** ....................... 4
- **Outdoor** ........................................ 5

9. Are these windows, extractor hood, fans or chimneys?

- **YES** .... 1
- **NO** .... 2

10. How many square meters of floor are usually heated?

   **Square meters**

   | 1 | 2 | 3 |

   **Enumerator:** Use the provided measuring tape to measure the floor area.

   **Enumerator:** If the respondent selected more than one type of heater, ask also Question 11.

   **Enumerator:** If only one heater was selected, record the corresponding code in the box of Question 11.

11. Which of the selected appliances is used for most of the time?

   **RECORD THE CODE, ACCORDING TO Q.6**
### SECTION 5. HEALTH PROBLEMS

1. In the last month, did any member of your household suffer from headaches, nausea, skin or eye irritation, difficulty breathing, asthma, burns or other injuries due to fuel burning?  

   - **YES** 1  
   - **NO** 2  

   → Record names of affected people  
   → GO TO SECTION 6

2. Which of the following health problems did (...Q.1...) suffer from? (multiple choice is allowed)
   - Headaches or nausea? A
   - Skin or eye irritation? B
   - Difficulty breathing, asthma? C
   - Burns? D
   - Other injuries? (Specify) E

3. Which of the following activities were performed when health problems arose? (multiple choice is allowed)
   - Cooking? A
   - Space heating? B
   - Lighting? C
   - Other domestic tasks? (Specify) D
   - Commercial activities? E
   - Other activities (Specify) F
   - Don’t know/Don’t remember G

<table>
<thead>
<tr>
<th>CODE</th>
<th>NAME</th>
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<tbody>
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### 6. WOOD ENERGY SECURITY

1. In the last 12 months, has your household experienced fuelwood or charcoal shortages?

   - **YES** 1
   - **NO** 2

   → End of survey

2. In which months? (select months and record the year on the dots)
   - January  
   - February  
   - March  
   - April  
   - May  
   - June  
   - July  
   - August  
   - September  
   - October  
   - November  
   - December

3. Which of the following activities were affected by such shortages?
   - Yes 1
   - No 2

   - Cooking?  
   - Space heating?  
   - Other domestic tasks?  
   - Agricultural activities?  
   - Commercial activities?  
   - Cultural/religious uses?
<table>
<thead>
<tr>
<th>OUTCOME OF THE INTERVIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Complete (effective)</td>
</tr>
<tr>
<td>2. Partial</td>
</tr>
<tr>
<td>3. Rejected</td>
</tr>
<tr>
<td>4. Nobody at home</td>
</tr>
<tr>
<td>5. Temporary dwelling</td>
</tr>
<tr>
<td>6. Empty dwelling</td>
</tr>
<tr>
<td>7. Dwelling under construction</td>
</tr>
<tr>
<td>8. Inhabitable or destroyed dwelling</td>
</tr>
<tr>
<td>9. Dwelling converted into business</td>
</tr>
<tr>
<td>10. Other, specify</td>
</tr>
</tbody>
</table>

| Missing Sections: _______________________ |

<table>
<thead>
<tr>
<th>OBSERVATIONS</th>
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</table>
Annex 2

A screenshot of the CAPI questionnaire
Annex 3

The Interviewer’s Manual

Woodfuel Supplementary Module

Long Basic, PAPI version

INTERVIEWING MANUAL

Rev. 4 - September 2017
1. Purpose of the module

Fuelwood and charcoal – collectively named as “woodfuel”26 - play an important role as source of energy in many countries in the world. More than two billion people rely on woodfuel as the main source of fuel for cooking (FAO 2014), especially in rural areas. Ensuring access to affordable, reliable, sustainable and modern energy is one of the main goal of the 2030 Agenda for Sustainable Development. Woodfuel is also an important source of income and employment for rural households. Additionally, there is a significant gender aspect and important social implications associated with woodfuel production and consumption. Women and children generally spend hours a day on collecting fuelwood for domestic use, which could be used on other activities for fulfilling and improving their socioeconomic well-beings. Furthermore, women and children are most likely to suffer from smokes and emissions (e.g. respiratory diseases) from inefficient burning of wood with primitive stoves in unventilated kitchens.

The Woodfuel Supplementary Module (WSM) is designed to collect information on the consumption and acquisition of woodfuel - and the related socioeconomic and health implications - by the household sector. The final goal is to gather internationally comparable data through a set of standard questions to be included in existing household surveys.

2. Design of the WSM

The Woodfuel Supplementary Module – Long Basic version – comprises six sections: Fuelwood, Charcoal, Household fuel combustion, Health, and Wood energy security, besides an initial section on household characteristics. The first two sections are divided into three sub-sections: consumption, acquisition/production, and sales. Each sub-section is opened by a filter question

26 According to the Unified Bio-Energy Terminology (UBET) woodfuels are a sub-category of biofuels, which in turn constitute a sub-category of renewable energy sources. Bio-fuels comprise Woodfuel, Agro-fuels and municipal by-products (See ftp://ftp.fao.org/docrep/fao/007/j4504e/j4504e00.pdf). As to woodfuels, this category includes solid, liquid and gaseous products. To the aims of this study, only solid woodfuels (fuelwood and charcoal) are considered, while black liquor, pyrolytic oil and other liquid and gaseous products are not taken into account. Fuelwood includes: i) wood in the rough; ii) chips; iii) sawdust; and iv) pellets. Based on the source of wood, fuelwood can also be divided into direct wood (from forests and non-forest land), indirect wood (from wood industry) and recovered wood (from society).
with a “Yes/No” answer. A negative answer will trigger a skip pattern to the next section.

The short form is similar to the long form, with just a lower number of questions. The current instructions follow the structure of the long form of the module. The numbering of questions is therefore different from that adopted in the short form.

3. Conducting the interview

Some background information about the survey should be provided at the beginning of the interview. The module has been developed by the Global Strategy for improving Agricultural and Rural Statistics\textsuperscript{27} in collaboration with the Forestry Department of the Food and Agriculture Organization of the United Nations (FAO). The data collected will help to understand the patterns of consumption and production of woodfuel at the household level in a country, in order to develop policies of sustainable management of forests, forest plantations and to evaluate the socio-economic conditions of households related with household fuel combustion.

An important aspect to be considered in order to collect reliable data is the selection of the right respondent. The person to be interviewed should be the most knowledgeable person of the household with regard to consumption and acquisition/production of woodfuel. This person may be the main cook, or the responsible person for woodfuel purchases, or the adult responsible for collecting fuelwood or producing charcoal. In case two people are identified (say: one for consumption and one for acquisition/production) both should be ideally interviewed; each of them will be asked the questions of the relevant section of the module (say, consumption to the main cook, and production to the collector/producer of woodfuel).

Questions must be asked exactly as worded; changing words or phrases, or adding/dropping words to a question must be avoided. Also, unless in presence of a skip pattern, a question must always be asked, even when the answer is obvious to the interviewer: filling the answer without asking the question must be avoided at any time.

At the end of sections 2.A, 2.B1 and 3.A there is some space for notes. Also at the end of the questionnaire there is an “Observations” section. Record in those sections all the problems that might have occurred during the interview process, like – for example – problems in measuring variables of interest, or problems

\textsuperscript{27} www.gsars.org
faced by respondents in understanding questions. Always record the question number (and the relative section) that originated the problem.

**COVER PAGE (LESOTHO)**

After reading aloud the confidentiality statement, the enumerator should fill in **Box A. Geographical Location**, using the following codes:

- **District**: record the 2-digit code of the district under which the village is administered, according to the list provided:

<table>
<thead>
<tr>
<th>Code</th>
<th>District</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Botha-Bothe</td>
</tr>
<tr>
<td>02</td>
<td>Leribe</td>
</tr>
<tr>
<td>03</td>
<td>Berea</td>
</tr>
<tr>
<td>04</td>
<td>Maseru</td>
</tr>
<tr>
<td>05</td>
<td>Mafeteng</td>
</tr>
<tr>
<td>06</td>
<td>Mohale’sHoek</td>
</tr>
<tr>
<td>07</td>
<td>Quthing</td>
</tr>
<tr>
<td>08</td>
<td>Qacha’s Nek</td>
</tr>
<tr>
<td>09</td>
<td>Mokhotlong</td>
</tr>
<tr>
<td>10</td>
<td>Thaba-Tseka</td>
</tr>
</tbody>
</table>

- **Constituency**: record here the constituency number under which the recorded village falls (See Annex 1).

- **Local Community Council**: record the number of the local community council under which the village falls (See Annex 1).

- **Ecological Zone**: record the code of the ecological zone under which the village falls:

<table>
<thead>
<tr>
<th>Code</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lowland</td>
</tr>
<tr>
<td>2</td>
<td>Foothill</td>
</tr>
<tr>
<td>3</td>
<td>Mountain</td>
</tr>
<tr>
<td>4</td>
<td>Senqu River Valley</td>
</tr>
</tbody>
</table>

- **Settlement type**: Record here whether the area is Urban, Peri-Urban or Rural. Your supervisor will make this known to you. Write code 1 for urban, code 2 for peri-urban and code 3 for rural, in the appropriate box.
• Ward: code of the ward under which the village falls. A ward number is a number assigned to an administrative division of the country allocated for the principal chief.

<table>
<thead>
<tr>
<th>CODE</th>
<th>WARD</th>
<th>CODE</th>
<th>WARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Botha-Bothe</td>
<td>13</td>
<td>Tebang</td>
</tr>
<tr>
<td>2</td>
<td>Makhoakhoeng</td>
<td>14</td>
<td>Likhoele</td>
</tr>
<tr>
<td>3</td>
<td>Leribe</td>
<td>15</td>
<td>Tajane le Pontseng</td>
</tr>
<tr>
<td>4</td>
<td>Tsikoane, Peka le Kolobere</td>
<td>16</td>
<td>Matelile</td>
</tr>
<tr>
<td>5</td>
<td>Mamathe le ThupaKubu</td>
<td>17</td>
<td>Phamong</td>
</tr>
<tr>
<td>6</td>
<td>Kueneng le Mapoteng</td>
<td>18</td>
<td>Taung</td>
</tr>
<tr>
<td>7</td>
<td>Maqhaka</td>
<td>19</td>
<td>Likoeng</td>
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<tr>
<td>8</td>
<td>Thaba-Bosiu le Ratau</td>
<td>20</td>
<td>Thaba-Tsoeu</td>
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<tr>
<td>9</td>
<td>Matsieng</td>
<td>21</td>
<td>Sebapala</td>
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<tr>
<td>10</td>
<td>Rothe, Kolo le Thaba-Tseka</td>
<td>22</td>
<td>Qacha’s Nek</td>
</tr>
<tr>
<td>11</td>
<td>Kubake le Ramabanta</td>
<td>23</td>
<td>Mokhotlong</td>
</tr>
<tr>
<td>12</td>
<td>Maama</td>
<td>24</td>
<td>Tlokoeng</td>
</tr>
</tbody>
</table>

• Household number: 3-digit code, starting from 001 (corresponding to the first household interviewed), which uniquely identifies a household within an enumeration area.

• EA code: Record in the appropriate space the code of the Enumeration Area (EA) to which you will be assigned by the office. The EA Code is an 11-digit code made of the following components:

- First 2 digits: District code;
- 3rd and 4th digit: Constituency code;
- 5th and 6th digit: Community council code;
- 7th digit: Ecological zone
- 8th digit: Settlement type
- Last 3 digits: EA number (starting from “001”).
Box B. Identification and location of the dwelling

- Village number and name: write the number of the village in the boxes, and the village name in the following space.
  - Record all the names by which the village is known, beginning with the one which appears more permanent than the others. For example, if a village is called after the name of the present headman, such a name is not very permanent because it may die with that headman. So try to find out if there are other names of a permanent nature.
  - Be careful about the villages that share a common area name. An example of this phenomenon will be found in the villages surrounding Qeme Plateau. Such villages should be clearly distinguished from one another by local names, e.g. Qeme Ha Mantsebo, Qeme Ha Mpo, Qeme Ha Ramorakane etc. If it is a town, write the name of the township e.g. Ha Hoohlo Maseru, Lisemeng in Hlotse and Mampoboleng in Moyeni.

Box C. Household information

- Name of the household head: record the name of the head of the household.
- Name of respondent: the person who will respond to the questions, preferably the person most acknowledgeable about woodfuel consumption and production.
- Report in the blue box the date of the interview and the time when interview started. If the interview had to be suspended and continued in another day, record the starting time of the two separate parts of the interview.

Box D. Responsible staff

Write the names and codes of the enumerator and the supervisor.

SECTION 1 – HOUSEHOLD ROSTER

Starting with the household head, record the names, last names, sex, age (in years) and relationship to the household head of each usual member of the household. Codes for sex (1 = male, 2 = female) and relationship to the household head are provided in the questionnaire. A person is considered to be a usual member of the household if (s)he usually eats and sleeps in the house.
However, it may be possible that members of the household did not eat or sleep at home during the reference period of the main variables; if not accounted for, these absences might bias the value per caput of variables of interest. Columns 5 and 6 of Section 1 take into account this possibility. On the other hand, some people who are not usual members of the household (for example: herd boys, neighbors, etc.) might have eaten or slept at home in the reference period. Additional lines are therefore included at the bottom of Section 1 to take into account these people.\textsuperscript{28} In case the age of non-household members is unknown, record 999.

\textbf{SECTION 2A. FUELWOOD USE}

\textbf{Q.1:} In the last week, did you or any member of your household use fuelwood for any domestic, agricultural, commercial, cultural or religious purpose? (Y/N)

This filter question allows for a Yes/No answer. In case of negative answer, go to Section 2B, question 8. Otherwise, ask Q. 2.

\textbf{Q.2} In the last week, did your household use fuelwood for: Cooking at home? (Y/N); Having picnic, barbecue (braai)? (Y/N); Space heating? (Y/N); Other domestic uses (…)? (Y/N); Agricultural uses (…)? (Y/N); Commercial uses (…)? (Y/N); Cultural or religious uses (…)? (Y/N).

Ask one use at time. If the answer to that particular use – for example, cooking – is “Yes”, ask the following questions and fill the boxes related to that particular use (number of days, type of wood used, etc.). If the answer is “No”, ask the following use – for example, heating. Repeat the exercise for all the possible uses. For domestic, agricultural, commercial, religious and cultural uses it is important to read the entire question, explaining the different types of uses that fall into those categories.

\textsuperscript{28} Let’s suppose, for example, that the number of usual members of a household is 5 (the head, the spouse and three children) and that, during the last week, two of them were absent (the head was abroad to work, and a son was out of town to study). The number of usual household members who ate and slept at home in the last week is therefore equal to 3. Let’s suppose now that in the same household a herd boy ate and slept at home in the last week. The total number of people who ate and slept at home in the last week is therefore equal to 4. If total consumption of fuelwood in the last week was – for example – 5 kg, this means that the consumption per caput was 1.25 kg. If we divided the total quantity by the number of usual members of the household, we would have obtained a value of 1 kg per person, which is a biased estimate of the consumption per person in that household.
Q.3: In how many days?

Indicate – for those uses with a Yes answer to Q.2 - the number of days (1 to 7) fuelwood was used in the last week. To avoid confusion, the previous week is to be considered from Monday to Sunday for all the questions. A 0 value is not allowed, as the answer to Q.2 was “Yes”.

Q.4: For (...Activity...) did your household use:

In asking the question, substitute the words “Cooking”, “Heating” etc. for the word “Activity” that lies in parentheses (For instance: “For other domestic purposes, did your household use:”). Write the code corresponding to the type(s) of wood used in the line of the activity under observation (for example: number 1 in the third line means that split stems/branches are used for heating). More than one type of fuelwood can be chosen for each type of use.

It is important to ask the respondent to show the type of wood used for a given purpose, to facilitate the enumerator to select the right code. If wood is not available at home, rely on the respondent’s reply. Below are some images about the different types of wood:

1. Split stems and branches
2. Brushwood
2. Twigs
3. Wood chips
3. Sawdust
4. Used, recovered, wood
5. Pellets
6. Briquettes
IMPORTANT: shrubs are to be considered fuelwood, provided they are made of wooden parts and are not herbaceous. Quantities of non-wood crop residues (such as: maize) or plants (such as aloe) should NOT be considered in this section, as they are not woodfuel (although they are biofuel).

Q.5 What was the usual daily amount of (Q.4) used by the household for (Activity)?

Let’s suppose we are investigating the use of fuelwood for commercial activities, and that the answer to question 4 is “Sawdust”. Question 5 will then be asked as follows: “What was the usual daily amount of sawdust used by the household for commercial activities?”.

The respondent will provide a double answer to this question. The first answer will be an estimation of the quantity of fuelwood consumed in a usual day, expressed in a unit of measurement chosen by him/her, without measuring actual quantities of wood (for example: 3 “loads”). Both the number and the unit of measurement will be reported by the enumerator in the corresponding boxes.

Then, the respondent will have to weigh the actual quantity of fuelwood usually consumed in one day. So, even if the reference period of question 2 is “one week”, the quantity to be weighed is referred to one usual day of that week. It is important to note that “Usual daily amount” should not be confused with “average daily amount”. For instance, if fuelwood is consumed for cooking only two days per week, and the quantity usually consumed in a day is 3 kg, then the quantity to be reported is 3 kg. The “average” quantity would be instead: 3*2/7 = 0.857 kg per day.

29 The same procedure will be adopted also for the other questions on quantities of woodfuel.
For weighing fuelwood, adopt the following procedure. For the first reported use (say: cooking) the respondent is asked to form a bundle (or to fill a sack, in case of pellets, briquettes or other improved fuelwood) representing the typical quantity used in one day for that particular use. The enumerator will tie it with a string and weigh it with the provided spring scale. Final quantity will be reported in kg. In case the quantity is too big to form a single bundle, weigh a smaller bundle and report the number of bundles necessary to come up with total quantity. The final quantity of wood will be expressed in kg (for instance: 3 bundles of 1.5 kg each = 4.5 kg). Quantities of fuelwood used for following purposes (heating, etc.) will be reported in terms of number of bundles like the one just weighed, allowing for decimals (e.g.: 2.5), hence fuelwood has to be weighed only once. If the same amount of wood is used for two different purposes (say: boiling water and cooking), record 888 for the second use, to avoid double accounting. To get precise values of the weight of a bundle, finally, the spring balance should be calibrated at the beginning of each day of the survey using a reference weight (e.g.: 1 kg).

In some cases, fuelwood – although commonly used by the household – might not be available at home at the time of the interview. In those cases, the weight estimated in local units of measurement will be the only recorded value. Conversion factors to convert those units into standard units should be sought, either through interviews to local experts\(^\text{30}\)/community leaders, or referring to existing literature\(^\text{31}\), or comparing the answers of those respondents who used the same non-standard unit and weighed wood. Otherwise, provided fuelwood is available in the surroundings of the dwelling and the interviewee is willing to do it, the usual daily amount of wood can be collected at the end of the interview.

\(^{30}\) For instance: transporters of wood may provide an estimate of how many kg or tons there are in a “truck” of wood, depending on the type of truck.

\(^{31}\) See for instance the World Bank publication: The use of non-standard units for the collection of food quantities.
IMPORTANT: if the estimated quantity and the measured (weighed) quantity do not correspond, the enumerator should NOT change the value of the first estimate.

In some cases, the size of a log is so big that cannot be lifted and weighed with the scale. In that case, an estimate of the volume, expressed in cubic meter, should be recorded. There are several ways to estimate the volume of a log. The one proposed here makes use of the Huber’s formula:

\[ V = \left\{ \left[ \frac{(d_1 + d_2)}{2} \right]^2 \times \frac{3.1416}{4} \right\} \times L \]

Where \( d_1 \) and \( d_2 \) are the two diameters at the mid-log, expressed in meters; 3.1416 is the approximate value of \( \pi \); and \( L \) is the length of the log (in meters).

For example, if \( d_1 = 21 \) cm = 0.21 m, \( d_2 = 25 \) cm = 0.25 m and \( L = 3 \) m, the volume would be \( V = 0.125 \) m\(^3\).

The diameter can be measured by using a caliper, like the one depicted in Figure 3. It is important that diameters be expressed in meters to have values expressed in cubic meters; should they be reported in cm, the final value should be divided by 10,000.

The reason why we take the average diameter \( \left[ \frac{(d_1 + d_2)}{2} \right] \) is that the section of a log is not a perfect circle, hence using only one value of diameter may lead to either an over- or an underestimation of the volume of the log. An alternative way to obtain the average diameter is to measure the circumference in the mid-log and then divide that value by \( \pi \). To this aim, there exist on the market specific “diameter tapes” that provide directly the measure of diameter when measuring the circumference. Another way to estimate the volume of a log is by using the Smalian formula, which requires the measurement of four (rather than two) diameters, i.e. 2 diameters at each end of the log, besides the length of the log.
If the volume of a standing tree should be measured, the height of tree (rather than the length of the log) should be measured with a height gauge.

Since there is not a specific space for recording the values of diameters in the PAPI version of the WSM, enumerators are required to write those values in the “Notes” Section at the bottom of page 2 and to calculate the Volume by applying the suggested formula. Once the volume and the tree species (see Q. 6) are known, the density coefficient corresponding to the specific tree is multiplied by the volume to obtain the final value of the weight. In the previous example (V = 0.125 m$^3$), should the tree species be “Wattle”, an average density coefficient of 0.75 could be used$^{32}$, leading to a weight of 0.125*0.75 = 0.09375 t = 93.75 kg.

IMPORTANT: always record the unit of measurement (m$^3$ or kg) to prevent mistakes in the subsequent step of data analysis.

Q.6: Which type of tree was mainly used? (Use the local name of the tree)

This question is to be asked only if the answer to Q. 4 was 1, 2 or 4, that is to say for the following answer categories: Split stems and branches; twigs, brushwood, shrubs; used and recovered wood. Knowing the tree species used as fuelwood is important under many points of view. First of all, in order to estimate the water content of wood with the hygrometer (see Q.7) - and hence its energy content - it is necessary to know the plant species. Secondly, knowing the tree species is necessary to estimate the weight of a log (see Q. 5) because each type of wood is characterized by a given value of specific weight. In addition, each type of wood is characterized by a given level of toxicity when burnt – which is higher for some species and lower for other. Finally, knowing which are the main species used in a given area may shed some light on the ecological consequences of wood cutting on the local ecosystem.

The only way to uniquely identify a plant species is by its scientific name, albeit this is often unknown to the vast majority of respondents. Several local names, however, may correspond to the same scientific name of a plant, even within the same region. Respondents will be asked to provide the local name of trees, which will be subsequently “translated” into the respective scientific names by the enumerator or the supervisor, based either on own-knowledge or on information obtained by key-informants (foresters, botanists, etc.). If the respondent does not know the tree species, leave blank.

$^{32}$ Based on information available at: http://www.worldagroforestry.org/treesandmarkets/wood/
Q.7: [Enumerator: measure the humidity of fuelwood, if the answer to Q. 4 was 1, 2 or 4] Record the value of wood humidity as shown on the display of the hygrometer.

The energy content of wood is heavily affected by its water content, which can be measured by means of electronic hygrometers that measure the intensity of an electric field in the wood. The latter also depends on the density of wood and hence on the wood species, which should be known in order to get a precise estimate of wood moisture.

The energy content of wood is heavily affected by its water content, which can be measured by means of electronic hygrometers that measure the intensity of an electric field in the wood. The latter also depends on the density of wood and hence on the wood species, which should be known in order to get a precise estimate of wood moisture.

There are several brands of hygrometers available on the market. Their functioning is simple: two metallic tips should be inserted into the wood; the wood species should be selected from a list, and the value of humidity will appear on the display.
Calorific value is defined as the amount of energy per unit mass or volume released on complete combustion (See: Wood Fuels Handbook, p. 11-16). The moisture content of wood changes the calorific value of the latter by lowering it. Indeed, part of the energy released during the combustion process is spent in water evaporation and is consequently not available for any desired thermal use. It is therefore possible to distinguish between the following Gross calorific value (or Higher Heating Value, HHV), and Net calorific value (or Lower Heating Value, LHV). The latter is determined by subtracting the heat of vaporization of the water from the Higher Heating Value. The net calorific value (NCV₀) of oven-dry wood of different species varies within a very narrow interval, from 18.5 to 19 MJ (Mega Joule) per Kg³³. In conifers it is 2 percent higher than in broad-leaved trees, due to the higher lignin content³⁴, and partly also to the higher resin, wax and oil content present in conifers.

The most decisive factor for a high energy yield is water content followed by wood type. For small heating systems (for heating private houses or apartments) the wood fuel should not have more than 25 percent water content. If wood has higher water content then the temperatures fall below the ideal range, which leads to increased smoke formation, higher emissions and damage to the chimney (See: Wood Fuels Handbook, p. 12). During seasoning, a 10 percent decrease in moisture entails an approximate 0.6 kWh (or 2.16 MJ) per kg increase in energy content.

Table 1: Calorific value of wood depending on water content

<table>
<thead>
<tr>
<th>Condition of wood</th>
<th>Water content (M)</th>
<th>Calorific Value (H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh timber</td>
<td>50-60%</td>
<td>2.0 kWh per kg</td>
</tr>
<tr>
<td>Timber stored for a summer</td>
<td>25-35%</td>
<td>3.4 kWh per kg</td>
</tr>
<tr>
<td>Timber stored several years</td>
<td>15-25%</td>
<td>4.0 kWh per kg</td>
</tr>
</tbody>
</table>


³³ However, when taking into account agricultural biofuels as well, the anhydrous calorific value varies within a 16.5 to 19 MJ per Kg interval. The anhydrous calorific value of wood fuels is on average 9 percent higher than that of herbaceous plants.

³⁴ Compared to cellulose and hemicellulose, lignin has a higher energy content.
Table 2: Average values used for wood fuels.

<table>
<thead>
<tr>
<th>NCV</th>
<th>Type of fuel</th>
<th>Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCV₀ = 18.5 MJ/kg = 5.1 kWh/kg</td>
<td>Oven-dry wood</td>
<td>M 0%</td>
</tr>
<tr>
<td>NCV₁₀ = 17.0 MJ/kg = 4.7 kWh/kg</td>
<td>Pellets</td>
<td>M 10%</td>
</tr>
<tr>
<td>NCV₂₀ = 14.4 MJ/kg = 4.0 kWh/kg</td>
<td>Firewood</td>
<td>M 20%</td>
</tr>
<tr>
<td>NCV₃₀ = 12.2 MJ/kg = 3.4 kWh/kg</td>
<td>Wood chips</td>
<td>M 30%</td>
</tr>
</tbody>
</table>


Water evaporation involves the ‘consumption’ of 2.44 MJ per kg of water. To calculate the caloric value (MJ per kg) of wood with specific water content (w), the following formula can be used:

\[ H_i = \frac{H_{i0} \times (100 - w) - 2.44 \times w}{100} \]

with \( H_{i0} \) varying from 18.5 to 19.0 MJ/kg (depending on the wood species) and \( w \) = water content (measured with the hygrometer).

S2B₁. FUELWOOD ACQUISITION

Q.8: In the last month, did you or any member of your household purchase fuelwood, excluding wood to produce charcoal?

This filter question allows for a Yes/No answer. In case of negative answer, go to question 13, otherwise, ask Q. 9. IMPORTANT: the reference period for this question is the last month, intended as the last “solar” month. If, for example, the survey is undertaken in mid-October, “last month” stands for 1 to 30 September. Wood purchased to produce charcoal should not be accounted in this section of the module, but in Section 3B₂ (Charcoal Production)

Q.9: Which type of fuelwood did you purchase?

The respondent indicates the type of fuelwood purchased according to the following categories: i) wood from forests, plantations or agricultural tree crops (Direct wood); ii) wood chips, sawdust, other industrial and artisanal by-products (Indirect wood); iii) Pellets, briquettes, other improved fuelwood. All
the three items should be asked by the enumerator, following the same procedure adopted for Q. 2: if the answer is Yes, ask the following questions (number of days, etc.); if it is No, go the next item.

The aim of this question is to distinguish wood that is directly removed from forests (direct wood) from wood obtained from the industrial and artisanal sector (indirect wood) and from society (used and recovered wood), in order to avoid the overestimation of wood removals from forests and get a more precise estimate of the impact of wood consumption on the ecosystem. An example of indirect wood is the by-product of wood carving activities (production of masks and other handicrafts) or of the production of djembes.

Q.10: In how many days?

Indicate the number of days (1 to 31) fuelwood was purchased in the previous month. A zero value is not allowed, as the answer to question 8 was “Yes”.

Q.11: What was the usual daily amount of (Q.9) purchased by the household?

If wood was already weighed in the “Use” Section, purchased quantities should be expressed in terms of number of bundles like the one weighed before, allowing for decimal values and fractions (e.g.: 2.5; one third, etc.). If wood was not weighed before, follow the procedure described for question 5. Both estimated and actual weight should be asked and recorded.

In case of bulk purchases (say: one single purchase of wood that cover the consumption of the entire year) it will not be possible to measure the total weight. Quantities of wood can therefore be expressed in stacked volume (in cubic meters) and then converted into solid volume\textsuperscript{35} using a conversion factor of 1.4 – for 1-meter firewood - or a factor of 2 - for chopped firewood. If the stock is available at home at the time of the interview, the stacked volume can be measured with a measuring tape.

\textsuperscript{35} While the stacked volume is the total volume of stacked material, including the space between the material pieces, solid volume does not take into account the volume of voids. See Wood fuels handbook, p. 4 and 5.
Otherwise, the volume of purchased wood should be converted into number of bundles, and a representative bundle should be weighed. Quantities expressed in solid volume will then be converted into kg following the procedure described in Question 5.

Q.12: What was the total monthly expenditure on fuelwood?

Indicate the total amount of money – expressed in local currency – spent on fuelwood by the household over the entire month. IMPORTANT: in this case is the total expenditure over one month that should be reported, not the expenditure in a usual day.

Q.13: In the last month, did you or any member of the household acquire fuelwood, excluding wood to produce charcoal, by: 01. Payment in kind? (Y/N); 02. Barter? (Y/N); 03. Gift? (Y/N); 04. Other? (Y/N).

This question investigates the acquisition of fuelwood by the household in ways other than purchase or collection. Payment in kind: when wood is received as payment for a job done. Barter: when it is received in exchange for another good. Gift: if it is received for free.

NOTE: it is possible that a household used fuelwood in the last week even if they did not acquire or collect fuelwood in the last month, as they may have used wood collected or otherwise acquired in a previous period. Accordingly, it is not wrong to have data in section 2.A and no data in section 2.B.

Q.14: In how many days?

Indicate the number of days (1 to 31) fuelwood was acquired in the previous month. A zero value is not allowed, as the answer to question 13 was “Yes”.

Q.15: What was the usual daily amount of fuelwood acquired by your household?

Both estimated weight and real weight should be collected. Follow the same procedure as the one described for Q. 11.
S2B2. FUELWOOD COLLECTION

Q.16: In the last month, did you or any member of your household cut or collect fuelwood, excluding wood to produce charcoal?

Filter question: the possible answers are Yes or No. A “No” answer will determine a skip pattern to the next section (Fuelwood Sales), question 24. As for Q. 8, “last month” stands for the last solar month (February, August, etc.). Wood cut to produce charcoal should not be accounted in this section of the module, but in Section 3B2 (Charcoal Production).

Q.17: In how many days?

Indicate the number of days (1 to 31) fuelwood was cut or collected in the previous month. A zero value is not allowed, as the answer to Q.16 was “Yes”.

Q.18: Did you collect: 1. Deadwood, twigs, brushwood, shrubs? (Y/N) Branches, stems, trees? (Y/N) Used or recovered wood? (Y/N)

This question should be asked in the same way as questions 2, 9 and 13: each answer category should be read, with a possible answer of Yes/No. If the answer is Yes, the following questions are asked (estimated and measured weight). If it is no, go to the next item.

Q.19: What was the usual daily amount of (Q.18) cut or collected by all the household members, in total?

First of all, it is important that the right respondent for this question (e.g.: the adult responsible for fuelwood collection) has been selected. Secondly, the amount to be reported is total amount collected by all the household members in a usual day. If wood was already weighed in one of the previous sections, quantities of cut or collected wood should be expressed in terms of number of bundles like the one weighed before, allowing for decimal values and fractions (e.g.: 2.5; one third, etc.). If wood was not weighed before, follow the procedure described for question Q.5. Always record both estimated and actual weight. In case entire stems or trees have been cut, it is preferable to measure the volume of the tree, rather than its weight. The value will therefore be expressed in cubic meters, specifying the unit (see Q.5).
Q.20: Did you collect fuelwood in: Natural forests? (Y/N); Forest plantation? (Y/N); Bush, river banks, other wild system? (Y/N); Own farm or yard? (Y/N); Other agricultural land? (Y/N); Urban area, village area, roadside? (Y/N); Construction sites, dumps? (Y/N); Other? (Y/N).

To precisely estimate the amount of wood removed from forests, it is necessary to know the origin of cut or collected wood. Not all the collected wood comes from forests: some of it may be obtained from the agricultural sector (pruning; cut trees), some from the industrial sector, and some from trees outside forests or shrubs. Finally, used and recovered wood can be obtained from dumps or construction sites. This is a multiple-choice question: respondents should select all the sources of cut/collected wood.

Q.21: How long does it take to:

Q.21.1 Go from your house to the main collecting area and back

Indicate the time needed to get to the main collection area in hours and minutes.

Q.21.2 Cut or collect fuelwood?

Indicate the time needed to cut or collect fuelwood in hours and minutes.

Time devoted to fuelwood collection is one of the most important variables to be surveyed: this amount of time may be subtracted to other activities such as school – for children – or a more remunerative job activity - for adults.

Q.21.3 Code of the main collecting area: If only one location was selected in answering question 20, record the same code for question 21.3 (e.g.: “4” for own farm or yard). If wood was cut or collected in more than one location, respondent should indicate the main collecting area, and the corresponding code should be recorded in question 21.3.

Q.22: Which household members were involved in fuelwood collection?

Specifying the household members involved in fuelwood collection is important to evaluate the socio-economic aspects of such activities, such as the time devoted to fuelwood collection by age class and gender, and the differential impacts of fuelwood collection on safety and health of women and children. All the household members involved in such activity in the last month should be listed by the respondent. Use the codes of the household roster in section 1.

IMPORTANT: since the answer to the filter question was “Yes”, there should be at least 1 record for question 22. In case some people who are not usual
members of the household - nor they ate or slept at home in the last week – helped the household to collect fuelwood, they should not be listed in this section, as they were not included in the household roster (Section 1). On the contrary, if some household members helped other households to collect fuelwood, they should be listed in Q. 22. The quantity collected for other people will then be recorded in Q. 28 (Section 2.C).

Q. 23: Did fuelwood collection have any of the following negative consequences on [Q.22]?

For the household members involved in fuelwood collection, answer questions 23.a to 23.e about the negative consequence(s) of fuelwood collection (such as: missed school days or injuries). Possible answers are “Yes” (code 1), “No” (code 2) and “N/A” (Not applicable, code 3). For instance, if a household member does not attend school, the answer to questions 23.c and 23.d will be 3 (N/A). In case “Other” negative consequences are mentioned by the respondent (Q. 23.e), specify the type of negative consequence that affected a given household member.

S2c. FUELWOOD SALES AND FUELWOOD GIVEN FOR FREE

Q. 24: In the last month, did you or any member of your household sell fuelwood?

Filter question: the possible answers are Yes (Code 1) or No (Code 2). A “No” answer will determine a skip pattern to question 28.

Q. 25: What was the total quantity sold by your household in the last month?

The quantity to be reported is the total quantity of fuelwood sold by the household over the entire month. If wood was already weighed in one of the previous sections, quantities sold should be expressed in terms of number of bundles (or logs) like the one weighed before, allowing for decimal values and fractions (e.g.: 2.5; one third, etc.). If wood was not weighed before, follow the procedure described for question Q.5. Remember to record both estimated and actual weight, and to specify whether the unit of measurement is kg or m³.
Q.26: Did your household sell fuelwood to: 1. Urban households? (Y/N); 2. Rural households? (Y/N); 3. Industrial plants? (Y/N); 4. Commercial activities? (Y/N); 5. Charcoal producers? (Y/N); Transporters, whole sellers? (Y/N); Retailers? (Y/N); Others? (Y/N).

This question aims to investigate the value chain of fuelwood, the presence of middlemen and the final destination of produced fuelwood. A Yes answer is coded with 1, a No with 2. This is a multiple choice question: all the buyers of fuelwood should be indicated by the respondent.

Q.27: What was the total income derived by your household from fuelwood sales in the last month?

Record the total amount of money derived by all the household members from sales of fuelwood over the entire month, in local currency.

Q.28: In the last month, did you or any member of your household give fuelwood for free? (for example: to another household, for initiation, etc.)

The possible answers are Yes (Code 1) or No (Code 2). A “No” answer will determine a skip pattern to Section 3. If the answer is Yes, record the estimated and the measured weight following the procedure already discussed.

S3A. CHARCOAL USE

Q.1: In the last week, did you or any member of your household use charcoal for any domestic, agricultural, commercial, cultural or religious purposes? (Y/N)

This filter question allows for a Yes/No answer. In case of negative answer, go to Section 3.B, question 5.

Q.2: In the last week, did your household use charcoal for: Cooking at home? (Y/N); Having picnic, barbecue (braai)? (Y/N); Space heating? (Y/N); Other domestic uses? (Y/N); Agricultural uses? (Y/N); Commercial uses? (Y/N); Cultural/religious uses? (Y/N).

(See Q.2 of S.2A).
Q.3: In how many days?
(See Q.3 of S.2A).

Q.4: What was the usual daily amount of charcoal used by your household for (Activity)?

The methodology to be adopted to weigh charcoal is analogous to the one described for fuelwood (see Q.5 of S.2A). The main difference consists in that, rather than forming a bundle, respondents will have to fill a sack (or a shopping bag) and weigh it with the spring scale. In case charcoal is not available at home, ask for the number of sacks consumed and the weight of each sack. Both estimated and actual weight should be asked and recorded.

S3B1. CHARCOAL ACQUISITION

Q.5: In the last month, did you or any member of your household purchase charcoal?

This filter question allows for a Yes/No answer. In case of negative answer, go to question 9, otherwise, ask Q. 6. As for fuelwood, the previous month is to be considered the last calendar month (e.g.: March, August, etc.).

Q.6: In how many days?

Indicate the number of days (1 to 31) charcoal was purchased in the previous month. A 0 value is not allowed, as the answer to question 5 was “Yes”.

Q.7: What was the usual daily amount of charcoal purchased by the household?

If charcoal was already weighed in the “Use” Section (Q. 4), purchased quantities should be expressed in terms of number of sacks like the one weighed before, allowing for decimal values and fractions (e.g.: 2.5; one third, etc.). If charcoal was not weighed before, follow the procedure described for question 4. Both estimated and actual weight should be asked and recorded.
In case of bulk purchases, ask for the number of sacks purchased and the weight of each sack (for instance: 10 sacks of 20 kg each, for a total of 200 kg).

Q.8: What was the total monthly expenditure on charcoal?

Indicate the total amount of money – expressed in local currency – spent on charcoal by the household over the entire month. IMPORTANT: in this case what should be reported is NOT the expenditure in a usual day, but the total expenditure over the entire month.

Q.9: In the last month, did you or any member of your household acquire charcoal by: 1. Payment in-kind? (Y/N); 2. Barter? (Y/N); 3. Gift? (Y/N); 4. Other? (Y/N).

This question investigates the acquisition of charcoal by the household in ways other than purchase or collection. Payment in kind: when charcoal is received as payment for a job done. Barter: when it is received in exchange for another good. Gift: if it is received for free.

NOTE: it is possible that a household used charcoal in the last week even if they did not acquire or produce charcoal in the last month, as they may have used charcoal produced or otherwise acquired in a previous period. Accordingly, it is not wrong to have data in section 3.A and no data in section 3.B.

Q.10: In how many days?

Indicate the number of days (1 to 31) charcoal was acquired in the previous month. A 0 value is not allowed, as the answer to question 9 was “Yes”.

Q.11: What was the usual daily amount of charcoal obtained by your household?

Both estimated weight and real weight should be collected. Follow the same procedure as the one described for Q. 7.
S3B2. CHARCOAL PRODUCTION

Q.12: In the last month, did you or any member of your household produce charcoal on your own account?

Filter question: the possible answers are Yes or No. A “No” answer will determine a skip pattern to the next section (Charcoal Sales), Q. 21. If a household member worked for a firm producing charcoal, the correct answer is “No” and hence this section should be skipped.

Q.13: In the last month, how many days did your household spend producing charcoal? This includes: Going from home to the main charcoal production area and back; Acquiring and transporting wood; Preparing the kiln; Burning wood and discharging charcoal.

Record the number of days (1 to 31) dedicated to all the steps of charcoal production by household members in the last month. To avoid confusion, the previous month is to be considered the entire calendar month (e.g.: August). A 0 value is not allowed, as the answer to Q. 12 was “Yes”.

Q.14: What was the total quantity produced?

Like for fuelwood collection, it is important to select the right respondent for this question (e.g.: the adult responsible for charcoal production). The amount to be reported is the total amount of charcoal produced by all the household members in the last month. If charcoal was already weighed in one of the previous sections, quantities should be expressed in terms of number of sacks like the one weighed before, allowing for decimal values or fractions (e.g.: 2.5; one third, etc.). If it was not weighed before, follow the procedure described for question Q.4. It is important to survey both estimated and actual quantity.

Q.15: The wood used to produce charcoal was: Cut by a household member? (Y/N); Acquired? (Y/N); Both? (Y/N).

The aim of this question is to investigate the charcoal value chain. In case the wood used to produce charcoal is not cut by any household member, questions 16 (on the source of wood) should not be asked.
Q.16: Where is the wood used to produce charcoal mainly cut?

As opposed to the analogous question on the source of collected fuelwood, only three options are listed for charcoal production: Natural forests, Forest plantations and Other.

Q.17: What is the type of tree mainly used to produce charcoal? (Use local names of plants)

This variable is needed to estimate the conversion factor of wood biomass into charcoal. The only way to uniquely identify a plant species is by its scientific name, although this is often unknown to the vast majority of respondents. Several local names may correspond to the same scientific name of a plant, even within the same region. Respondents will be asked to provide the local name of trees, which will be subsequently “translated” into the respective scientific names by the enumerator, based on own knowledge or on information obtained through local experts.

Q.18: Which household members were involved in charcoal production?

Specifying the household members involved in charcoal production is important to evaluate the socio-economic aspects of such activities, such as the time devoted to charcoal production by age class and gender, and impacts of charcoal production on members’ safety and health. All the household members involved in such activity in the last month should be listed by the respondent, including those who helped other households to produce charcoal. Use the codes of the household roster in section 1. IMPORTANT: since the answer to the filter question was “Yes”, there should be at least 1 record for question 18.

Q.19: Did charcoal production have any of the following negative consequences on [Q.18]?

(See Q.23, Section 2B2).
Q.20: What type of kiln was used to produce charcoal?

The type of kiln used is the most important parameter – along with the wood species used to produce charcoal – in estimating the efficiency of conversion of wood biomass into charcoal (expressed in terms of kg of wood burnt to produce 1 kg of charcoal). While the efficiency of traditional kilns is very low – causing serious environmental problems of deforestation in areas where production of charcoal is substantial – that of modern, improved kilns is much higher. The main types of kilns are: Earth pit; Earth mound; Brick kilns; Steel kilns. Casamance is an improved type of earth mound kiln (with a chimney), while an improved version of steel kiln is the Portable Adam Retort. Pictures on a flash card (or on tablet, for CAPI interviews) should be provided to respondents in order to identify the category of kiln used to produce charcoal. Also, it is important that the interviewer take pictures of the kiln, to allow for subsequent checks and to build an archive of kilns used in the country. If possible, enumerators should also take notes (in the box at the end of the module) to provide additional information about the kiln.

Figure 10. Earth pit (1)  
Figure 11. Earth pit (2)  
Figure 12. Earth mound  
Figure 13. Casamance kiln
S3c. CHARCOAL SALES

Q.21: In the last month, did you or any member of your household sell charcoal?

Filter question: the possible answers are Yes (Code 1) or No (Code 2). A “No” answer will determine a skip pattern to the next section (Cooking). For “last month” is intended the last calendar month (May, November, etc.).

Q.22: What was the total quantity sold by your household in the last month?

The quantity to be reported is the total quantity of charcoal sold by the household over the entire month. If charcoal was already weighed in one of the previous sections, quantities sold should be expressed in terms of number of sacks like the one weighed before, allowing for decimal values and fractions (e.g.: 2.5; one third, etc.). If it was not weighed before, follow the procedure described for question 4 of this section. Record both estimated and actual weight, and specify whether the unit of measurement is kg or m³.
Q.23: What was the total income derived by your household from charcoal sales in the last month?

Record the total amount of money derived by all the household members from sales of charcoal over the entire month, in local currency.

Q.24: Did your household sell charcoal to: Urban households? (Y/N); Rural households? (Y/N); Industrial plants? (Y/N); Commercial activities? (Y/N); Charcoal producers? (Y/N); Transporters, wholesalers? (Y/N); Retailers? (Y/N); Other (Specify)? (Y/N).

This question aims to investigate the value chain of charcoal, the presence of middlemen and the final destination of the produced charcoal. This is a multiple choice question, hence all the buyers of charcoal (not just the main one) should be indicated by the respondent.

S4A. COOKING

Q.1: Which of the following types of stove does your household use for cooking? Select all that apply.

Respondents have to mention all the stoves used by the household for cooking, even those that are only rarely used. For example, the second stove can be one used only during weekends for preparing specific foods (or for barbecuing), or can be the second-best option to use when the main stove is unavailable (say: for lack of electricity, gas, etc.). The type of stove used is one of the most important parameters in estimating the efficiency of biomass combustion (or of energy use).

While the efficiency of traditional stoves is very low – which increases both the consumption of biomass and the time needed for its collection, and causes high levels of indoor air pollution – the efficiency of modern, improved stoves is much higher. The main types of stoves are: induction stoves, other electric stoves, gas stoves, other improved (manufactured) stoves, traditional/homemade\textsuperscript{36} stoves, and open fire. Pictures on a flash card (or on the tablet, in case of CAPI interview) should be provided to respondents in order to

\textsuperscript{36} Built by household members or other people with materials available in place.
identify the category of stove(s) used to cook. Such pictures should reflect the main types of stove used in a given country. To distinguish between traditional and manufactured solid fuel stoves, see: http://catalog.cleancookstoves.org/stoves

Q.2: What is the utilized fuel or source of energy?


IMPORTANT: for a given type of stove, more than one type of fuel can be selected (for example: open fire can have fuelwood and dung as fuels).

Q.3: Where is the stove located?

The location of the stove is an important factor to be considered when analyzing indoor air pollution. Low-efficiency stoves cause the emission of pollutants that may negatively affect the health of household members - especially of those who spent higher amount of time cooking. Such effects can be much higher in absence of ventilation. There are five possible answer categories to this question: 1. Indoor, in a dedicated kitchen. 2. Indoor, in a room used also for sleeping; 3. Indoor, in the living area; 4. In a separate building; 5. Outdoor.

IMPORTANT: what should be recorded is the location of the stove (i.e.: of the source of emissions), not of the kitchen. For a given type of stove, more than one location can be selected (for instance: open fire can be indoor or outdoor, depending on the climatic conditions).
Q.4: Are there windows, extractor hoods, fans or chimneys in the cooking place? (Y/N)

Absence of windows, extractors hoods, chimneys, fans or other ventilation systems causes an increase in concentration of indoor air pollutants. Record 1 for “Yes” and 2 for “No”. If the location is outdoor, record “Yes” when in presence of a chimney or any other device that prevents smoke to re-enter the house from the door or the windows.

Q.5: Which of the selected stoves is used most of the times?

Respondent should indicate the stove used the most of time to cook. Knowing the main stove of the household is necessary to understand the energy/fuel consumption patterns of a household (for example: low consumption of woodfuel because the stove used for most of the time is an electric stove). The main stove is the stove that is used most of the times. The code to be reported is the corresponding stove code of question 1.

S4b. HEATING

Q.6: What does your household use to heat home when needed? Select all that apply.

Indicate all the heaters/heating systems used by the household. The second heater can be the second-best option to be adopted when the main heating system is unavailable (say: for lack of electricity, gas, etc.), or the heater used in a separate building (in case the dwelling is made up of two separate buildings).

The main types of heating systems are: 1. Centralized heating system (for urban households); 2. Air conditioner; 3. Electric heater; 4. Gas heater; 5. Paraffin heater; 6. Traditional/homemade space heater; 7. Cookstove 1; 8. Cookstove 2; 9. Fireplace; 10. Open fire; 11. Other (Specify). It is important to notice that code 7 or 8 should be selected in case the same stove used for cooking is also the main heating system of the household (double-use of the same device).

Pictures on a flash card should be provided to respondents in order to identify the category of heater(s) used to heat space. Such pictures should reflect the main types of heaters used in a given country. It is also important that the interviewer take pictures of the heater(s) used by the respondents, to allow for subsequent checks and to build an archive of heaters used in the country.
Q.7: What is the utilized fuel or source of energy?
(See Q.2 of Section 4A, “Cooking”).

Q.8: Where is the (Q.6) located?

The location of the heater is an important factor to be considered when analyzing indoor air pollution. Low-efficiency heaters cause the emission of pollutants that may negatively affect the health of household members - especially of those who spent higher amount of time indoor. Such effects can be much higher in absence of ventilation. There are five possible answer categories to this question: 1. Indoor, in a dedicated room. 2. Indoor, in a room used also for sleeping; 3. Indoor, in the living area; 4. In a separate building; 5. Outdoor. IMPORTANT: what should be recorded is the location of the source of emissions.

Q.9.: Are there windows, extractor hoods, fans or chimneys?
(See Q.4 of Section 4A, “Cooking”).

Q.10: How many square meters of floor area are usually heated?

This question aims at estimating the efficiency of energy use to the aims of space heating, in terms of fuel consumption per square meter. Using the provided tape, the enumerator should measure the floor area of the space being heated by the household’s heating system.

Q.11: Which of the selected appliances is used for the most time?

Similarly to the cookstove, the main heating system is identified in terms of the amount of time of its use. The code to be reported is the corresponding code of question 6.
S5. HEALTH PROBLEMS

Q.1: In the last month, did any member of your household suffer from headaches, nausea, skin or eye irritations, difficulty breathing, asthma, burns or other injuries due to fuel burning?

List the household members who suffered from health problems due to fuel burning, specifying the type of health problem occurred by answering Yes or No in the relevant boxes of Q.2. Use the same code as in the roster.

Q.2: Did (...Q.1...) suffer from: headaches or nausea? (Y/N); skin or eye irritations? (Y/N); difficulty breathing, asthma? (Y/N); burns? (Y/N); other injuries? (Y/N).

Indicate the health problems in which the selected household members incurred in the last month while at home. Since it is difficult for respondent to identify household fuel combustion as the cause of health problem, this question only asks whether they suffered from any of the listed problems “while at home”.

Q.3: Which of the following activities were performed when health problems arose? Cooking? (Y/N); Space heating? (Y/N); Lighting? (Y/N); Other domestic tasks? (Y/N); Commercial activities? (Y/N); Other activities (_________)? Don’t know/don’t remember.

Indicate the activity(ies) performed when health problems occurred for each affected household member. This is a “select all that apply” type of answer.

S6. WOOD ENERGY SECURITY

Q.1: In the last 12 months, has your household experienced fuelwood or charcoal shortages?

For households heavily depending on woodfuel for basic activities such as cooking or heating space, the occurrence of woodfuel shortages may impact their livelihoods and even their food security. The last three questions of the woodfuel module investigate whether such shortages occurred and, if so, in which period of the year and the affected activity(ies). Question 1 is a filter question; in case of a negative answer, the interview terminates here. In this section, “last 12 months” does not correspond to the last calendar year (say: 2016) but to the 12 months prior to the interview. For example, if the interview is conducted in mid-October, the last 12 months goes from October of the previous year to 30 September of the same year.
Q.2: In which month(s)? (Select the months and record the year on the dots)

Select all the months in which woodfuel was not available during the last 12 months. Specify the year. Tick the box(es) of the month(s) when shortages occurred, and indicate the year (2016 or 2017) on the dots.

Q.3: Which of the following activities were affected by such shortages?
Cooking? (Y/N); Space heating? (Y/N); Other domestic tasks? (Y/N); Agricultural activities? (Y/N); Commercial activities? (Y/N); Cultural/Religious uses? (Y/N)

Select all the activities that were negatively affected by woodfuel shortages.

**Box E.**

Record the time when the interview finishes, in order to calculate the duration of the interview (in minutes). If the interview was suspended and completed in a following day, record the two ending times.

Record also the phone number(s) of the interviewee, in case it will be necessary to retrieve some piece of information.

**Box F. Outcome of the interview**

Record the code corresponding to the outcome of the interview.

1: if the interview was complete in all parts.
2: if it was possible only a partial interview (Specify which sections are missing).
3 to 9: the interview could not take place for the following reasons:

- **Rejected**: people refused to be interviewed;
- **Nobody at home**: the house is inhabited, but there was nobody at home when the interviewers arrived;
- **Temporary dwelling**: the house is inhabited only in a given period/season of the year, which does not correspond to the period of the interview;
- **Empty dwelling**: the house is uninhabited;
- **Dwelling under construction**;
- **Other (Specify)**.
### ANNEX 1. Codes of Rural Constituencies and their Community Councils

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## Codes of Urban Constituencies and their Urban Councils

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Annex 4

Location of the selected Enumeration Areas

Legend:
- Districts
- EAs
Annex 5

Map of an Enumeration Area
Annex 6

Pictures of the pre-test and the field test

1. The training of enumerators at Khali Hotel, Maseru

2. Pre-testing the module in the village of Likotsi
3. Pre–test: Weighing Fuelwood

4. Paola: one of the most common "traditional" stoves in the surveyed areas

5. Field test: filling the paper questionnaire