



Food and Agriculture  
Organization of the  
United Nations

# **Safe Access to Fuel and Energy (SAFE) Toolbox**

**Woodfuel Assessment  
in Displacement Settings**

**User guide**



# **Safe Access to Fuel and Energy (SAFE) Toolbox**

## **Woodfuel Assessment in Displacement Settings**

A tool for supporting field-based actors to assess woodfuel resources and energy needs in displacement settings

### **User guide**

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, 2016

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## Acronyms

CCT	Controlled Cooking Test
FAO	Food and Agriculture Organization of the United Nations
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICS	Improved Cooking Stoves
IDPs	Internally Displaced Persons
KPT	Kitchen Performance Test
LCCS	Land Cover Classification System
LHV	Low Heating Value
LPG	Liquefied Petroleum Gas
MAI	Mean Annual Increment
PRA	Participatory Rural Appraisal
SAFE	Safe Access to Fuel and Energy
UNHCR	United Nations High Commissioner for Refugees
WBT	Water Boiling Test
WFP	World Food Programme



## 1. Introduction

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This user guide describes how to use the *Safe Access to Fuel and Energy (SAFE) Toolbox: Woodfuel Assessment in Displacement Settings* for supporting field-based actors who are directly involved in the management of natural resources and protection of crisis-affected populations. This tool provides guidance for assessing, monitoring and planning energy-related interventions.

The SAFE Toolbox is an Excel-based application, which supports the systematic collection and analysis of multi-sectoral field data on energy needs, woodfuel resources and associated risks and challenges faced by people in displacement settings.

The SAFE Toolbox is intended to support the identification of the baseline situation in which no intervention to address the energy needs of displaced and host communities has been carried out. The tool can be used to establish the baseline setting and to develop alternative scenarios to compare against the baseline. The user can simulate alternative scenarios in which improved cooking technologies and new tree plantations are introduced to increase energy efficiency, reduce energy consumption and improve woodfuel supply. These scenarios facilitate the planning of interventions to contribute to safe and sustainable access to energy for cooking and to reduce environmental impacts and other associated risks in displacement settings.

The SAFE Toolbox is a complementary tool of the methodology presented in the Technical Handbook: *Assessing Woodfuel Supply and Demand in Displacement Settings (FAO/UNHCR. 2016)*.

## 2. SAFE Toolbox Structure Overview

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The user interface of the SAFE Toolbox is a sequence of Excel worksheets for data input as summarized below:

- 1) Definition of population and social units of the targeted displacement setting;
- 2) Assessing energy consumption at the baseline;
- 3) Screening technologies for cooking at the baseline and alternative scenario(s);
- 4) Woody biomass resources at the baseline (stocks and productivity);
- 5) Afforestation and reforestation interventions in the alternative scenario(s);
- 6) Comparative results for the baseline and alternative scenario(s);
- 7) Estimation of GHG emissions and removals;
- 8) Questionnaire template to collect data through interviews and focus group discussions.

## 3. Expected Results

---

Comparative results are provided for the baseline and the alternative scenario of the targeted displacement setting, as follows:

- Consumption of fuelwood and other energy sources for cooking;
- Time spent on fuelwood collection;

- Integration of woodfuel demand and potential supply in order to show the potential deficit or surplus of woody biomass;
- Fuel requirements for the selected improved cooking technologies in the alternative scenario;
- CO<sub>2</sub>eq emissions and removals, and economic benefits.

## 4. Step-by-Step Tutorial

### 4.1 Starting

After launching the Excel file of the SAFE Toolbox, firstly the user need to enable the content in order to use the tool. Then the user can start to navigate the tool by clicking the Start button (Fig.1).

To run the SAFE Toolbox, the system requirements include Windows and Microsoft Office Excel 2013.

The image shows the initial steps of using the SAFE Toolbox. The top part is a screenshot of Microsoft Excel with a security warning that says "SECURITY WARNING: Some active content has been disabled. Click for more details." and an "Enable Content" button highlighted with a red circle and arrow labeled "1". Below this is the SAFE Toolbox application window. The window title is "SAFE Toolbox: Woodfuel Assessment in Displacement Settings". It features a navigation bar with buttons for "Population and Social Units", "Energy Consumption", "Screening Technologies for Cooking", "Woody Biomass Resources", "Afforestation and Reforestation", "Main Results", "GHGs Results", "Questionnaire Template", and "References". A text box explains the tool's purpose: "The SAFE Toolbox is an Excel-based application, which supports a systematic collection and analysis of multi-sectoral field data on energy needs and associated risks and challenges of targeted displacement settings. The current status of energy consumption and woodfuel collection and use, is integrated with data on the woody biomass stock and productivity as potential energy supply for cooking, based on the context-specific situation (baseline), the tool estimates the impacts of alternative scenarios in which current cooking systems are replaced with improved and more energy efficient cooking technologies. The tool also allows the users to make simulations of the impacts on the potential woodfuel supply through appropriate interventions of afforestation and reforestation. The SAFE Toolbox can be used by field-based actors who are directly involved in the management of natural resources and protection of crisis-affected populations for assessing, monitoring and planning energy-related interventions." Below this is a flowchart titled "ANALYTICAL FLOW OF THE SAFE TOOLBOX" showing the process from input modules to expected results. At the bottom, a red box contains the text "To Start press the button" with an arrow pointing to a green "START" button.

Figure 1. Analytical flow of the SAFE Toolbox

## 4.2 Identification of the Targeted Population and Social Units

The worksheet entitled *Population and social units* is used to enter data on the number and average size of households, schools, clinics, and other social units (e.g. bakeries, cafeterias) which provide services in the targeted area.

Data collection should be carried out at the camp/community level through key informants such as camp managers, NGO staff, community mobilizers, community leaders and other relevant respondents. The user should enter the required data in the white cells.

- 1 Select the country in which the target area is situated.
- 2 Enter additional information about the target area.
- 3 Enter the size of the current population in the targeted area and number of relevant social units (i.e. households, schools, clinics, administrative centers, other).

POPULATION AND SOCIAL UNITS

Clear Data
NEXT >>  
Energy Consumption

Country: Select a country 1

Region:

Targeted area:

How long has the targeted area started to host refugees/IDPs? Enter data (mm/yyyy)  2

*Country population*

Parameter (unit)	Value	Year
Total population	-	-
Rural population	-	-
Urban population	-	-
Refugees, IDPs and other person of concern to UNCHR	-	-

Source: FAO, 2013: FAOSTAT; UNHCR, 2014: Population Statistics

*Population and social units*

Total current population of the targeted area	
Number of households	
Average size of household	
Number of schools	
Number of clinics	
Number of administrative centers	
Other (e.g. number of restaurants, cafeterias, bakeries)	

**INSTRUCTIONS**

1) Select the country in which the targeted area is situated.

2) Enter additional information of the targeted area.

3) Enter the current population of the targeted area (e.g. refugee camp, hosting area) and number of relevant social units (i.e. households, schools, clinics, administrative centers, other).

**Figure 2.** Layout of the worksheet 'Population and social units'

More information related to the methodology on how to collect data can be found in the Technical Handbook: *Assessing Woodfuel Supply and Demand in Displacement Settings* (FAO/UNHCR. 2016).

## 4.3 Assessing Energy Consumption (Baseline)

A number of factors influence the energy consumption for cooking and other basic needs in displacement settings for displaced people. The precise quantity and type of fuel used for cooking depends on several site-specific factors, including the availability and quality of wood and other energy sources, climate, type and quantity of food cooked, type of stove available and its energy efficiency, cooking practices, etc. In this regards, field data can be obtained through a combination of i) rapid, structured and quantitative questionnaires with household respondents; ii) focus group discussions (disaggregated by gender) with household members; and iii) semi-structured interviews

with key informants including camp managers, community mobilizers, community leaders and stove producers.

**Baseline assessment of energy consumption for cooking by each social unit:**

- 1 Enter the annual average market price per unit of fuel currently being used or planned for future applications. If the selected fuel is locally produced and not sold in local markets, enter the estimated cost of production. Please note that data on the fuel market prices are not used to make calculations within the SAFE Toolbox but it might be useful to collect these data as an entry point for further socio-economic analyses. In particular fuel unit market prices can be considered to assess costs and economic benefits in replacing a specific energy source. The user should enter the required data in the white cells.
- 2 Provide the daily average amount of fuel(s) consumed for cooking over the year for each social unit of the targeted area (e.g. households, schools, clinics and administrative centers). Please note this value refers to one representative household while it is an aggregated value for each other social unit. For example, if several schools are placed in the targeted area, the daily average consumption of a specific fuel results from the sum of all schools. The user should enter the required data in the white cells.
- 3 Enter data related to fuelwood collection for cooking at household level. The user should enter the required data in the white cells.

**ASSESSING ENERGY CONSUMPTION (Baseline)**

Clear Data << Pop

Country:

Region:

Targeted area:

Current average energy consumption for cooking by social unit<sup>1</sup>

Energy sources	Unit	Market price Local currency/unit	Household (one unit) unit/day/household	Schools unit/day	Clinics unit/day	Administr. centers unit/day	Other unit/day
Fuelwood	kg						
Charcoal	kg						
Kerosene	liter						
LPG	kg						
Ethanol	liter						
Electricity	kWh						
Biogas	m <sup>3</sup>						
Briquettes	kg						

<sup>1</sup> Assuming a constant daily consumption of fuel(s) or energy sources over the year. Please provide an average value per each social unit.

**Figure 3.** Layout of the worksheet ‘Assessing energy consumption (Baseline)’

**Fuelwood collection for cooking at household level**

What is the distance moved by a displaced person to collect fuelwood (radius in km)?

How many kg of fuelwood are collected per trip?

How many hours does one trip take including collection and return?

**Figure 4.** Data entry for household fuelwood collection

More information related to the methodology on how to collect data can be found in the Technical Handbook: *Assessing Woodfuel Supply and Demand in Displacement Settings (FAO/UNHCR. 2016)*.

## 4.4 Screening Technologies for Cooking

The screening of technologies and assessment of local cooking practices should be carried out after an initial determination of the main cooking systems used in the targeted displacement settings. The screening and assessment involves a multi-faceted approach, which considers several variables specific to the local context. The baseline screening provides entry points for conducting a feasibility assessment of locally appropriate and fuel-efficient cooking systems.

### ***Selection of the main cooking systems by social unit in the baseline situation:***

In the first section of the worksheet entitled *Screening Technologies for Cooking*, the user should select the main cooking system currently in place for each social unit (baseline situation). The selection of the main cooking systems for each social unit must follow the following sequence of the 3 dropdown lists: 1) Energy source; 2) Stove category; 3) Stove model. By following this sequence, the tool automatically updates the dropdown list according to the selection.

- 1** **Energy source:** Selection of the main energy source for cooking in the baseline situation (e.g. fuelwood, charcoal and kerosene).
- 2** **Stove category:** Selection of the main stove category in the baseline situation (e.g. mud stoves, ceramic stoves and prefabricated stoves). The tool provides a list of stove categories according to the selection in the previous drop-down list '*energy source*'.
- 3** **Stove model:** Selection of the stove model. This drop-down list provides names of specific stoves according to what has been selected in the drop-down list '*energy source*' and '*stove category*'. If the stove of interest is not provided in the list, the user is able to select a '*user-defined*' stove but in this case values on the thermal efficiency are required.
- 4** **Info:** The user can check the info box beside each cooking system in order to obtain general information.
- 5** **Thermal efficiency:** The thermal efficiency of a biomass cook stove indicates the ability to transfer the heat produced by the fuel into the pot. The thermal efficiency value is the fraction of heat that is transferred into the pot. The remaining energy is lost to the environment. Default values of average thermal efficiency are provided for the selected stoves. If the user has selected a *user-defined stove*, the user must provide the thermal efficiency of the stove in the white cell that appears by unticking the default value box. When more accurate data are available, they should be entered instead of default values.

## SCREENING TECHNOLOGIES FOR COOKING

Population Data
<< BACK  
Energy Consumption
NEXT >> Woody  
Biomass Resources

Country:

Region:

Targeted area:

---

### Cooking systems in the baseline situation

SELECTION OF THE MAIN COOKING SYSTEMS BY SOCIAL UNIT IN THE BASELINE SITUATION

Social unit	Step 1	Step 2	Step 3	Info	Thermal efficiency
	Energy source	Stove category	Stove model		
Households	Fuelwood	Three stone fire	Three stone fire	<input checked="" type="checkbox"/>	19%
Schools	Fuelwood	Prefabricated metal	100 Liter Institutional Cookstove	<input checked="" type="checkbox"/>	46%
Clinics	LPG	LPG stoves	LPG stove	<input checked="" type="checkbox"/>	80%
Administrative centers	Fuelwood	Prefabricated metal	Metal rocket inst.	<input type="checkbox"/>	36%
Other	Select energy source	Stove category	Select the stove	<input checked="" type="checkbox"/>	Default value


**General information**

**Three stone fire**

Open fires are used every day by a large percentage of the world's population. The three stone fire system can be used more or less successfully, depending on the care and skill of the operator. If the sticks of wood are burnt at the tips and pushed into the center as the wood is consumed, the fire can be hot and relatively clean burning. If too much of the stick is smoldering, a lot of smoke is produced. The closer the pot is to the fire, the more of the heat enters the pot.

**Three stone fire**

Open fires are used every day by a large percentage of the world's population. The three stone fire system can be used more or less successfully, depending on the care and skill of the operator. If the sticks of wood are burnt at the tips and pushed into the center as the wood is consumed, the fire can be hot and relatively clean burning. If too much of the stick is smoldering, a lot of smoke is produced. The closer the pot is to the fire, the more of the heat enters the pot.



INSTRUCTIONS

The selection of the main cooking systems for each social unit must follow the following sequence of the 3 dropdown lists: 1) Energy source; 2) Stove category; 3) Stove model. By following this sequence, the tool automatically updates the dropdown list according to the selection.

Default values are provided based on average thermal efficiency of the selected stove under optimal conditions. If the user-defined stove is selected, the user have to provide the stove thermal efficiency in the white cell that appears by unticking the default value box. In any case, when more accurate data are available, they can be entered instead of

More info available on the Clean Cooking Catalog: <http://catalog.cleancookstoves.org>

*Figure 5. Layout of the main cooking system selection in the baseline situation*

### **Selection of the main cooking systems by social units in the alternative scenario:**

The purpose of this section is to consider alternative scenarios by replacing current cooking systems with other energy sources and/or improved cook stoves with higher thermal efficiency. It is important to keep in mind that an appropriate and sustainable cooking system should be determined by a combination of local specific factors including: 1. Households and institution fuel and energy needs; 2. Availability of spare parts; 3. Skills for technology supply and maintenance; 4. Cultural habits; 5. Reliability of energy supply; 6. Financial limitations; 7. Lifespan of the technology.

As per the baseline cooking system, the selection of the main cooking systems in the alternative scenario must follow the following sequence of the 3 dropdown lists: 1) Energy source; 2) Stove category; 3) Stove model.

Note: In the case that the cooking system selected at the baseline for a specific social unit does not change in the alternative scenario, it is necessary to re-select the same cooking system in the dropdown lists in order to calculate the results.

- 1 **Energy source:** Selection of the main energy source for cooking in the baseline situation (e.g. fuelwood, charcoal and kerosene).
- 2 **Stove category:** Selection of the main stove category in the baseline situation (e.g. mud stoves, ceramic stoves and prefabricated stoves). The tool provides a list of stove categories according to the selection in the previous drop-down list 'energy source'.

- 3 **Stove model:** Selection of the stove model. This drop-down list provides names of specific stoves according to what has been selected in the drop-down list 'energy source' and 'stove category'. If the stove of interest is not provided in the list, the user is able to select a 'user-defined' stove but in this case values on the thermal efficiency are required.
- 4 **Info:** The user can check the info box beside each cooking system in order to obtain general information.
- 5 **Thermal efficiency:** The thermal efficiency of a biomass cook stove indicates the ability to transfer the heat produced by the fuel into the pot. The thermal efficiency value is the fraction of heat that is transferred into the pot. The remaining energy is lost to the environment. Default values of average thermal efficiency are provided for the selected stoves. If the user has selected a *user-defined stove*, the user must provide the thermal efficiency of the stove in the white cell that appears by unticking the default value box. When more accurate data are available, they should be entered instead of default values.
- 6 **Expected uptake:** This section allows the user to make simulations on the expected uptake of the selected cooking system in the alternative scenario. Based on these values, which are expressed in %, the tool provides results for the alternative scenario.

**Alternative scenario with improved technologies**


The purpose of this section is to consider alternative scenarios by the replacement of current cooking systems with appropriate improved stoves with higher combustion efficiency as well as reduced health risks. It is important to keep in mind that an appropriate and sustainable cooking system should be determined by a combination of local specific factors including: 1. Households and institution needs; 2. Availability of spare parts; 3. Skills for technology supply and maintenance; 4. Cultural habits; 5. Sustainability of energy supply; 6. Financial limitations; 7. Lifetime expectancy of the technology; 8) the potential for communal cooking.

SELECTION OF COOKING SYSTEMS BY SOCIAL UNIT IN THE ALTERNATIVE SCENARIO				Info	Thermal efficiency	Expected uptake of the selected alternative cooking system expressed in %	
Social unit	Step 1 Energy source	Step 2 Stove category	Step 3 Stove model			Default value	Value
Households	Fuelwood	Prefabricated metal	Save80 stove	<input checked="" type="checkbox"/>	45%	60%	◀ ▶
Schools	Biogas	Biogas stoves	Biogas stove	<input checked="" type="checkbox"/>	50%	100%	◀ ▶
Clinics	LPG	LPG stoves	LPG stove	<input checked="" type="checkbox"/>	80%	100%	◀ ▶
Administrative centers	Fuelwood	Prefabricated metal	Metal rocket inst.	<input type="checkbox"/>	36%	100%	◀ ▶
Other	Select energy source	Stove category	Select the stove	<input checked="" type="checkbox"/>	Default value	100%	◀ ▶

**General information**

**Prefabricated metal**  
 Prefabricated stoves are constructed from steel, sheet metal or another type of metal. These stoves sometimes include ceramic liners or grates. These kind of stoves are commonly portable, durable and require little maintenance. Prefabricated stoves can be built simply by using scrap metal. However building requires semi-skilled artisans. Simple models use firewood, but metal stoves can also be adapted to use charcoal with the addition of a grate.

**Save80 stove**



Pot capacity (min/max): 2-8 L; People fed (min/max): 2 / 15  
 Approximate lifetime: 15 years Countries deployed: Chad, Ethiopia, Lesotho, Nigeria, Rwanda, Togo, Uganda, Zambia  
 Average thermal efficiency: 45%

More info available on the Clean Cooking Catalog <http://catalog.cleancookstoves.org>

**INSTRUCTIONS**

The selection of the main cooking systems for each social unit must follow the following sequence of the 3 dropdown lists: 1) Energy source; 2) Stove category; 3) Stove model. By following this sequence, the tool automatically updates the dropdown list according to the selection.

Default values are provided based on average thermal efficiency of the selected stove under optimal conditions. If the user-defined stove is selected, the user have to provide the stove thermal efficiency in the white cell that appears by unticking the default value box. In any case, when more accurate data are available, they can be entered instead of default values.

This section allows the user to make simulations on the expected uptake of the selected cooking system in the alternative scenario. Based on these values expressed in %, the tool provides accordingly results for the alternative scenario.

Figure 6. Layout of the selection of cooking systems in the alternative scenario

## 4.5 Woody Biomass Resources (Baseline)

The combination of data from field surveys, forest inventories and remote sensing techniques can be entered in this sheet. Woody biomass resources from forests and other woodlands such as dedicated energy plantations, shrubland, savanna and agricultural land should be considered. The share of non-forest areas that supply woody biomass can be substantial. When defining a target area, it is assumed that woody biomass is acquired and/or produced with local resources within a maximum distance of 10-15 km from the user.

Short interviews with local stakeholders can be used to determine the source of woodfuel supply and to identify the area to be targeted.

More information related to the methodology on how to collect data can be found in the Technical Handbook: *Assessing Woodfuel Supply and Demand in Displacement Settings (FAO/UNHCR. 2016)*.

**LCCS classes and woody biomass resources from the above-ground biomass (abg) in the current situation:**

- 1 LCCS classes:** Enter the land cover class of the targeted area based on the map of woody biomass resources distribution. This process derives from the interaction between map products and field measurements. Follows an example on representative LCCS: LC1: Closed forest (trees > 60%); LC2: Open forest (15% < trees < 60%); LC3: Shrubland (shrubs > 50%); etc.
- 2 Land area (ha):** Enter the number of hectares for each LCCS class that provide woody biomass from natural and planted forest sources based on the targeted area.
- 3 Above-ground biomass stock (t/ha):** Woody above ground biomass can be estimated by using field ground measurements and through the use of allometric models. When using volume equations, biomass is estimated by multiplying the volume by wood density and expansion factors.
- 4 Mean Annual Increment (MAI) (m<sup>3</sup>/ha/year):** Volume of wood growing on one hectare during one year on average since the forest plantation has been established. It is expressed in cubic meters per hectare per year.

**Intermediate results**

**Annual above-ground biomass growth (t/year):** Oven-dry weight of net annual increment of woody biomass in the target land area, including branches, trunk, bark and stump. The term “growth” is used here instead of “increment”, since the latter term tends to be understood in terms of merchantable volume.

**WOODY BIOMASS RESOURCES (Baseline)**

Clear Data
Population
Energy Consumption
<< BACK Screening Technology for Cooking
NEXT >> Afforestation and Reforestation

Country:

Region:

Targeted area:

LCCS classes and woody biomass resources from the above-ground biomass (abg) in the current situation (Baseline)

LCCS classes	Land area (ha)	% of land area	Abg biomass stock (DM) (t/ha)	Total abg biomass stock (t)	Mean annual increment (m <sup>3</sup> /ha/yr)	Annual abg biomass growth (t/yr)
LC1:		-		0		0.0
LC2:		-		0		0.0
LC3:		-		0		0.0
LC4:		-		0		0.0
LC5:		-		0		0.0
LC6:		-		0		0.0
LC7:		-		0		0.0
LC8:		-		0		0.0
Total				0		0

Characteristics of fuelwood collected for cooking

Wood density (kg/m <sup>3</sup> )	☑ Default value	0		<input type="text" value="Select below a tree species to get default value of wood density"/>	
Energy content - LHV (MJ/kg)	☑ Default value	17		<input type="text" value="Select tree species"/>	
Moisture content when collected (% on a wet basis)	☑ Default value	15%			
Conversion efficiency of fuelwood to charcoal (%)	☑ Default value	20%			

DEFINITIONS

**LCCS classes:** Provide LCCS classes according to the local specificity. For example: LC1: Closed forest (trees > 60%); LC2: Open forest (15%<trees<60%); LC3: Shrubland (shrubs > 50%); etc.

**Land area (ha):** Enter number of hectares of each LCCS class that provide natural and planted woody biomass sources based on the targeted area.

**Above-ground biomass stock (t/ha):** Woody above ground biomass can be estimated by using field ground measurements and through the use of allometric models. When using volume equations, biomass is estimated by multiplying the volume by wood density and expansion factors.

**Mean Annual Increment (MAI) (m<sup>3</sup>/ha/year):** Volume of wood growing on one hectare during one year on average since the forest plantation has been established. It is expressed in cubic meters per hectare per year.

**Characteristics of fuelwood:** Enter the required data related to the main type of fuelwood collected and used for cooking in the targeted area. Default values are provided, however if more accurate values are available, enter own data based on local-specific sources.

**Charcoal conversion efficiency:** Enter the percentage of the conversion efficiency of fuelwood into charcoal.

Figure 7. Layout of the Woody Biomass Resources worksheet

### Characteristics of fuelwood collected for cooking:

- 5 When assessing woodfuel consumption, it is important to take into consideration the chemical and physical properties of the woody biomass. In this section, the user has to enter the following data related to the main type of woody biomass collected (i.e. the main type of tree species) and used for cooking in the targeted area: the wood density, energy content and moisture content. Default values are provided based on average values derived from the available literature. These values should be carefully used as they affect the results of the calculation of fuelwood consumption and if more accurate values are available, the user should enter their own data based on local-specific sources.
- 6 If charcoal is considered as a source of energy for cooking, the tool allows the user to enter the efficiency (in %) of converting fuelwood into charcoal. A default value of 20% is provided but the user is able to enter their own data if a more accurate value is available. It is important to carefully evaluate this data as it affects the fuelwood consumption calculated in the results of the tool.

Characteristics of fuelwood collected for cooking		
Wood density (kg/m <sup>3</sup> )	<input checked="" type="checkbox"/> Default value	560
Energy content - LHV (MJ/kg)	<input checked="" type="checkbox"/> Default value	17
Moisture content when collected (% on a wet basis)	<input checked="" type="checkbox"/> Default value	15%
Conversion efficiency of fuelwood to charcoal (%)	<input checked="" type="checkbox"/> Default value	20%

Figure 8. Data entry of woody biomass characteristics

## 4.6 Afforestation and Reforestation (Alternative Scenario)

The *Afforestation and Reforestation* worksheet is used to enter data for the purpose of making an estimation of the potential annual above-ground biomass growth from a new plantation in the alternative scenario. The establishment of a new forest plantation will contribute to increasing the potential annual supply of woody biomass that would contribute to mitigate the impact on the natural resources of the targeted area.

- 1 Select the forest plantation species of interest for an afforestation or reforestation intervention. Common forest plantation species can be selected from a dropdown list, but if the plantation species of interest is not on the list, there is also the option of selecting *user-defined* species. In such cases, the user must provide additional data (e.g. Mean Annual Increment (MAI), wood density). The main limitation of this section is that the tool only allows the user to select pure stand plantations and not mixed-species plantations.
- 2 Enter the number of hectares that would be dedicated for establishing the new plantation.
- 3 Growth characteristics of the selected plantation are provided through default values. However, the user can always use their own values by unticking the default value box.

- 4 As the MAI may refer only to the commercial growing stock, this section uses biomass expansion factors through the trunk and bark ratio to the total above-ground biomass in order to include the remaining woody biomass that is typically harvested as fuelwood for non-commercial production (i.e. branches). Use of default values for trunk and bark ratio to the total above ground biomass must be considered as an approximation as a large variation can be observed among different species. Therefore, the use of default values requires expert judgment to ensure the selected data are appropriate.

AFFORESTATION and REFORESTATION (Alternative scenario)

<< BACK  
Woody Biomass Resources
NEXT >>  
MAIN RESULTS

---

Country:

Region:

Targeted area:

---

Selection of the species and characteristics

Select the species

Number of hectares

MAI (m<sup>3</sup>/ha/yr)

Wood density (kg/m<sup>3</sup>)

Energy content - LHV (MJ/kg)

Default value

Default value

Default value

Annual abg biomass growth from the new plantation ton/year

Average trunk+bark ratio to the above ground biomass that is typically harvested for woodfuel production

Trunk+bark 
 Default values

INSTRUCTIONS

- 1) Select the forest plantation species of interest for afforestation or reforestation intervention.
- 2) Enter the number of hectares that would be dedicated for establishing the new plantation.
- 3) Growth characteristics of the selected plantation are provided by default, however the user can always use own values unticking the default value box.
- 4) As the MAI may refer only to the commercial growing stock, the trunk+bark ratio to the above-ground biomass is provided in order to consider additional woody biomass that can be collected from the branches and other part of the tree not included in the MAI. Use of default values requires expert judgment to ensure the selected data are appropriate.

Population
Energy Consumption
Cooking Technology Systems
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Woody Biomass Resources
NEXT >>  
MAIN RESULTS

Figure 9. Layout of the Afforestation and Reforestation worksheet

## 4.7 Main Results

The information presented in the *Main Results* worksheet aims to compare the baseline situation with other alternative scenarios highlighting the beneficial and detrimental impacts.

The current status of energy consumption and woodfuel collection and use is integrated with data on the woody biomass stock and productivity as a potential energy supply for cooking.

**The expected main results are presented below:**

**Result 1:** Comparison of fuelwood consumption for cooking in the baseline and the alternative scenario (Figure 10).

Through the stove's thermal efficiency rating and by simulating a shift to a different energy source, the tool makes an estimation of the reduction in fuelwood consumption when new cooking systems are introduced in the alternative scenario.

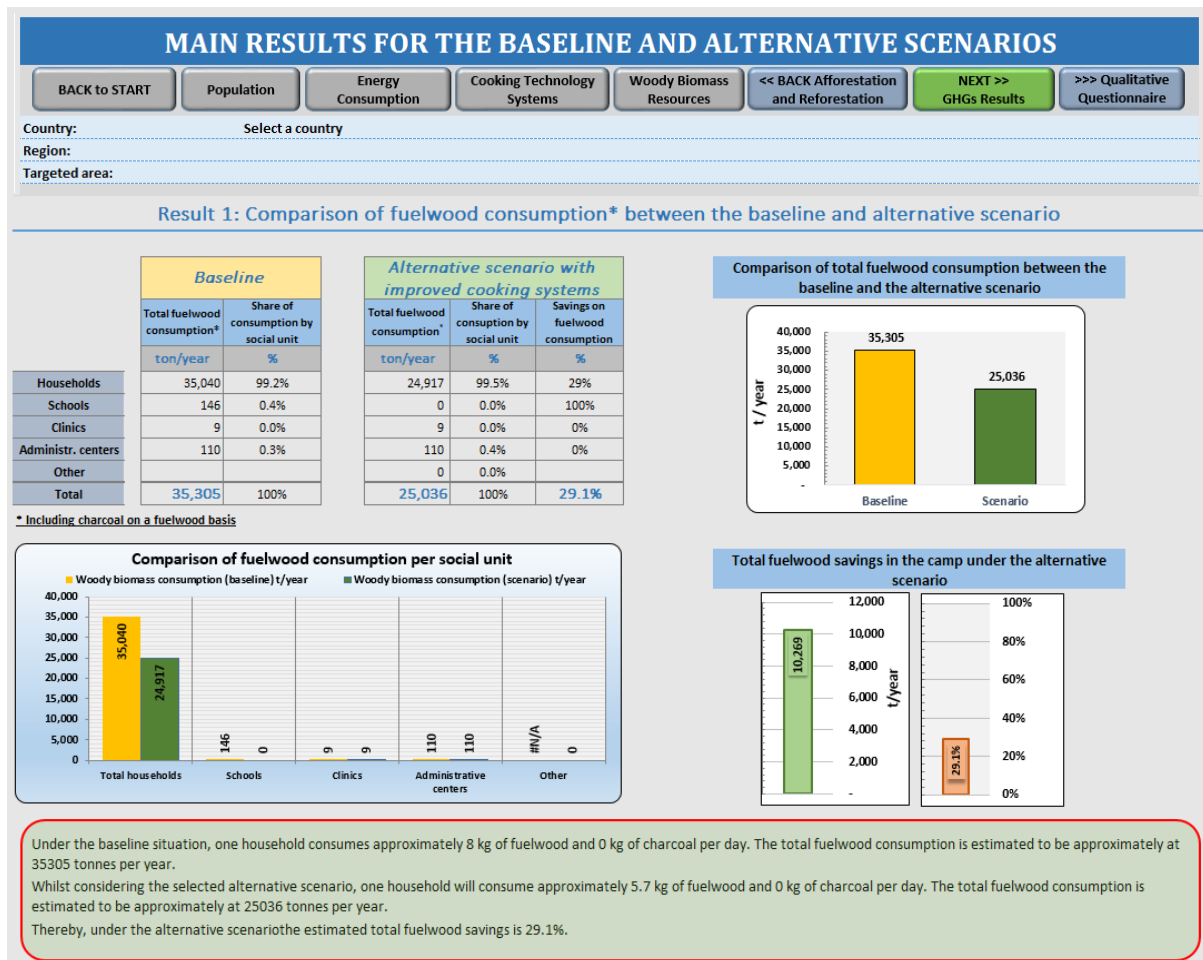


Figure 10. Layout of results with data as example on the fuelwood consumption

**Result 2:** Comparison of fuelwood collection per household in the baseline and the alternative scenario (Figure 11).

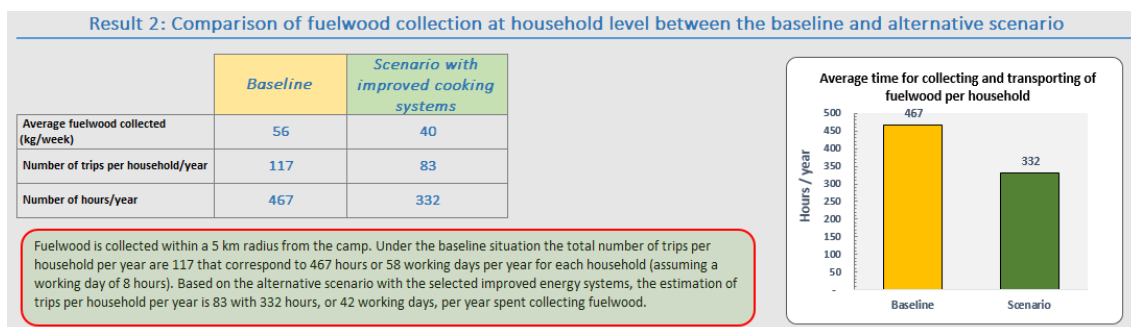
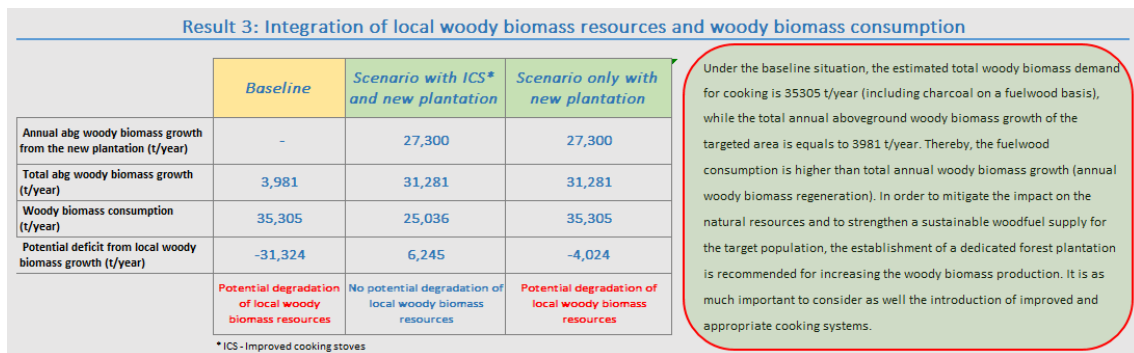


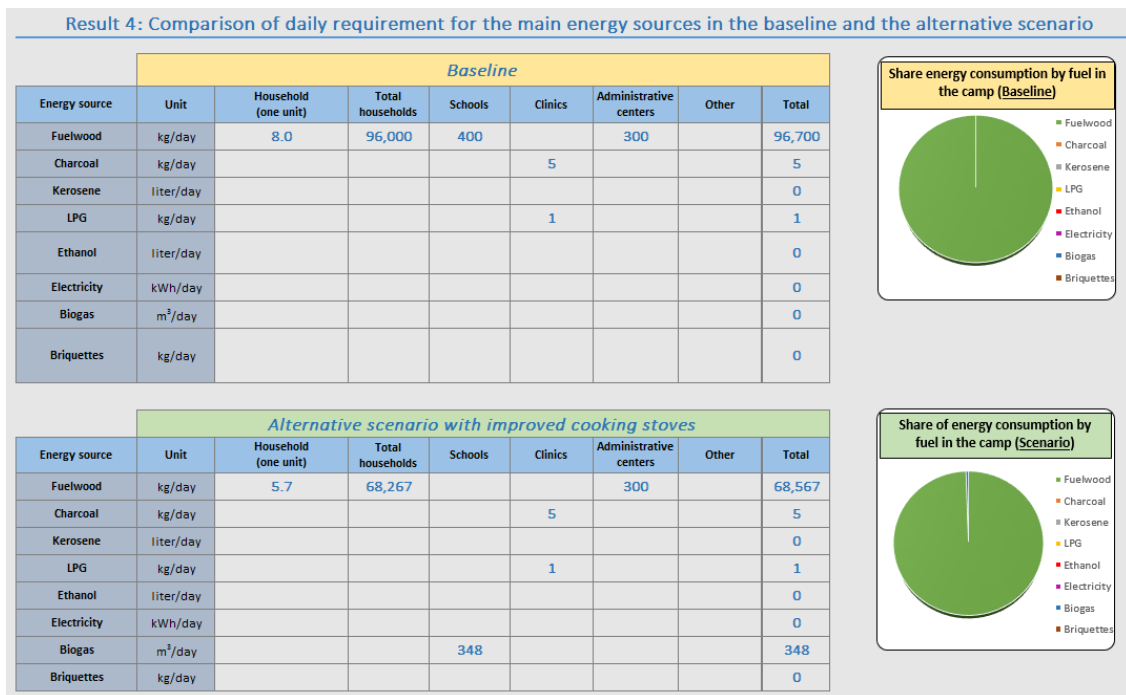
Figure 11. Layout of results with data as example on the fuelwood collection

**Result 3:** Potential deficit or surplus of woody biomass according to the integration of the estimated annual production with the levels of woodfuel consumption for cooking (Figure 12);



**Figure 12.** Layout of results on data integration of woodfuel supply

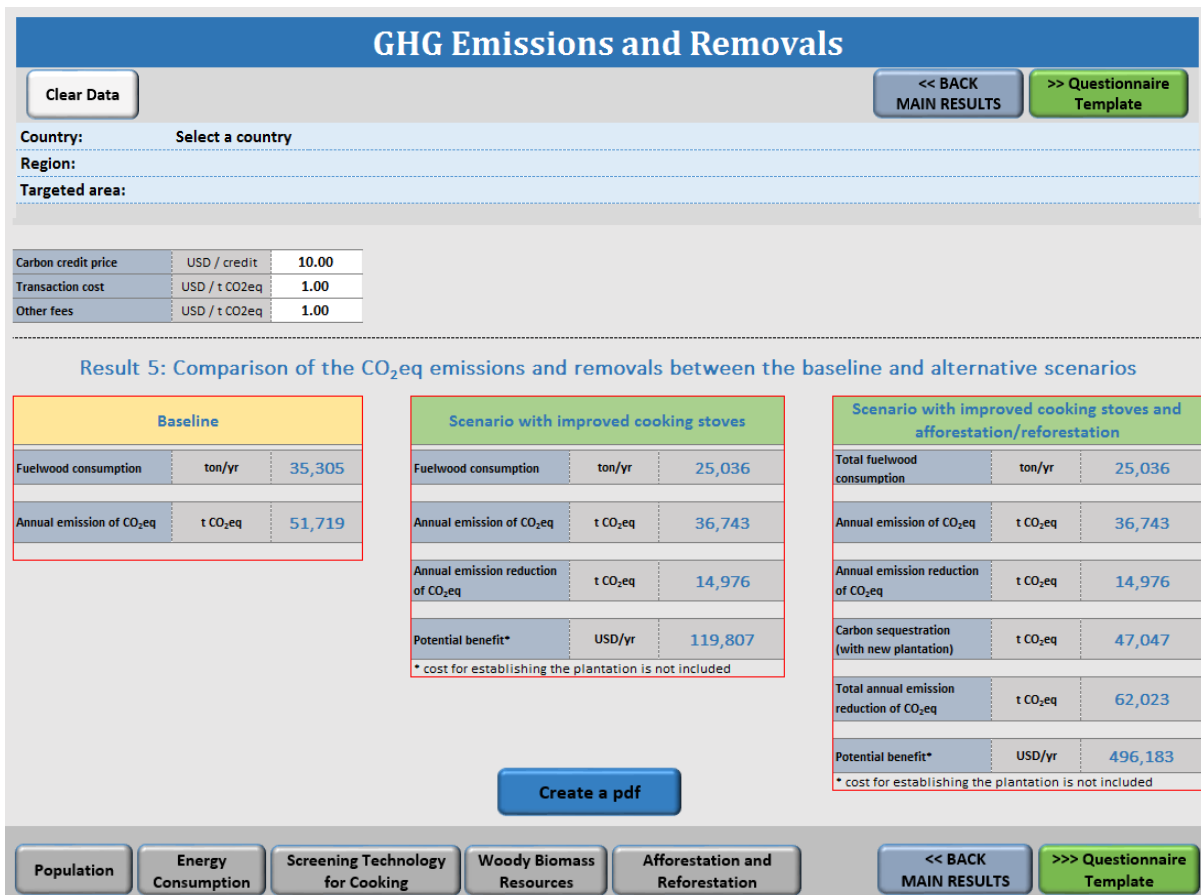
**Result 4:** Daily fuel requirements in the baseline and the alternative scenario (Figure 13).



**Figure 13.** Layout of results on fuel needs estimations in the alternative scenario

## 4.8 GHG Emissions and Removals

**Result 5:** This section provides a comparison of results of the estimated annual CO<sub>2</sub>eq emissions and removals for the baseline situation and two alternative scenarios. The first alternative scenario includes only improved cook stoves while the other alternative scenario makes a simulation which also incorporates an increased potential woody biomass supply through afforestation and reforestation interventions. In this second alternative scenario, the tool also calculates the carbon removals (sequestration) from the new established plantation.



*Figure 14. Layout of results with data as example on GHG emissions and removals*

## 4.9 Questionnaire Template

The assessment of woodfuel demand is carried out by analysing associated challenges and opportunities through data collected in the field using methods such as questionnaires, focus group discussions, semi-structured interviews with key informants, observations of cooking practices and Participatory Rural Appraisal (PRA) techniques.

This section of the SAFE Toolbox provides a template that may be used to obtain information from focus group discussions.

QUESTIONNAIRE TEMPLATE	
Clear Data	<a href="#">Create a pdf and print out the questionnaire</a> <a href="#">BACK to START</a> <a href="#">BACK to the MAIN RESULTS</a>
Country:	Select a country
Region:	
Targeted area:	
<p>The following questionnaire may be used to obtain qualitative data from focus group discussions and interviews to key informants, on issues related to access to cooking fuel and the associated risks and challenges.</p>	
<h3>1. Cooking practices</h3>	
	Yes No
1.1 Presoaking such as legumes, grains, etc. prior to cooking	<input type="checkbox"/> <input type="checkbox"/>
1.2 Covering pots with lids when cooking	<input type="checkbox"/> <input type="checkbox"/>
1.3 Use a pot with a flat bottom instead of round-shaped pots	<input type="checkbox"/> <input type="checkbox"/>
1.4 Cutting large pieces of wood into smaller pieces	<input type="checkbox"/> <input type="checkbox"/>
1.5 Cutting ingredients into small pieces before cooking	<input type="checkbox"/> <input type="checkbox"/>
1.6 Sheltering the cooking fire from wind	<input type="checkbox"/> <input type="checkbox"/>
1.7 Extinguish the fire when you have finished cooking	<input type="checkbox"/> <input type="checkbox"/>
<h3>2. Food and nutrition</h3>	
2.1 What type of cooked foods are the most common within the camp?	
2.2 How long does it take in average to cook these main dishes?	
2.3 How many times in a day are meals cooked?	
2.4 What prevents people from having the desired number of meals?	
2.5 Do people sell or barter food to obtain fuel for cooking? How often?	
<h3>3. Fuelwood collection</h3>	
3.1 Who are the people responsible for collecting fuelwood?	<input type="checkbox"/> Male adult <input type="checkbox"/> Female adult <input type="checkbox"/> Male child <input type="checkbox"/> Female child <input type="checkbox"/> Other, please specify:
3.2 Is the amount of fuelwood being obtained sufficient?	<input type="checkbox"/> Yes <input type="checkbox"/> No
3.3 Is the fuelwood for cooking uses collected as live or dead wood?	
3.4 Where is the fuelwood collected? (probes: communal land, private land, government land)	
<h3>4. Protection, health risks and conflicts</h3>	
4.1 Are people experiencing problems with the current source of fuel?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If Yes:	<input type="checkbox"/> High price <input type="checkbox"/> Poor quality <input type="checkbox"/> Safety <input type="checkbox"/> Fuel shortages <input type="checkbox"/> Long distance to collect it <input type="checkbox"/> Competition between groups for access to fuel <input type="checkbox"/> Other, please specify:
4.2 If safety is the primary protection concern, what is the cause?	<input type="checkbox"/> Ongoing conflict near the settlement/fuel collection area <input type="checkbox"/> Landmines, animals, dangerous terrain, etc. <input type="checkbox"/> Sexual assaults <input type="checkbox"/> Threats from army/police personnel/border guards, etc. <input type="checkbox"/> Threats from militia <input type="checkbox"/> Threats from bandits or opportunists <input type="checkbox"/> Threats from host population or opposing <input type="checkbox"/> Other, please specify:
4.3 Does the population cook indoors or outdoors?	<input type="checkbox"/> Indoor <input type="checkbox"/> Outdoor <input type="checkbox"/> Both
4.4 What are the health implications of the use of current cooking fuel?	<input type="checkbox"/> Acute respiratory infections <input type="checkbox"/> Eye infections <input type="checkbox"/> Asthma <input type="checkbox"/> Allergies <input type="checkbox"/> Fire hazards <input type="checkbox"/> Foodborne diseases/diarrhoea due to insufficient cooking/boiling <input type="checkbox"/> Other, please specify:
4.5 What are the main problems of the use of current cooking system?	<input type="checkbox"/> Food is undercooked
<p>Start Population Energy_Consumption Technologies Woody_Biomass_Resources Forest_Plantation Results GHGs Questionnaire</p>	

Figure 15. Layout of the Questionnaire Template worksheet

## 5. Annex

This Annex presents the list of data required and related data sources for each worksheet of the SAFE Toolbox.

Worksheet	Data required	Data sources
<b>POPULATION AND SOCIAL UNITS (Baseline)</b>	<ul style="list-style-type: none"> <li>Total current population in the targeted humanitarian setting</li> <li>Number of households</li> <li>Average size of household</li> <li>Number of schools</li> <li>Number of clinics</li> <li>Number of administrative centers</li> <li>Number of other relevant social units (e.g. number of restaurants, bakeries)</li> </ul>	<ul style="list-style-type: none"> <li>UNHCR Emergencies database (<a href="http://data.unhcr.org">http://data.unhcr.org</a>)</li> <li>UNHCR Statistical Online Population Database (<a href="http://www.unhcr.org/pages/4a013eb06.html">www.unhcr.org/pages/4a013eb06.html</a>)</li> <li>Internal Displacement Monitoring Centre (<a href="http://www.internal-displacement.org/">www.internal-displacement.org/</a>)</li> <li>Other existing report and document analysis</li> <li>Key informant interviews</li> </ul>
<b>ASSESSING ENERGY CONSUMPTION (Baseline)</b>	<ul style="list-style-type: none"> <li>Average annual market price per unit of fuel used for cooking (local currency/unit)</li> <li>Daily average amount of fuels used for cooking for each social unit of the targeted area (unit/day)</li> <li>Distance moved by a displaced person to collect fuelwood (radius in km)</li> <li>Average amount of fuelwood collected per trip (kg/trip)</li> <li>Average time required to collect fuelwood for one trip including collection and return (hours per trip)</li> </ul>	<ul style="list-style-type: none"> <li>UNHCR database, document analysis</li> <li>World Bank Microdata Library (<a href="http://microdata.worldbank.org/index.php/home">http://microdata.worldbank.org/index.php/home</a>)</li> <li>Field survey (interviews, questionnaires, observations, focus group discussions)</li> </ul>
<b>SCREENING TECHNOLOGIES FOR COOKING (Baseline and alternative scenario)</b>	<ul style="list-style-type: none"> <li><b>BASELINE:</b> Main cooking system currently in place for each social unit: energy source and stove model</li> <li>Thermal efficiency of the selected stoves (%)</li> <li><b>ALTERNATIVE SCENARIO:</b> Main cooking system for replacing the current cooking system for each social unit: energy source and stove model</li> <li>Thermal efficiency of the selected stoves (%)</li> <li>Expected uptake of the selected alternative cooking systems (%)</li> </ul>	<ul style="list-style-type: none"> <li>Field survey (interviews, questionnaires, observations focus group discussions)</li> <li>Stove efficiency test (WBT, CCT, KPT)</li> <li>Document analysis, reports and handbooks developed by WFP, GIZ</li> <li>Default values on the thermal efficiency for a list of cooking stoves are provided by the tool</li> </ul>
<b>WOODY BIOMASS RESOURCES (Baseline)</b>	<ul style="list-style-type: none"> <li>Type of LCCS classes of the targeted area</li> <li>Land area for each LCCS class (ha)</li> <li>Mean above-ground biomass stock for each LCCS class (t/ha)</li> <li>Mean Annual Increment (MAI) for each LCCS class (in m<sup>3</sup>/ha/year)</li> </ul>	<ul style="list-style-type: none"> <li>Direct field surveys and interviews to key persons</li> <li>Satellite or aerial images and image processing</li> <li>Forest inventories</li> </ul>

	<ul style="list-style-type: none"> <li>• Characteristics of the main type of fuelwood collected for cooking: wood density (kg/m<sup>3</sup>), energy content (MJ/kg), moisture content when collected (% on a wet basis)</li> <li>• Charcoal efficiency of fuelwood to charcoal (%)</li> </ul>	<ul style="list-style-type: none"> <li>• Default values on the fuelwood characteristics and charcoal conversion efficiency are provided by the tool.</li> </ul> <p>Further data sources:</p> <ul style="list-style-type: none"> <li>- <a href="http://due.esrin.esa.int/globcover/">http://due.esrin.esa.int/globcover/</a></li> <li>- <a href="http://www.fao.org/geonetwork/srv/en/main.home">www.fao.org/geonetwork/srv/en/main.home</a></li> <li>- <a href="http://database.prota.org/">http://database.prota.org/</a></li> <li>- <a href="https://datadryad.org/repo/handle/10255/dryad.235">https://datadryad.org/repo/handle/10255/dryad.235</a></li> <li>- <a href="http://worldagroforestry.org/regions/south-east-asia/resources/wood-density-database">worldagroforestry.org/regions/south-east-asia/resources/wood-density-database</a></li> <li>- <a href="http://www.globalloometree.org">www.globalloometree.org</a></li> </ul>
<b>AFFORESTATION and REFORESTATION (Alternative scenario)</b>	<ul style="list-style-type: none"> <li>• Selection of the main plantation species for afforestation/reforestation plan for energy purposes</li> <li>• Number of hectare for establishing new plantation (ha)</li> <li>• Mean Annual Increment (MAI) for each LCCS class (m<sup>3</sup>/ha/year)</li> <li>• Characteristics of the selected plantation species for energy purposes: wood density (kg/m<sup>3</sup>), energy content (MJ/kg), moisture content when collected (% on a wet basis)</li> <li>• Average trunk+bark ratio to the total above ground biomass that is typically harvested for woodfuel production (%)</li> </ul>	<ul style="list-style-type: none"> <li>• Direct field surveys and interviews to key persons</li> <li>• Default values on the MAI, fuelwood characteristics and the average trunk+bark ratio to the total above ground biomass are provided by the tool.</li> <li>- <a href="http://www.fao.org/forestry/plantedforests/67507/en/">www.fao.org/forestry/plantedforests/67507/en/</a></li> </ul>
<b>GHG Emissions and Removals</b>	<ul style="list-style-type: none"> <li>• Carbon credit price, transaction cost, other fees (USD/carbon unit)</li> </ul>	<ul style="list-style-type: none"> <li>• The price of CERs is negotiated between buyers and sellers. However, for more details please see:</li> <li>- <a href="https://cdm.unfccc.int/Registry/index.html">https://cdm.unfccc.int/Registry/index.html</a></li> <li>- <a href="https://offset.climateutralnow.org/">https://offset.climateutralnow.org/</a></li> </ul>
<b>QUESTIONNAIRE TEMPLATE</b>	<ul style="list-style-type: none"> <li>• Challenges in accessing and using fuel for cooking</li> <li>• Environmental conditions</li> <li>• Laws and regulations</li> <li>• Relationship between host and displaced populations</li> <li>• Access to land, land tenure</li> </ul>	<ul style="list-style-type: none"> <li>• SAFE guidance and case studies</li> <li>• Field survey (interviews, questionnaires, observations focus group discussions)</li> <li>• UNHCR database, document analysis and report</li> </ul>

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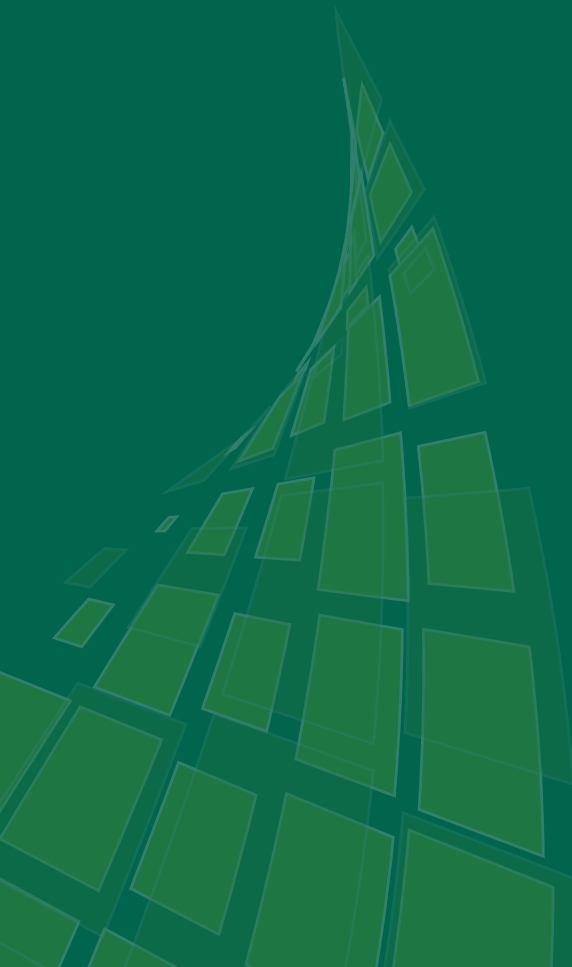
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