The development of this tool was part of the HEED project funded by the ESPRC Global Challenges Research Fund (Grant N EP/P029531/1)

Renewable Energy Recommendations Tool (HEED-RERT) for Camps

This is the HEED-RER tool user guide. It is designed to provide an accessible step-wise explanation for users on how to navigate the Excel Tool spreadsheet.

https://github.com/heedproject/rert Version 1.2

Developed by: Rembrandt Koppelaar (Scene Connect)

Reviewed by: Jonathan Nixon (Coventry University)

Structure of the User Guide

Slides	Contains
3-4	Tool use background
5	Five steps in HEED-RER tool usage
6-8	Technology options comparable in RERT for Cooking, household electricity/lighting, camp community/institutional electricity/lighting
9-10	Dashboard Tool Results Examples
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24	Overview of technical calculations

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The Humanitarian Engineering and Energy for Displacement (HEED) project aims to understand the energy needs of forcibly displaced people to increase access to safe, sustainable and affordable energy

The HEED Renewable Energy Recommendations tool (HEED-RERT) for Camps:
The first version (v1) of the tool was built by Scene Connect with support from Coventry University and Practical Action between June 2018 and August 2019.

It aims **to provide technology recommendations based on energy-economic-environment-health performance indicators** to provide support for **how best to increase energy access** in refugee camps and improve sustainability for i) **Cooking Energy, ii) Household Lighting and Electricity, iii) Community/Camp central Lighting and Electricity.**

Users engage with an **Excel spreadsheet** where they answer questions to describe the population of the camp, as well as the camp energy infrastructure and energy use of families therein. They can also enter technical data for particular renewable energy and cooking options. This allows the **user to localise the results into the local context** as much as possible.

Results are **presented in the form of an indicator dashboard** where different **technology options can be compared** with their performance indicator scoring.

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Recommended use of the RERT -

#1 It is recommended for each camp (or part of a camp) **to save the spreadsheet with a new name as** its own self-contained version. To this end information can be filled in on the overview tab in the sheet.

#2 **The tool has been built with Excel 2018 and Excel 2019 versions**. It is not backwards compatible with older versions at this time. Please use recent versions of Microsoft Excel to use it.

#3 **Feel free to modify and adjust the tool for your own purposes.** HEED-RERT is built on Open Source principles

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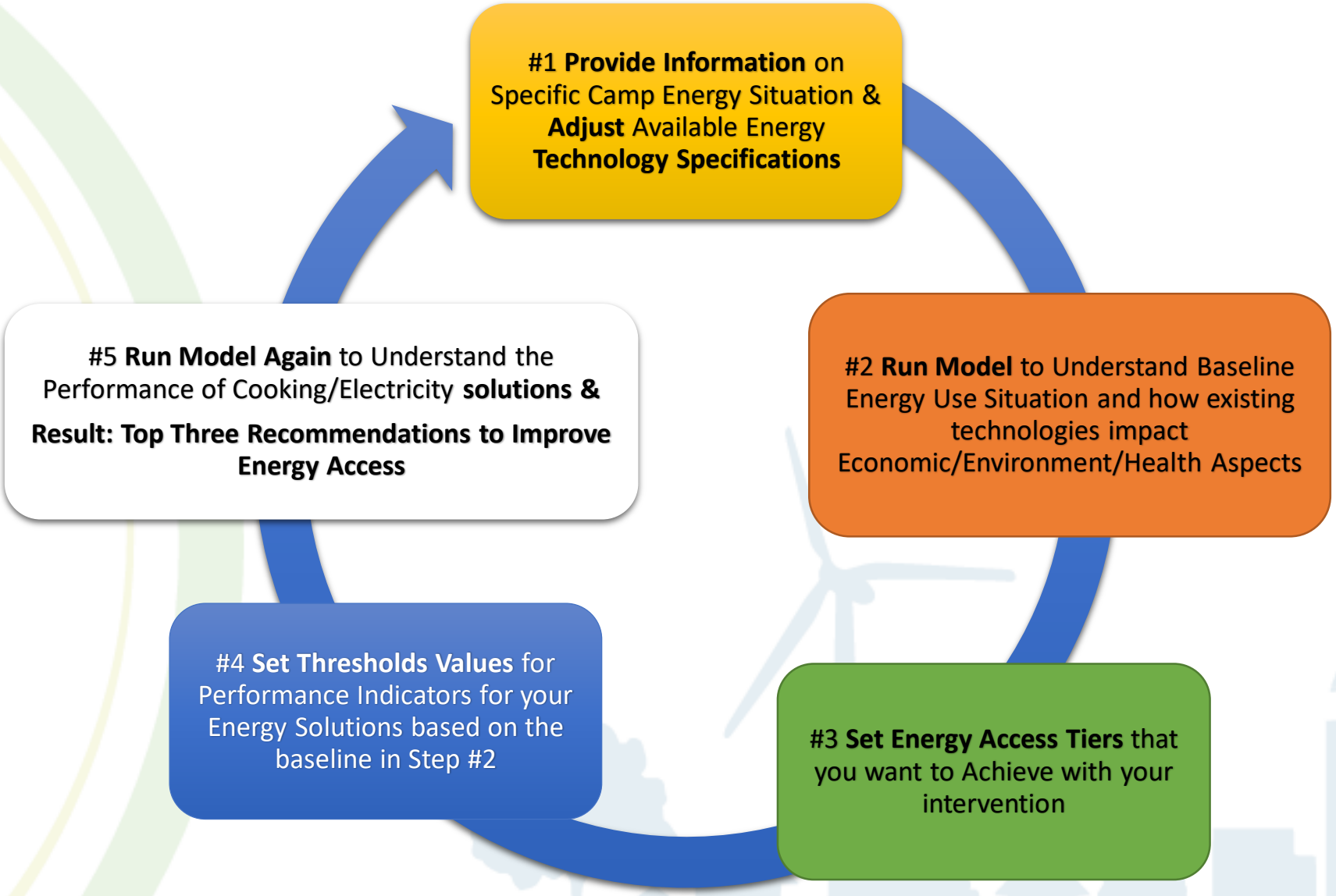
Five Steps in HEED-RER Tool Usage



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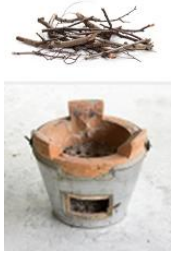
Cooking Stove & Fuel Combinations currently comparable

Traditional three stones stove & wood fuel		Traditional three stones stove & charcoal		Basic cooking stove from clay & wood fuel		Basic cooking stove from clay & charcoal	
Cookstove From fired clay (ceramic) & wood fuel		Cookstove made with fired clay (ceramic) & charcoal		Improved stove from metal with side feeder & wood fuel		Improved stove from metal with side feeder & charcoal	
Improved stove from metal batch loaded & woodfuel		Improved stove from metal batch loaded & charcoal		Gasifier Stove built for burning pellets & pellet fuel		Cookstove for liquid fuel with ethanol	
Cook stove for liquid fuel with kerosene		Cook stove for gas burning with LPG supply		Cook stove for gas burning with biogas supply		Modern Cook Stoves Induction Electric Cooker	

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Household Lighting & Electricity options currently comparable in

Rooftop / 100% Solar Electricity		Rooftop 100% Solar Electricity + 2 hours battery storage		Rooftop 100% Solar Electricity + 4 hours battery storage		Rooftop 100% Solar Electricity + 6 hours battery storage	
Rooftop 100% Solar Electricity + 8 hours battery storage		Centralised 100% Solar Electricity + Diesel Generation		Centralised 100% Wind Electricity + Diesel Generation		Centralised 50% Solar + 50% Wind Electricity + Diesel Generation	
Centralised 100% Solar-PV Electricity + Lithium-Ion Batteries		Centralised 100% Wind Electricity + Lithium-Ion Batteries		Centralised 50% Solar + 50% Wind Electricity + Lithium-Ion Batteries			

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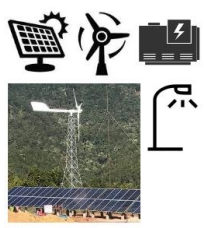
Camp community / infrastructure energy currently comparable in

100% Solar Street Lighting + 100% Solar + Diesel Generation		100% Solar Street Lighting + 100% Wind Electricity + Diesel Generation		100% Solar Street Lighting + 50% Solar + 50% Wind + Diesel Generation		100% Solar Street Lighting + 100% Solar + Lithium-Ion Batteries	
100% Solar Street Lighting + 100% Wind Electricity + Lithium-Ion Batteries		100% Solar Street Lighting + 50% Solar + 50% Wind + Lithium-Ion Batteries		100% Grid Street Lighting + 100% Solar + Diesel Generation		100% Grid Street Lighting + 100% Wind + Diesel Generation	
100% Grid Street Lighting + 50% Solar + 50% Wind + Diesel Generation		100% Grid Street Lighting + 100% Solar + Lithium-Ion Batteries		100% Grid Street Lighting + 100% Wind + Lithium-Ion Batteries		100% Grid Street Lighting + 50% Solar + 50% Wind + Lithium-Ion Batteries	

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Dashboard Result: Energy Technologies Compared on Indicators

Total thresholds met, the higher the better

					Options Fitting your Selected Energy Tier		
Number of Minimum or Maximum Thresholds Met by Intervention ----->				6	7	4	6
Option Energy Access Tiers ----->				0.56	2	1	1
Click to Calculate Threshold Scoring & Ranking Score of Cooking Solutions			User Thresholds for Cooking	Current Situation	Cookstove made with fired clay (ceramic) with charcoal supply	Improve stove from metal fueled with side feeder with woodfuel supply	Basic cooking stove made out of clay with charcoal supply
Camp - Investment cost for cooking interventions	franc (RWF)	one off	78,200,000	8,289,835	15,550,421	143,616,000	12,949,376
Camp - Total Cooking Fuel Cost	franc (RWF)	Per month	20,400,000	18,521,113	12,174,931	11,830,867	20,291,551
Camp - Carbon Dioxide emissions per year	Tonnes	Per year	3,000	6,366	2,387	4,818	3,979
Camp - Annual area deforested for woodfuel use	km2	per year	0	0.277	0.31	0.15	0.85
Camp - Area used for providing woodfuel from plantations	km2		2	0.007	0.00	0.00	0.00
Household - Unaffordability of Cooking Fuel	Very Low/Low/Medium/High/Very high		Low	Very high	Very high	Very high	Very high

Energy Access Level

Performance indicator

Unit

Thresholds set by user

Baseline result

Results for calculated technology options

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The Tool Identifies the Top 3 Best Scoring Options

Household Cooking

Click to Calculate Threshold Scoring & Ranking Score of Cooking Solutions

Indicator	Unit	Period	User Thresholds for Cooking	Current Situation	ions Fitting your Selected Energy: Cookstove made with fired clay (ceramic) with charcoal supply	Improve stove from metal fueled with side feeder with woodfuel supply	Basic cooking stove made out of clay with charcoal supply
Number of Minimum or Maximum Thresholds Met by Intervention ----->				6	7	4	6
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Camp - Area used for providing woodfuel from plantations	km2		2	0.007	0.00	0.00	0.00
Household - Unaffordability of Cooking Fuel	Very Low/Low/Medium/High/Very high		Low	Very high	Very high	Very high	Very high
Household - Monthly Cooking Fuel Cost	franc (RWF)	Per day	10,000	5,262	3,459	3,361	5,765
Household - Cost of purchasing cooking stove	franc (RWF)	one off	10,000	2,355	4,418	40,800	3,679
Household - Carbon Dioxide emissions per family per year	Tonnes	Per year	6.00	1.89	0.68	1.37	1.13
Household - Health risk associated with cooking	Very Low/Low/Medium/High/Very high		Low	Very high	High	High	High

Options that are more advanced than Your Selected Energy Tier or meet less criteria thresholds set by you

Indicator	Gasifier Stove built for burning pellets with pellet supply	Cook stove for gas burning with LPG supply	Modern Cook Stoves Induction Electric Cooker	Improve stove from metal that is batch loaded with charcoal supply	Cook stove for liquid fuel combustion with kerosene supply	Cook stove for liquid fuel combustion with ethanol supply	Cook stove for gas burning with biogas supply	Improve stove from metal fueled with side feeder with charcoal supply	Improve stove from metal that is batch loaded with woodfuel supply	Cookstove made with fired clay (ceramic) with woodfuel supply	Traditional stove - three stones with pot or alternatives - with woodfuel supply	Traditional stove - three stones with pot or alternatives - with charcoal supply	Basic cooking stove made out of clay with woodfuel supply
Number of Minimum or Maximum Thresholds Met by Intervention ----->	5	5	5	6	6	7	7	4	4	6	5	5	6
Option Energy Access Tiers ----->	3	3	3	3	3	3	3	2	2	2	0	0	0
Camp - Investment cost for cooking interventions	123,669,333	98,935,467	167,552,000	143,616,000	146,009,600	146,009,600	98,935,467	143,616,000	143,616,000	15,550,421	0	0	12,949,376
Camp - Total Cooking Fuel Cost	7,708,800	80,583,294	139,626,667	7,609,332	34,148,693	11,236,836	0	16,909,626	8,518,224	8,518,224	23,661,733	33,819,252	14,197,040
Camp - Carbon Dioxide emissions per year	3,401	1,436	0	1,492	1,643	1,322	2,166	3,316	3,469	3,469	9,636	6,631	5,782
Camp - Annual area deforested for woodfuel use	0.14	0.00	0.00	0.19	0.00	0.00	0.00	0.43	0.11	0.11	0.31	0.85	0.18
Camp - Area used for providing woodfuel from plantations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Household - Unaffordability of Cooking Fuel	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high
Household - Monthly Cooking Fuel Cost	2,190	22,893	39,667	2,162	9,701	3,192	0	4,804	2,420	2,420	6,722	9,608	4,033
Household - Cost of purchasing cooking stove	35,133	28,107	47,600	40,800	41,480	41,480	28,107	40,800	40,800	4,418	0	0	3,679
Household - Carbon Dioxide emissions per family per year	0.97	0.41	0.00	0.42	0.47	0.38	0.62	0.94	0.99	0.99	2.74	1.88	1.64
Household - Health risk associated with cooking	Low	Low	Very low	Low	Very low	Very low	Low	High	High	High	Very high	Very high	High

Thresholds set by user

Baseline result

Top 3 recommendations

Results for all other calculated technology options

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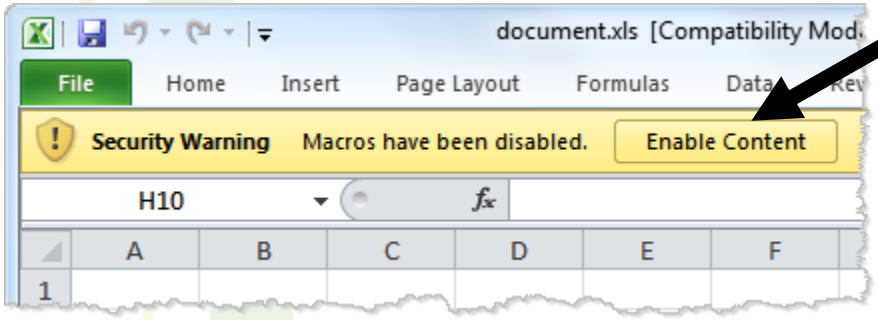
Step 1 – Opening the Spreadsheet

You need to enable "macro's" when opening the spreadsheet when prompted otherwise the results cannot be calculated.

If you see this click here



For Help about this see the Microsoft Office Documentation here:
https://support.office.com/en-us/article/enable-or-disable-macros-in-office-files-12b036fd-d140-4e74-b45e-16fed1a7e5c6

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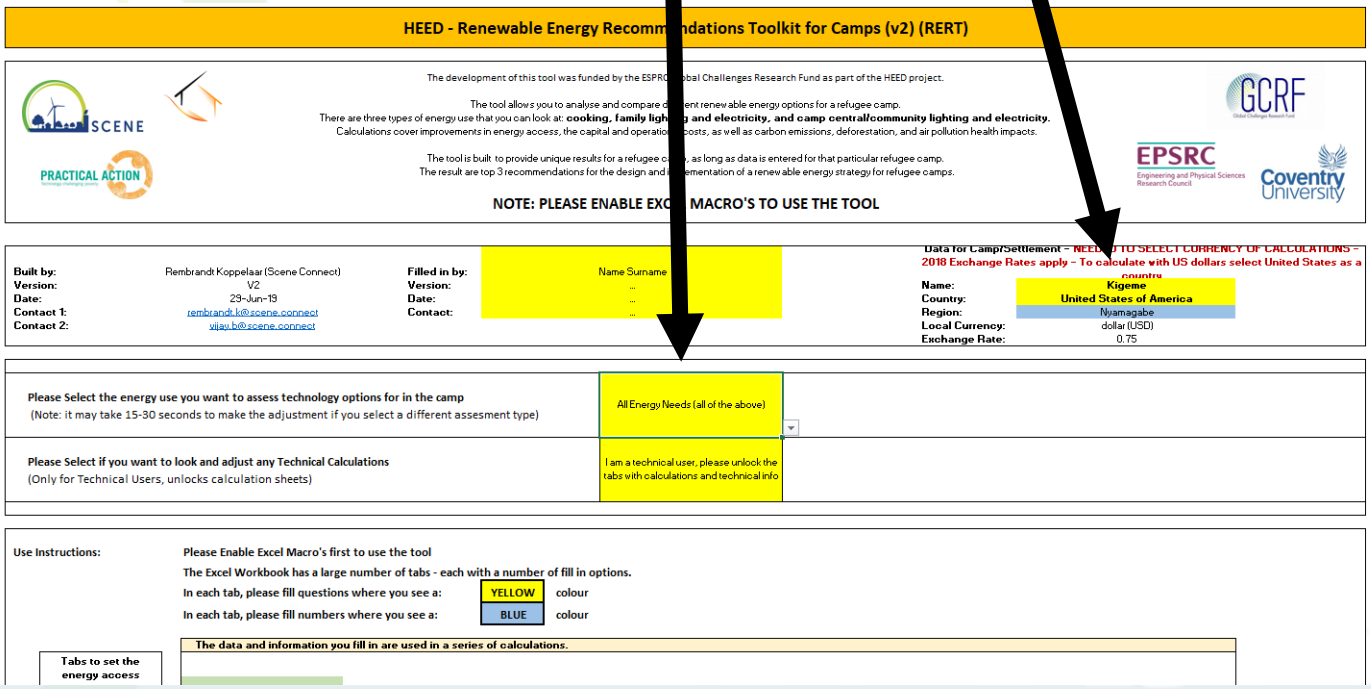
Step 2 – Fill in Overview – START HERE - tab

Overview - START HERE | Scenario Builder | #1CampMapping | #2CentralEnergyNeeds | #3HouseholdCooking | #4HouseholdElectricityLighting

- Fill this in to keep track of saved versions
- Fill this in with country, camp name and which currency to use in the calculations
- Select if you want to look only at i) cooking energy use, ii) at household electricity and lighting, iii) community/central lighting & electricity, or iv) all three of these



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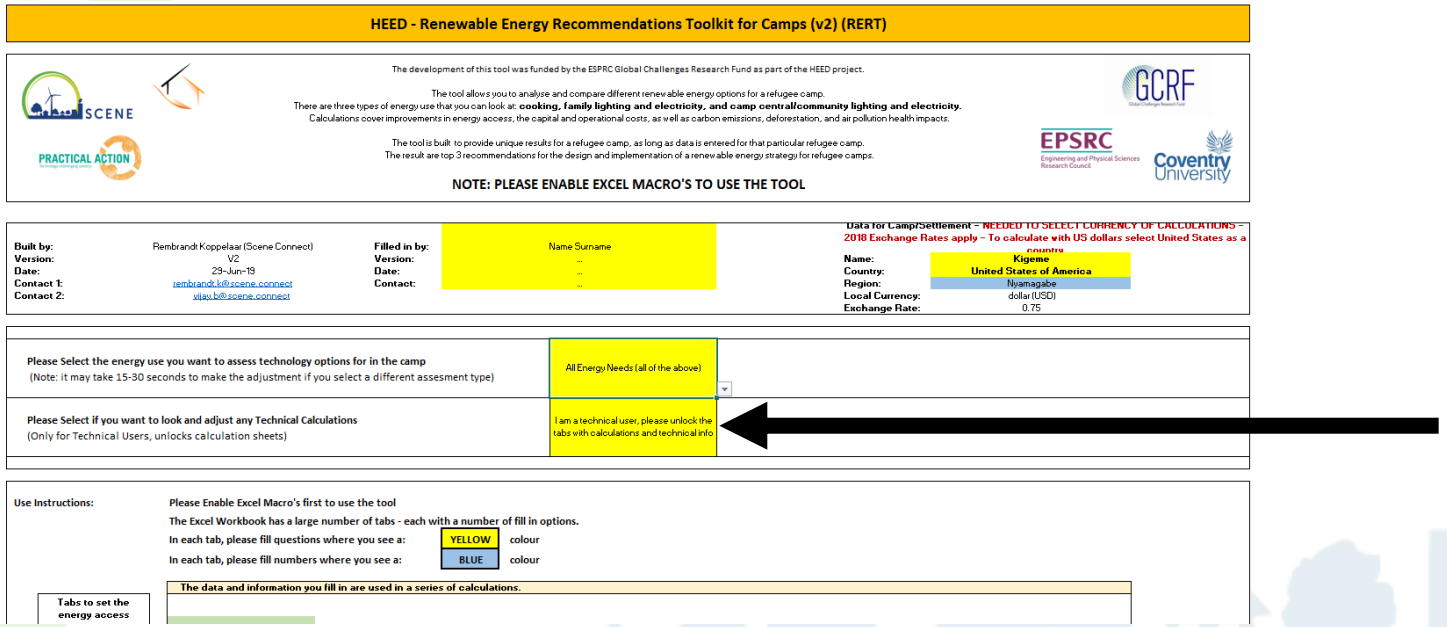
Step 2 – Select Tool Modes

Overview - START HERE | Scenario Builder | #1CampMapping | #2CentralEnergyNeeds | #3HouseholdCooking | #4HouseholdElectricityLighting

- Select here if you are a technical user or a regular user. If you select the technical user option additional spreadsheet tabs will be unlocked and made visible:
  - Calc_Energy_Demand – containing energy demand calculations
  - Calc_Energy_Supply – containing demand-supply matching calculations
  - Calculation_KPIs – containing the calculations for performance indicators



HEED - Renewable Energy Recommendations Toolkit for Camps (v2) (RERT)

The development of this tool was funded by the ESPRC Global Challenges Research Fund as part of the HEED project.

The tool allows you to analyse and compare different renewable energy options for a refugee camp.
There are three types of energy use that you can look at: **cooking, family lighting and electricity, and camp central/community lighting and electricity.**
Calculations cover improvements in energy access, the capital and operational costs, as well as carbon emissions, deforestation, and air pollution health impacts.

The tool is built to provide unique results for a refugee camp, as long as data is entered for that particular refugee camp.
The result are top 3 recommendations for the design and implementation of a renewable energy strategy for refugee camps.

NOTE: PLEASE ENABLE EXCEL MACRO'S TO USE THE TOOL

Built by:	Rembrandt Koppelaar (Scene Connect)	**Filled in by:**	Name Surname	Data for Camp/Settlement = NEEDED TO SELECT CURRENCY OF CALCULATIONS =
Version:	V2	**Version:**	..	2018 Exchange Rates apply - To calculate with US dollars select United States as a country
Date:	29-Jun-19	**Date:**	..	**Name:** Kigeme
Contact 1:	rembrandt.k@scene.connect	**Contact:**	..	**Country:** United States of America
Contact 2:	vijay.b@scene.connect			**Region:** Nyamagabe
				Local Currency: dollar (USD)
				Exchange Rate: 0.75

Please Select the energy use you want to assess technology options for in the camp (Note: it may take 15-30 seconds to make the adjustment if you select a different assesment type)	All Energy Needs (all of the above)
Please Select if you want to look and adjust any Technical Calculations (Only for Technical Users, unlocks calculation sheets)	I am a technical user, please unlock the tabs with calculations and technical info

Use Instructions:

Please Enable Excel Macro's first to use the tool
The Excel Workbook has a large number of tabs - each with a number of fill in options.
In each tab, please fill questions where you see a: YELLOW colour
In each tab, please fill numbers where you see a: BLUE colour

Tabs to set the energy access

The data and information you fill in are used in a series of calculations.

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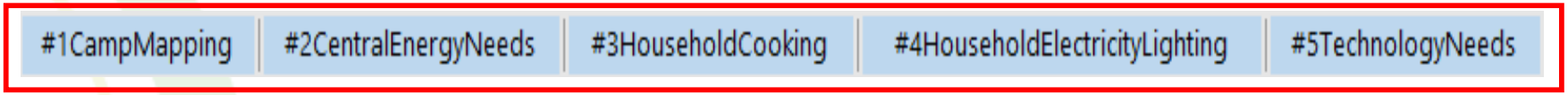
Step 3 - Guide to Provide Camp Information - where

To create an accurate baseline of the energy situation in the Entire Camp, you need to answer close to 100 questions. These are divided in five main areas (spreadsheet tabs):



- #1CampMapping, lists 9 questions about the number of people living in the camp, how many households operate businesses, its geography and the availability of vacant space,
- #2CentralEnergyNeeds, lists 20 questions about camp buildings, the source of electricity and heat, the camp's food centres, water supply, and street lights.
- #3HouseholdCooking, lists 10 questions about cooking stoves and fuel use
- #4 HouseholdElectricityLighting, lists 27 questions about use of mobile phones, lighting options available, and electrical appliances.
- #5TechnologyNeeds, lists 15 questions about the economic situation of households in the camp and the provisioning of fuels by camp management

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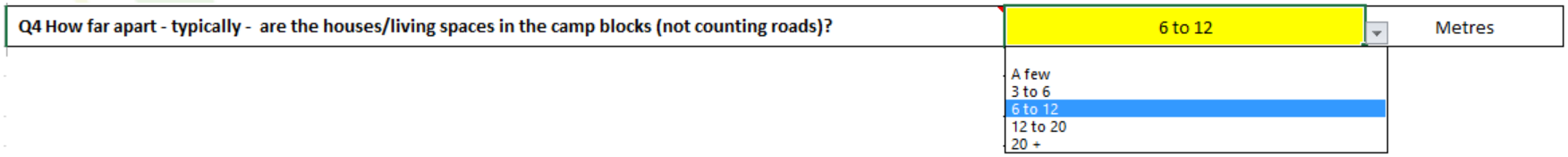
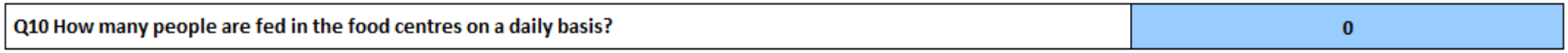
Step 3 - Guide to provide Camp Information - How

There are two types of questions to fill in for each camp

- Multiple choice (yellow fields) with a selection drop down list:



- Open questions (blue fields) where you need to fill in a quantity or a name



In some cases you may be prompted that you have filled in an answer that falls outside of the range that is possible (for example 12 out of 10 is not possible). If you fill in more or less than 10 when the totals should sum up to 10, you will be prompted to make sure as few errors as possible are entered.

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Step 4 – Calculate Results to obtain a Baseline

#3HouseholdCooking	#4HouseholdElectricityLighting	#5TechnologyNeeds	RESULTS

The results are calculated in the "results" tab separately for each type of energy use:

i) Cooking Energy,
ii) Household Lighting and Electricity,
iii) Community Lighting and Electricity.

After you have filled in the answers to the tool questions for the first time, you can go to the results section and click on the calculate buttons

Buttons for Calculating Results

Click to Calculate Threshold Scoring & Ranking Score of Cooking Solutions

Click to Calculate Threshold Scoring & Ranking of Household Lighting & Electricity Solutions

Click to Calculate Threshold Scoring & Ranking Score of Community Lighting & Electricity Solutions

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Step 5 – Read the Baseline Performance

Click Here to Calculate the Results for Cooking Solutions

			User Set Thresholds for Cooking (if set in Scenario Builder)	Estimate for Current Camp Situation
Camp - Investment cost for cooking interventions (max threshold)	dollar (USD)	one off	0	35,866
Camp - Total Cooking Fuel Cost (max threshold)	dollar (USD)	Per month	0	14,830
Camp - Carbon Dioxide emissions per year (max threshold)	Tonnes	Per year	0	4,497
Camp - Annual area at risk from deforestation for woodfuel use (max threshold)	km2	per year	0	0.210
Camp - Area used for providing woodfuel from plantations (max threshold)	km2		0	0.003
Household - Affordability of Cooking Fuel	Very Low/Low/Medium/High/		0	Very low
Household - Monthly Cooking Fuel Cost (max threshold)	dollar (USD)	Per day	0	4
Household - Cost of purchasing cooking stove (max threshold)	dollar (USD)	one off	0	9
Household - Carbon Dioxide emissions per family per year (max threshold)	Tonnes	Per year	0.00	0.89
Household - Health risk associated with cooking	Very Low/Low/Medium/High/		0	High

Baseline Performance Of Current Camp Situation

1. Cost 35,866 USD if existing stoves were to be bought again
2. Cost 14,830 USD to buy stove fuel per month
3. 4,497 tonnes CO2 emissions per year from cooking stoves in camp

And so forth for all indicators

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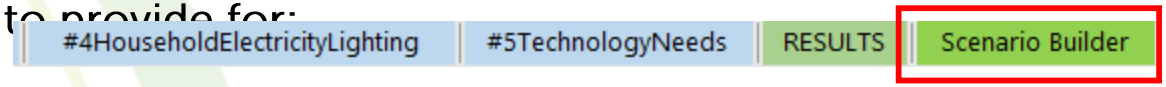
Step 6 – Set Energy Access Tier to Achieve

In the tab "Scenario Builder" you can set the Energy Access Tiers for Cooking, Lighting, Street Lighting, Electricity and Heating that the recommendations need to provide for:



The impact is that the 3 main recommended solutions will be selected within the desired tier of energy access (e.g. if selecting tier 1 the recommendations will be

Cooking	Tier 1	**Tier 1:** < 7 hours per week fuel acquisition preparation time, < 15 minutes stove preparation minutes per meal, ≤ 800 µg/m3 Particulate Matter 2.5 exposure, **Tier 2:** < 4 hours per week fuel acquisition preparation time, < 10 minutes stove preparation minutes per meal, ≤ 400 µg/m3 Particulate Matter 2.5 exposure, **Tier 3:** < 1.5 hours per week fuel acquisition preparation time, < 5 minutes stove preparation minutes per meal, ≤ 170 µg/m3 Particulate Matter 2.5 exposure,
Lighting	Keep current baseline	**Tier 1:** 1000 lumen hours per day, availability > 4 hours per day. **Tier 2:** Electrical lighting, availability > 4 hours per day. **Tier 3:** Electrical lighting, availability > 8 hours per day.
Street Lighting	Tier 2	**Tier 1:** One functional street lamp in neighbourhood, availability 2 night hours per day **Tier 2:** 25% of neighbourhood covered with street lighting, availability 4 night hours per day **Tier 3:** 50% of neighbourhood covered with street lighting, availability 50% of night hours per day
Electricity	Tier 2	**Tier 1:** Electricity for tasks lighting and phone charging, with power of 3 Watts, capacity at 12 Watt-hours, and availability of 4 hours per day and 1 hour per ever **Tier 2:** Electricity for general lighting + phone charging + television + fan, with power of 50 Watts, capacity at 200 Watt-hours, and availability of 4 hours per day **Tier 3:** Electricity for general lighting + phone charging + television + fan + medium power appliances like refrigerators, air coolers, food processors etc., with po and availability of 8 hours per day and 3 hours per evening.
Heating	Tier 3	**Tier 1:** Personal space around individuals heated, required fuel collection time 7 hours per week. **Tier 2:** One or more rooms heated, required fuel collection time 3 hours per week. **Tier 3:** One or more rooms heated, required fuel collection time 1.5 hours per week.

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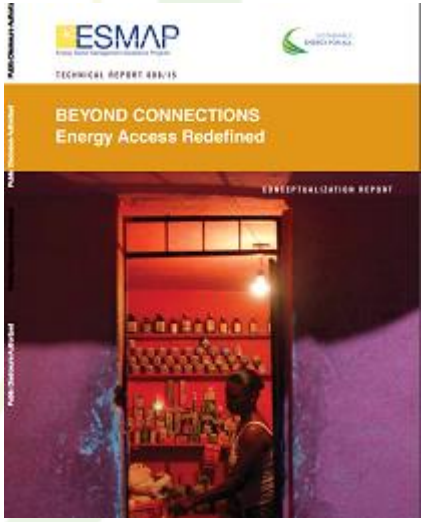
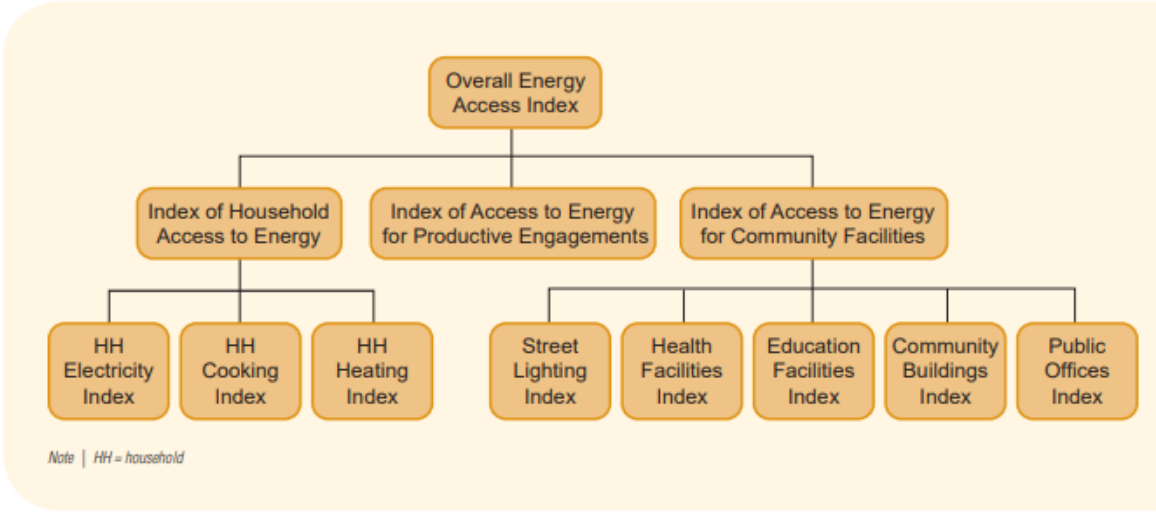
Step 6 – What are Energy Access Tiers?

The Energy Access Tiers framework was setup by ESMAP (Energy Sector Management Assistance Programme) to provide a common approach to understand the energy access for different types of energy use. It contains tables that outline under which conditions people or families achieve energy access levels ranging from 0 to 5 (see table below for the different type of indices).

More details can be found here: https://www.esmap.org/node/55526





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Step 7 – Set thresholds for indicators

In the tab "Scenario Builder" you can also set the minimum or maximum thresholds that a solution needs to take into account. Each technology solution is weighted on how many threshold option set by you it meets.

If there are 10 performance indicators (like for Cooking in v1) each cooking stove + fuel solution can receive a score between 0 and 10 points

Thresholds can be compared and set relative to the baseline situation. For example set a threshold that the cooking fuel cost per month should be at maximum as high as the current expenditure, or that the carbon dioxide emissions should be 50% lower in tonnage of CO2 per year.

Example Threshold Levels for Cooking Solutions to meet that are set by the user

Household Cooking - Select your Solution Thresholds		
1. Camp - Maximum - Investment cost for cooking interventions	78,200,000	franc (RWF)
2. Camp - Maximum - Total Cooking Fuel Cost	20,400,000	franc (RWF)
3. Camp - Maximum - Carbon Dioxide emissions per year	3000	Tonnes
4. Camp - Maximum - Annual area deforested for woodfuel use	0	km2 / year
5. Camp - Maximum - Area used for providing woodfuel from plantations	2	km2
6. Household - Maximum - Affordability of Cooking Fuel	Low	
7. Household - Maximum - Monthly Cooking Fuel Cost	10,000	franc (RWF)
8. Household - Maximum - Cost of purchasing cooking stove	10,000	franc (RWF)
9. Household - Maximum - Carbon Dioxide emissions per family per year	6	Tonnes
10. Household - Maximum - Health risk associated with cooking	Low	

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Step 7 – Set thresholds for indicators

In the tab "Scenario Builder" you can also set the minimum or maximum thresholds that a solution needs to take into account. Each technology solution is weighted on how many threshold option set by you it meets.

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2. Camp - Maximum - Total Cooking Fuel Cost	20,400,000	franc (RWF)
3. Camp - Maximum - Carbon Dioxide emissions per year	3000	Tonnes
4. Camp - Maximum - Annual area deforested for woodfuel use	0	km2 / year
5. Camp - Maximum - Area used for providing woodfuel from plantations	2	km2
6. Household - Maximum - Affordability of Cooking Fuel	Low	
7. Household - Maximum - Monthly Cooking Fuel Cost	10,000	franc (RWF)
8. Household - Maximum - Cost of purchasing cooking stove	10,000	franc (RWF)
9. Household - Maximum - Carbon Dioxide emissions per family per year	6	Tonnes
10. Household - Maximum - Health risk associated with cooking	Low	

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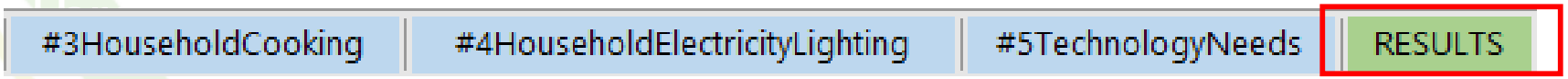
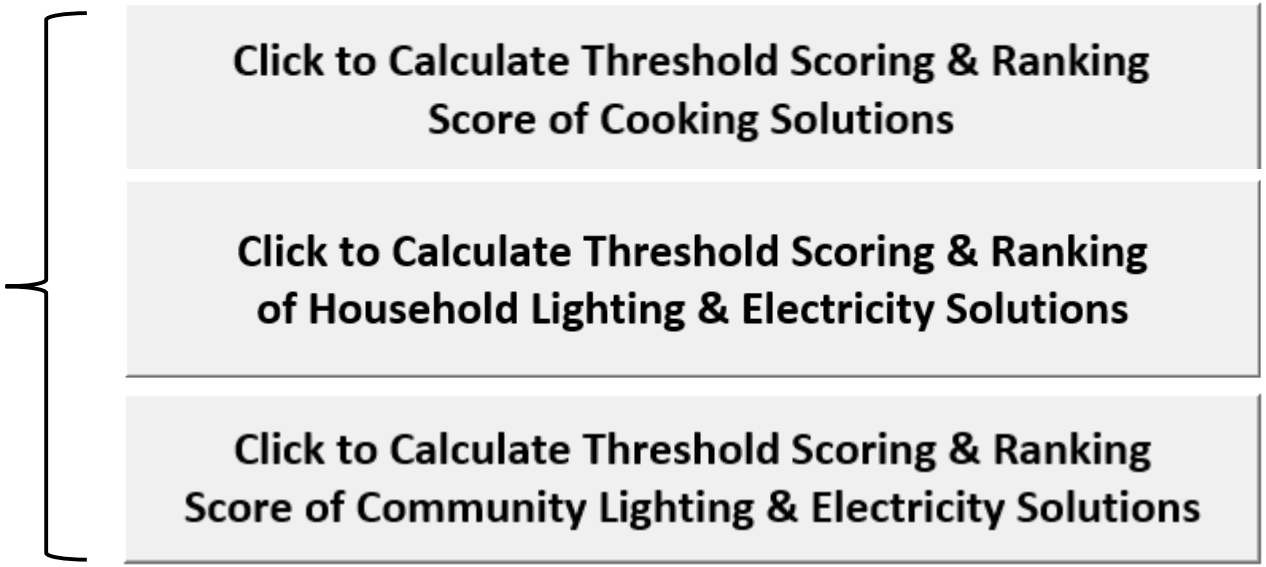
Step 8 – Re-run results with your Energy Access Tier +



You can now re-run the results:

i) Cooking Energy,
ii) Household Lighting and Electricity,
iii) Community Lighting and Electricity.

Buttons for Calculating Results



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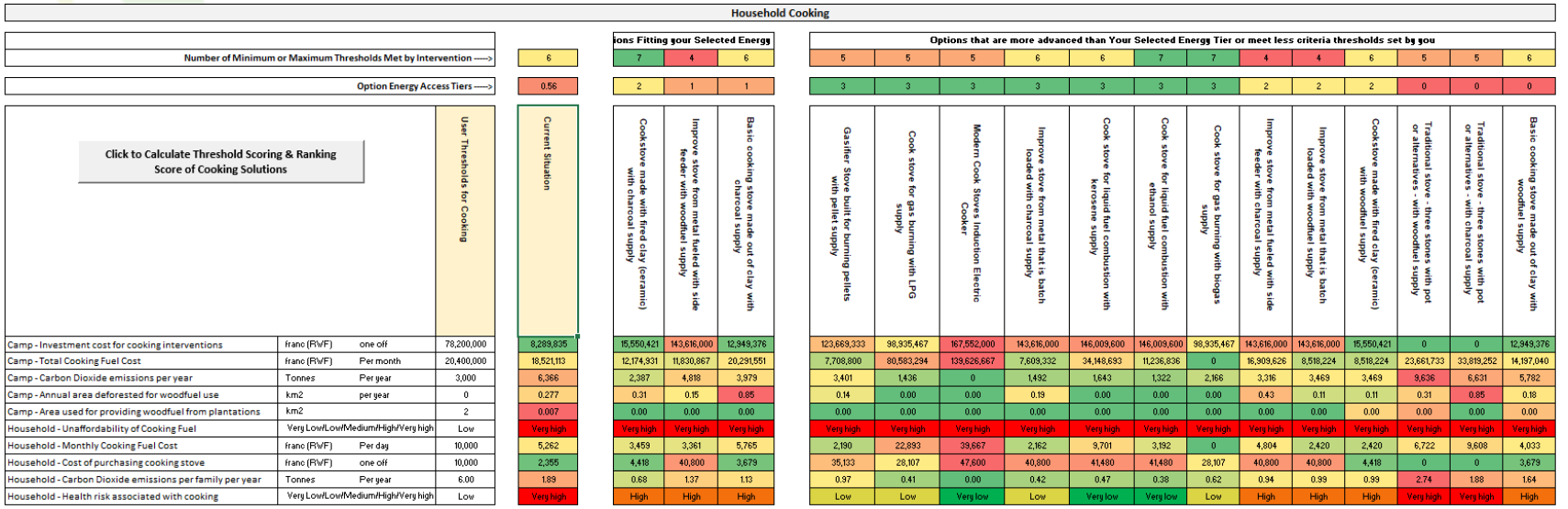
Step 9 – Interpret your Results

Performance of options scoring +
Energy Access Tiers provided by Options



Household Cooking

			User Thresholds for Cooking	Current Situation	Cookstove made with fired clay (ceramic) with charcoal supply	Improve stove from metal fueled with side feeder with woodfuel supply	Basic cooking stove made out of clay with charcoal supply	Gasifier Stove built for burning pellets with pellet supply	Cook stove for gas burning with LPG supply	Modern Cook Stoves Induction Electric Cooker	Improve stove from metal that is batch loaded with charcoal supply	Cook stove for liquid fuel combustion with kerosene supply	Cook stove for liquid fuel combustion with ethanol supply	Cook stove for gas burning with biogas supply	Improve stove from metal fueled with side feeder with charcoal supply	Improve stove from metal that is batch loaded with woodfuel supply	Cookstove made with fired clay (ceramic) with woodfuel supply	Traditional stove - three stones with pot or alternatives - with woodfuel supply	Traditional stove - three stones with pot or alternatives - with charcoal supply	Basic cooking stove made out of clay with woodfuel supply
Number of Minimum or Maximum Thresholds Met by Intervention ---->				6	7	4	6	5	5	5	6	6	7	7	4	4	6	5	5	6
Option Energy Access Tiers ---->				0.56	2	1	1	3	3	3	3	3	3	3	2	2	2	0	0	0
Camp - Investment cost for cooking interventions	franc (FWF)	one off	78,200,000	8,289,835	15,550,421	143,616,000	12,949,376	123,669,333	98,935,467	167,552,000	143,616,000	146,009,600	146,009,600	98,935,467	143,616,000	143,616,000	15,550,421	0	0	12,949,376
Camp - Total Cooking Fuel Cost	franc (FWF)	Per month	20,400,000	18,521,113	12,174,931	11,830,867	20,291,551	7,708,800	80,583,294	139,626,667	7,609,332	34,148,693	11,236,836	0	16,909,626	8,518,224	8,518,224	23,661,733	33,819,252	14,197,040
Camp - Carbon Dioxide emissions per year	Tonnes	Per year	3,000	6,366	2,387	4,818	3,979	3,401	1,436	0	1,492	1,643	1,322	2,166	3,316	3,469	3,469	9,636	6,631	5,782
Camp - Annual area deforested for woodfuel use	km2	per year	0	0.277	0.31	0.15	0.85	0.14	0.00	0.00	0.19	0.00	0.00	0.00	0.43	0.11	0.11	0.31	0.85	0.18
Camp - Area used for providing woodfuel from plantations	km2		2	0.007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Household - Unaffordability of Cooking Fuel	Very Low/Low/Medium/High/Very high		Low	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high	Very high
Household - Monthly Cooking Fuel Cost	franc (FWF)	Per day	10,000	5,262	3,459	3,361	5,765	2,190	22,893	39,667	2,162	9,701	3,192	0	4,804	2,420	2,420	6,722	9,608	4,033
Household - Cost of purchasing cooking stove	franc (FWF)	one off	10,000	2,355	4,418	40,800	3,679	35,133	28,107	47,600	40,800	41,480	41,480	28,107	40,800	40,800	4,418	0	0	3,679
Household - Carbon Dioxide emissions per family per year	Tonnes	Per year	6.00	1.89	0.68	1.37	1.13	0.97	0.41	0.00	0.42	0.47	0.38	0.62	0.94	0.99	0.99	2.74	1.88	1.64
Household - Health risk associated with cooking	Very Low/Low/Medium/High/Very high		Low	Very high	High	High	High	Low	Low	Very low	Low	Very low	Very low	Low	High	High	High	Very high	Very high	High

Click to Calculate Threshold Scoring & Ranking Score of Cooking Solutions

Thresholds set by user

Baseline result

Top 3 recommendations

Results for all other calculated technology options

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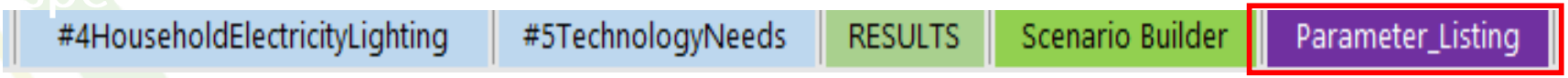
Step 10 – Make specific changes in technology

spe



In addition to the camp questions, in the "Parameter-Listing tab there are several hundred values that define the technologies compared in the model and the calculations.

For example, if you have specific data for a specific stove you can adjust that here, if you have specific information about the cost of solar, if you have data on the energy use of appliances, and so forth.

Any value in green can be edited here directly and this will change the calculations. Once editing a value here (or in the camp questions) you can run the results again and get an updated insight in the performance of the solutions.

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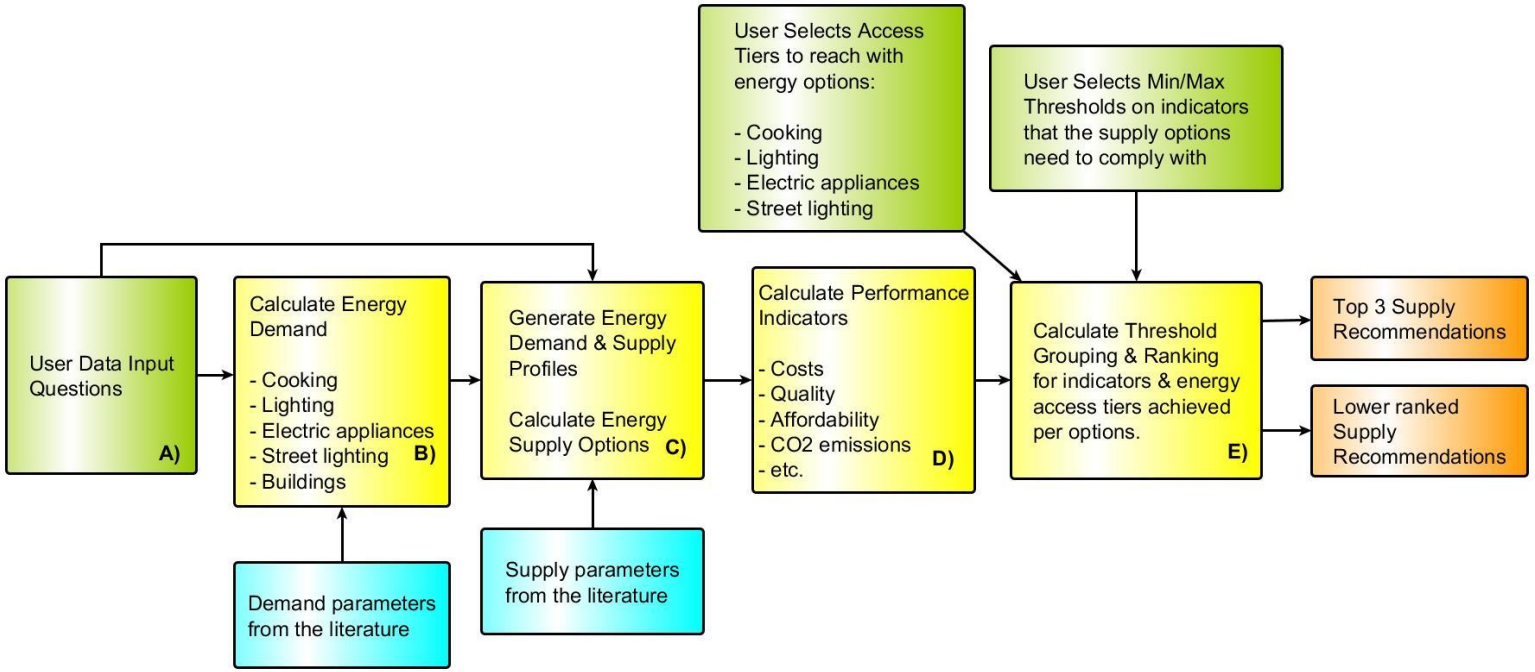
Overview of Models and Methods used

The user guide explained the usage process for the RER tool. More detailed technical information can be found in the technical documentation made to describe the calculations carried out in the tool. An overview of the calculation steps is shown in the figure below.



Link to technical documentation: [to be added when online repository is completed]

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In case of questions about HEED please contact Elena Gaura (csx216@Coventry.ac.uk).

For technical questions about this tool please contact Rembrandt Koppelaar (rembrandt.k @ scene.community).

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