



SDG7 Energy Compact of ZIPOLOPOLO COOKSTOVE SOLUTIONS

A next Decade Action Agenda to advance SDG7 on sustainable energy for all, in line with the goals of the Paris Agreement on Climate Change

SECTION 1: AMBITION

1.1. Ambitions to achieve SDG7 by 2030. [Please select all that apply, and make sure to state the baseline of each target]

(Member States targets could be based on their NDCs, energy policies, national five-year plans etc. targets for companies/organizations could be based on their corporate strategy)

<input type="checkbox"/> 7.1. By 2030, ensure universal access to affordable, reliable and modern energy services.	<p>Target(s):</p> <ul style="list-style-type: none"> ● To mainstream an <u>affordable pellet cookstove</u> that uses sustainably produced pellet fuel (made from human food agricultural waste). ● Presently, there is no mainstream pellet cookstove in Malawi. ● While still better than traditional charcoal stoves concerning indoor air pollution, this compact is less about improved indoor air pollution, but more about a total cookstove solution that sequesters carbon when compared with a meal cooked on a charcoal stove and a meal cooked on a pellet stove. <p>Time frame:</p> <ul style="list-style-type: none"> ● 2021 to 2030 <p>Context for the ambition(s):</p> <ul style="list-style-type: none"> ● The majority (96% of families) of fire based cookstoves in Malawi use unsustainable / illegal charcoal and wood. These stoves are: <ul style="list-style-type: none"> ○ Wood - 3 Stone Stove ○ Wood - Chitetezo Mbaula ○ Charcoal - Jiko Style Mbaula ● The ambition is to provide an alternative and suitable stove that uses legal and sustainable fuel, instead of illegal / unsustainably sourced charcoal and wood fuel
<input type="checkbox"/> 7.2. By 2030, increase substantially the share of renewable energy in the global energy mix.	<p>Target(s):</p> <ul style="list-style-type: none"> ● To mainstream <u>affordable pellet fuel</u> made from sustainable and annually grown human food agricultural waste ● Presently, there is no mainstream pellet fuel in Malawi. ● While still better than traditional charcoal fuel concerning indoor air pollution, this compact is less about improved indoor air pollution, but more about a total cookstove solution that sequesters carbon when compared with a meal cooked with charcoal fuel and a meal cooked with pellet fuel. <p>Time frame:</p> <ul style="list-style-type: none"> ● 2021 until 2030 <p>Context for the ambition(s):</p> <ul style="list-style-type: none"> ● 96% of Malawi's energy for cooking and heating comes from illegal / unsustainable wood and charcoal ● The ambition is to provide an alternative fuel as a suitable replacement for illegal / unsustainably sourced charcoal and wood fuel
<input type="checkbox"/> 7.3. By 2030, double the global rate of improvement in energy efficiency.	<p>Target(s):</p> <p>Time frame:</p> <p>Context for the ambition(s):</p>

<input type="checkbox"/> 7.a. By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.	Target(s): Time frame: Context for the ambition(s):
<input type="checkbox"/> 7.b. By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programs of support.	Target(s): Time frame: Context for the ambition(s):

1.2. Other ambitions in support of SDG7 by 2030 and net-zero emissions by 2050. *[Please describe below e.g., coal phase out or reforming fossil fuel subsidies etc.]*

Target(s): <ul style="list-style-type: none"> • Same as 7.1 and 7.2 above Time frame: <ul style="list-style-type: none"> • Same as 7.1 and 7.2 above Context for the ambition(s): <ul style="list-style-type: none"> • Same as 7.1 and 7.2 above

SECTION 2: ACTIONS TO ACHIEVE THE AMBITION

2.1. Please add at least one key action for each of the elaborated ambition(s) from section 1. *[Please add rows as needed].*

<i>Description of action (please specify for which ambition from Section 1)</i> <ul style="list-style-type: none"> • Design and produce a cookstove, that financially competes with existing cookstoves that use illegal / unsustainable wood and charcoal 	<i>Start and end date</i> Already started & ending 2030
<i>Description of action (please specify for which ambition from Section 1)</i> <ul style="list-style-type: none"> • Produce pellets, for this cookstove, made from annually grown agricultural human food waste (maize stalks and husks, groundnut shells, rice husks, etc) 	<i>Start and end date</i> Already started and ending 2030
<i>Description of action (please specify for which ambition from Section 1)</i>	<i>Start and end date</i>
<i>Description of action (please specify for which ambition from Section 1)</i>	<i>Start and end date</i>

SECTION 3: OUTCOMES

3.1. Please add at least one measurable and time-based outcome for each of the actions from section 2. *[Please add rows as needed].*

<i>Outcome</i>	<i>Date</i>
Based upon 2 cooking sessions per day per stove (450g pellet fuel): <ul style="list-style-type: none"> ● Fuel Pellets <ul style="list-style-type: none"> ○ Year 2021 to 2021 – 10,000 kg total sales ○ Year 2022 to 2030 – 540,000 kg total sales ● Pellet Stoves <ul style="list-style-type: none"> ○ Year 2021 to 2022 – 61 stoves total sales ○ Year 2021 to 2030 – 3,349 stoves total sales ○ Starting with 61 stoves in 2021 and doubling every year till 2030 <ul style="list-style-type: none"> ■ 2021 = 61 stoves, 2022 = 122 stoves, 2023 = 183 stoves ... 2030 total = 3,349 stoves 	

SECTION 4: REQUIRED RESOURCES AND SUPPORT

4.1. Please specify required finance and investments for each of the actions in section 2.

<ul style="list-style-type: none"> ● Services – National media campaign to promote the cookstove solution @ US\$1,500 per month from now until 2030 – approx. 108 months = US\$162,000 ● Finance – To buy and store 550 tons of pellets over a 9 year period – US\$ 1.23 million ● Zipolopolo Cookstoves Solutions has made the investment of: <ul style="list-style-type: none"> ○ Responding to the global call to provide solutions to reduce GHG emissions that are affecting climate change ○ Designing the cookstove, training local manufacturers how to make it (it is not a copy, it is an original) and already selling the first approx 100 units during 2021 as a proof of concept ○ Establishing a pellet fuel supply chain from the farms (raw material) to the pelletiser (end product) ○ Establishing a cookstove supply chain using local market vendors ● To mainstream both the cookstove and the pellet fuel, Zipolopolo Cookstove Solutions needs investment for marketing and pellet fuel
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4.2. [For countries only] In case support is required for the actions in section 2, please select from below and describe the required support and specify for which action.

[Examples of support for Member States could include: Access to low-cost affordable debt through strategic de-risking instruments, capacity building in data collection; development of integrated energy plans and energy transition pathways; technical assistance, etc.]

<input type="checkbox"/> Financing	<i>Description</i>
<input type="checkbox"/> In-Kind contribution	<i>Description</i>
<input type="checkbox"/> Technical Support	<i>Description</i>
<input type="checkbox"/> Other/Please specify	<i>Description</i>

SECTION 5: IMPACT

5.1. Countries planned for implementation including the number of people potentially impacted.

Malawi

- 3,349 Zipolopolo Pellet Stoves x average Malawi household size of 4.4 = 14,734 impacted people.
- 1 Zipolopolo Pellet fuel bag of 225 g has the firepower to cook a meal for 4 to 6 people ([see video on how it is done](https://youtu.be/7uHPID4f3jQ) - <https://youtu.be/7uHPID4f3jQ>)

5.2. Alignment with the 2030 Agenda for Sustainable Development – Please describe how each of the actions from section 2 impact advancing the SDGs by 2030.

[up to 500 words, please upload supporting strategy documents as needed]

Malawi

- SDG 7.1
 - Provide an affordable and sustainable end to end solution (biomass pellet based cookstove appliance and fuel service)
 - This urban / peri urban market segment is very price sensitive. Both the pellet stove and the pellet fuel compete favourably with wood/charcoal stoves and wood/charcoal fuel
 - Stove Costs
 - [Zipolopolo pellet stove](#) retails for K5,000 (approx US\$5.90)
 - [Jiko style charcoal stove](#) retails for about K4,500 (approx US\$5.30)
 - [Chitetezo mbaula](#) wood stove retails for about K3,500 (approx US\$4.10)
 - Fuel Costs
 - Legal and sustainable Zipolopolo pellet fuel retails for US\$525 per ton
 - Legal and sustainable charcoal fuel retails for about US\$730 per ton
 - Illegal and unsustainable charcoal fuel (17% of Malawi households) retails for about US\$1,180 per ton
 - Illegal and unsustainable wood fuel (79% of Malawi households) retails for about US\$100 per ton
 - 2018 census showed about 4 million households in Malawi
- SDG 7.2
 - Invest further into the biomass waste supply chain to produce more pellet fuel by leveraging the need to convert 96% of Malawian cookstove families from unsustainable / illegal wood and charcoal fuels
 - This biomass waste is sourced from farms producing food for human consumption
- Sources
 - [Malawi census 2018](#)
 - [UKAID / USAID MCHF Project](#)

5.3. Alignment with Paris Agreement and net-zero by 2050 - Please describe how each of the actions from section 2 align with the Paris Agreement and national NDCs (if applicable) and support the net-zero emissions by 2050. *[up to 500 words, please upload supporting strategy documents as needed]*

Malawi

In Malawi, you cannot have pellet fuel biomass “access to affordable, reliable, sustainable and modern energy for all” if the raw material cannot be grown due to:

- No rain
- Too much rain
- Poor soil
- Excessive heat

And, for this reason, the negative effects of climate change are very significant to achieve SDG 7 goals from a biomass perspective, as our pellet fuel biomass is agriculturally produced human food farm waste (Malawi NDC Report - July 2021 - Page 9 / Section “Malawi’s Climate Change Response”).

We have placed a lot of emphasis on the GHG emission suitability of the Zipolopolo Cookstove initiative as a GHG mitigation tool toward climate change.

3,349** stoves x average tree saving of 11 small to medium hardwood trees per stove used twice per day = 36,834 trees saved per year (not cut down for wood/charcoal stove use)

Workings

- Average charcoal use, using a charcoal stove, per meal is 200 g x 2 meals per day = 400 g x 365 days = 146 kg.
- Village style (earth kilns) wood to charcoal conversion rate is about 10:1 (10 kg wood makes about 1 kg charcoal)
- Therefore, 146 kg of charcoal requires 1,460 kg of dry tree.
- A live tree is about 35% water (excluding roots - or about 50% with roots); therefore 1,460 kg dry tree is about 2,246 kg of live tree.
- 2,246 kg of live tree is about 11 small to medium mature hardwood trees.

** at year end 2030

Paris Agreement Alignment - Nett Zero by 2050 - Malawi

- Trees
 - One mature small to medium forest hardwood tree that is cut down for charcoal would have absorbed about 21 kg of CO₂ per year.
 - Therefore, one tree saved from being cut down will absorb about 21 kg CO₂ per year.
 - If one pellet cookstove replaces one charcoal cookstove, then the Zipolopolo pellet cookstove project (of 3,349 stoves by 2030) can save the need to cut down 36,834 trees (otherwise used for wood or charcoal cookstove use).
 - 36,834 trees will absorb about 774 tCO₂.
- Charcoal
 - Almost all household cookstove charcoal in Malawi is from illegal and / or unsustainable natural hardwood forest sources.
 - About 2.7 kg of CO₂ is emitted when combusting 1 kg of charcoal (including the production of charcoal).
 - 1 stove using an average of 400 g charcoal per day (2 cooking sessions) will use about (0,40 kg x 365 days) 146 kg charcoal per year.
 - If about 2.7 kg of CO₂ is emitted when combusting 1 kg of charcoal (including the production of charcoal), then each stove will emit about 394 kg CO₂ per year x 3,349 stoves per year = 1,320 tCO₂ / year.
- Pellets
 - Our pellets are made from annually grown dried agricultural human food waste, such as maize, rice, groundnuts, etc. This food will be grown whether we like it or not, so we may as well use the biomass waste as cookstove fuel.
 - About 50% of the dry mass of biomass is carbon.
 - 1 stove using an average of 450 g pellets per day (2 cooking sessions) will use about (0,45 kg x 365 days) 164 kg pellets per year.
 - If about 50% is carbon, then each stove will emit about 82 kg per year x 3,349 stoves per year = 275 tCO₂ / year.
- Therefore
 - Based on 3,349 pellet stoves replacing 3,349 charcoal stoves by 2030, we can calculate:
 - Charcoal Stoves
 - 774 tCO₂ NOT absorbed due to tree cutting + 1,320 tCO₂s = 2,094 tCO₂ emitted into the atmosphere per year
 - Pellet Stoves
 - 774 tCO₂ absorbed due to NO tree cutting + 275 tCO₂ of pellet stove emissions = 499 tCO₂ NOT emitted (negative) into the atmosphere per year (this excludes additional CO₂ absorption from the annual crop when growing in the field)
 - Therefore
 - 1 x charcoal stove produces 0.62 tCO₂ per year
 - 1 x pellet stove removes 0.15 tCO₂ per year (assuming 1 charcoal stove is replaced by 1 pellet stove)
 - Or, 1 x pellet stove produces 0.082 tCO₂ per year (assuming 1 pellet stove is used simultaneously with 1 charcoal stove)
- Nett Reduction in CO₂
 - Unlicensed charcoal production and distribution is illegal in Malawi (although not enforced).
 - If enforced, or voluntarily, and 1 charcoal stove is replaced by 1 pellet stove, then:

- 3,349 pellet stoves will remove 499 tons of someone else's CO₂ / year (better than nett zero - carbon sequestration tool)
- 3,349 pellet stoves will save 2,094 tCO₂ / year from being emitted by charcoal cookstoves
- 3,349 pellet stoves will have a total CO₂ reduction 2,593 tons per year

- Financing

- Total funds requested for this project is US\$1,392,000.
- 3,349 cookstoves used twice per day = 6,698 cooking sessions per year ([1 pellet stove cooking session feeds 4 to 6 people](#)).
 - Using charcoal, this will emit 2,094 tCO₂ per year.
 - Using pellets, this will remove 499 tCO₂ per year (compared to the charcoal stove equivalent)
- Funds requested for this project to be nett zero = US\$1,392,000 / 2,094 tCO₂ = US\$665 per ton.
- Funds requested for this project to be 499 tCO₂ below nett zero = US\$1,392,000 / 2,593 tCO₂ = US\$537.00 per ton.

- Malawi NDC's

- As per Malawi's updated NDC of July 2021 (see below), if all identified measures were funded by 2040, emission reductions are estimated at 51% at an expected cost of US\$46 billion (excluding FOLU).
- Malawi's GHG emissions were estimated in 2017 to be 9.33 million tCO₂.
- Malawi's GHG emissions are estimated in 2040 to be 34.6 million tCO₂.
- A 51% reduction of 17.7 million tCO₂ by 2040, at a cost of US\$46 billion.
- This equates to a cost of US\$2,599 per ton (for a 51% reduction)
 - Analysis
 - Much higher than the cost of the Zipolopolo Cookstove solution
 - The Zipolopolo Cookstove solution exceeds nett zero to become a carbon sequestrator solution

- Sources

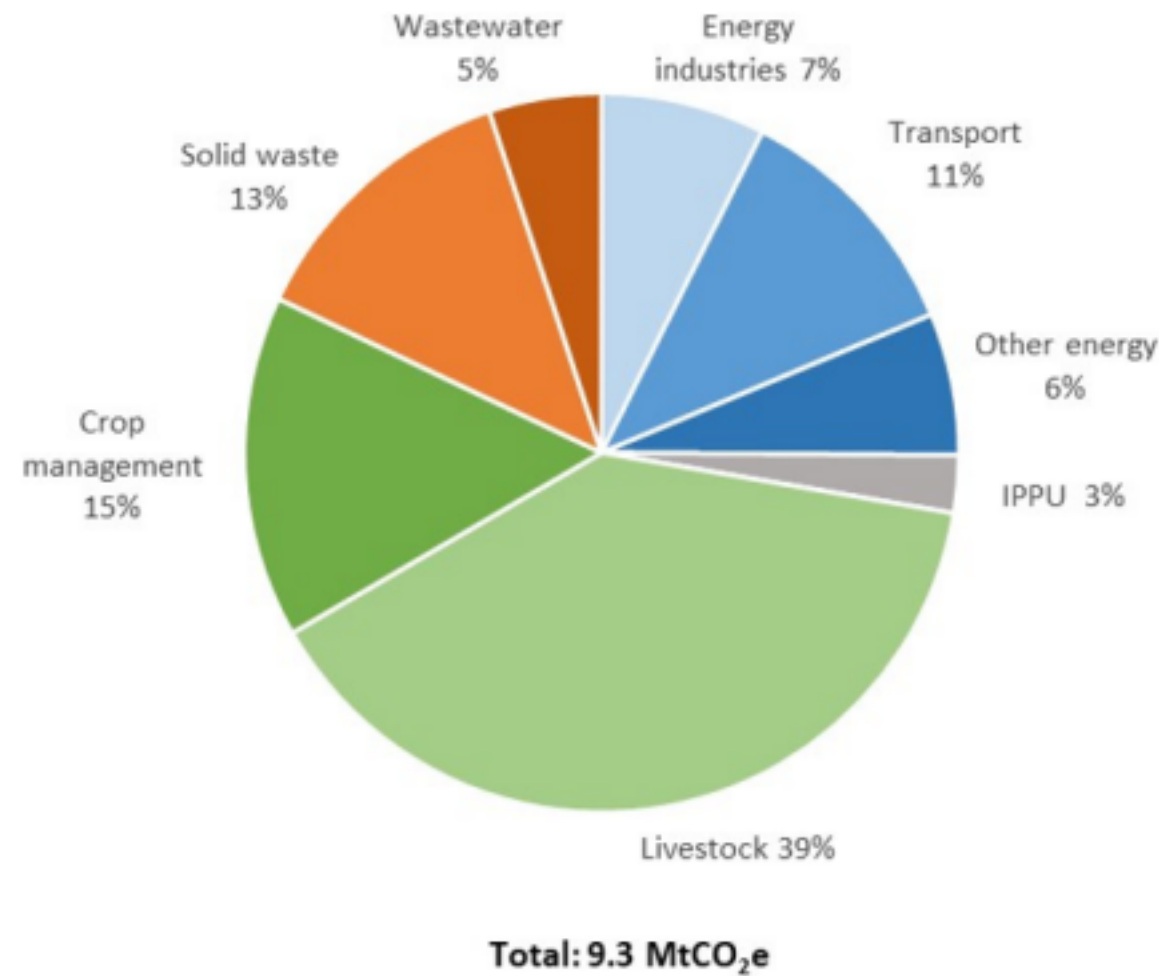
- [USDA, USA - Water in tree's](#)
 - - https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5269813.pdf
- [Wood to charcoal conversion rates + Average Charcoal Consumption + CO₂ in Charcoal Production](#)
 - - https://energypedia.info/wiki/Cooking_with_Charcoal
- [CO₂ Absorption per Tree](#)
 - - <https://www.usda.gov/media/blog/2015/03/17/power-one-tree-very-air-we-breathe>
- [Carbon in Charcoal](#)
 - - <https://www.fao.org/3/X5328E/x5328e0b.htm#:~:text=The%20fixed%20carbon%20content%20of,charcoal%20consists%20mainly%20of%20carbon>
- [CO₂ emitted when Burning Charcoal + CO₂ in Charcoal Production](#)
 - - https://energypedia.info/images/4/4a/EN-Charcoal%2C_carbon_emissions_and_international_onventions%3Bprotocols-Almeida_A._Site.pdf
- [CO₂ Emissions for Various Fuels](#)
 - - https://www.volker-quaschnig.de/datserv/CO2-spez/index_e.php
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Table 8-1 Estimated NDC funding requirements (mitigation and adaptation)

USD million	2020-2025	2025-2030	2030-2040	Total
Mitigation measures				
Unconditional contribution	1,664	1,949	5,362	8,974
Conditional contribution	2,550	5,393	24,866	32,808
Total	4,213	7,341	30,228	41,782
Adaptation measures				
Unconditional contribution	573	738	817	2,128
Conditional contribution	656	818	945	2,419
Total	1,230	1,556	1,762	4,547
Combined total	5,443	8,897	31,990	46,329

GHG emissions profile (Baseline)

GHG emissions (excl. FOLU), 2017



► Contribution of emissions sources:

- **Agriculture 54%:** livestock represents largest share (CH₄ and N₂O) followed by emissions from managed agricultural soils (N₂O)
- **Energy 25%:** Energy use in buildings for cooking, lighting, heating and cooling (LPG, diesel, kerosene); transport fuels (diesel, gasoline), energy industries (power; charcoal), and fugitive emissions
- **Waste 18%:** solid waste disposal at unmanaged dumpsites (CH₄); open burning, and waste water treatment (N₂O)
- **IPPU 3%:** mainly calcination CO₂ from clinker within cement plants, and lime production

Source data: Malawi GHGI, TNC, EC, 2020 and UNDP, 2020

GHG Mitigation Goals

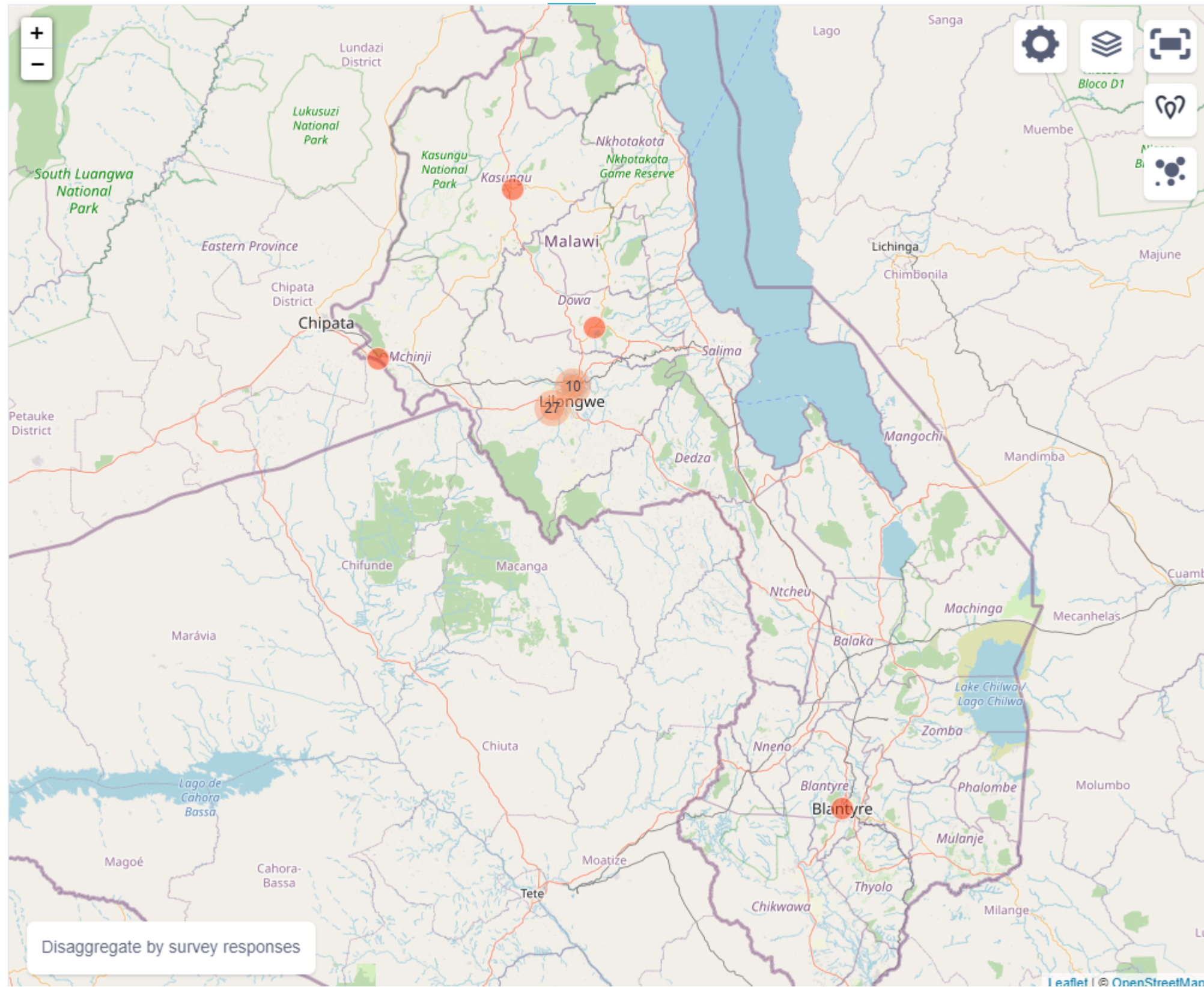
- ▶ Malawi's GHG emissions are currently among the lowest worldwide
- ▶ Under BAU scenario, emissions are forecast to increase by more than three times by 2040
- ▶ Energy use is expected to be the largest driver followed by waste generation, livestock and crop management.
- ▶ Analyses of Malawi's mitigation potential shows that projected emissions could be reduced by around 50 per cent (50%) by 2040 if all identified measures were funded.
- ▶ Energy sector account for the largest share of total potential at 85%, followed by agriculture (9%), waste (5%), and IPPU (1%)
- ▶ Much of Malawi's mitigation potential could be achieved at relatively low cost (<\$30/tCO₂e)
 - Approximately **216,000 new green jobs** could be created associated with successful implementation of the identified measures.

SECTION 6: MONITORING AND REPORTING

6.1. Please describe how you intend to track the progress of the proposed outcomes in section 3. Please also describe if you intend to use other existing reporting frameworks to track progress on the proposed outcomes.

- Sales of stoves and pellets are tracked using our own database.
- For user identification, we use the Malawi national ID system.
- We are not aware of other reporting frameworks but are happy to consider using them.

Sample - Pellet Fuel and Stove Database Map



Please use the checklist below to validate that the proposed Energy Compact is aligned with the guiding principles.

I. Stepping up ambition and accelerating action - Increase contribution of and accelerate the implementation of the SDG7 targets in support of the 2030 Agenda for Sustainable Development for Paris

Agreement I. 1. Does the Energy Compact strengthen and/or add a target, commitment, policy, action related to SDG7 and its linkages to the other SDGs that results in a higher cumulative impact compared to existing frameworks? Yes No

I.2. Does the Energy Compact increase the geographical and/or sectoral coverage of SDG7 related efforts? Yes No

I.3. Does the Energy Compact consider inclusion of key priority issues towards achieving SDG7 by 2030 and the net-zero emission goal of the Paris Agreement by 2050 - as defined by latest global analysis and data including the outcome of the Technical Working Groups? Yes No

II. Alignment with the 2030 agenda on Sustainable Development Goals – Ensure coherence and alignment with SDG implementation plans and strategies by 2030 as well as national development

plans and priorities. II.1. Has the Energy Compact considered enabling actions of SDG7 to reach the other sustainable development goals by 2030? Yes No

II.2. Does the Energy Compact align with national, sectoral, and/or sub-national sustainable development strategies/plans, including SDG implementation plans/roadmaps? Yes No *II.3. Has the Energy Compact considered a timeframe in line with the Decade of Action?* Yes No

III. Alignment with Paris Agreement and net-zero by 2050 - Ensure coherence and alignment with the Nationally Determined Contributions, long term net zero

emission strategies. III.1. Has the Energy Compact considered a timeframe in line with the net-zero goal of the Paris Agreement by 2050? Yes No

III.2. Has the Energy Compact considered energy-related targets and information in the updated/enhanced NDCs? Yes No

III.3. Has the Energy Compact considered alignment with reaching the net-zero emissions goal set by many countries by 2050? Yes No

IV. Leaving no one behind, strengthening inclusion, interlinkages, and synergies - Enabling the achievement of SDGs and just transition by reflecting interlinkages

with other SDGs. IV.1. Does the Energy Compact include socio-economic impacts of measures being considered? Yes No

IV.2. Does the Energy Compact identify steps towards an inclusive, just energy transition? Yes No

IV.3. Does the Energy Compact consider measures that address the needs of the most vulnerable groups (e.g. those impacted the most by energy transitions, lack of energy access)? Yes No

V. Feasibility and Robustness - Commitments and measures are technically sound, feasible, and verifiable based a set of objectives with specific performance indicators, baselines, targets and data

sources as needed. V.1. Is the information included in the Energy Compact based on updated quality data and sectoral assessments, with clear and transparent methodologies related to the proposed measures? Yes No *V.2. Has the Energy Compact considered inclusion of a set of SMART (specific, measurable, achievable, resource-based and time based) objectives?* Yes No *V.3.*

Has the Energy Compact considered issues related to means of implementation to ensure feasibility of measures proposed (e.g. cost and financing strategy, technical assistant needs and partnerships, policy and regulatory gaps, data and technology)? Yes No

SECTION 8: ENERGY COMPACT GENERAL INFORMATION

8.1. Title/name of the Energy Compact

Zipolopolo Cookstove Solutions

8.2. Lead entity name (for joint Energy Compacts please list all parties and include, in parenthesis, its entity type, using entity type from below)

AIATECH

8.3. Lead entity type

- | | | |
|--|---|--|
| <input type="checkbox"/> Government | <input type="checkbox"/> Local/Regional Government | <input type="checkbox"/> Multilateral body /Intergovernmental Organization |
| <input type="checkbox"/> Non-Governmental Organization (NGO) | <input type="checkbox"/> Civil Society organization/Youth | <input type="checkbox"/> Academic Institution /Scientific Community |
| <input checked="" type="checkbox"/> Private Sector | <input type="checkbox"/> Philanthropic Organization | <input type="checkbox"/> Other relevant actor |

8.4 Contact Information

Marcel Blankenstein – marcel.blankenstein@gmail.com – 265 999 821 959

8.5. Please select the geographical coverage of the Energy Compact

- Africa Asia and Pacific Europe Latin America and Caribbean North America West Asia Global

8.6. Please select the Energy Compact thematic focus area(s)

- Energy Access Energy Transition Enabling SDGs through inclusive just Energy Transitions Innovation, Technology and Data Finance and Investment.

SECTION 9: ADDITIONAL INFORMATION (IF REQUIRED)

Please provide additional website link(s) on your Energy Compact, which may contain relevant key documents, photos, short video clips etc.

[Zipolopolo "FAST" Cookstove - Introduction](#)

[Zipolopolo "FAST" Cookstove - Small Fuel Bag](#)

[Zipolopolo "FAST" Cookstove - Cellphone Battery Hack](#)

[Zipolopolo "FAST" Cookstove - Large Fuel Bag](#)

[Zipolopolo "FAST" Cookstove - Removing the Ash](#)

[Zipolopolo "FAST" Cookstove - Multiple Power Supplies](#)

[Zipolopolo "FAST" Cookstove - Cookbook Ver 28.08.2021](#)

[Zipolopolo "FAST" Cookstove - Multiple Stoves, One Power Supply](#)

[Zipolopolo "FAST" Cookstove - Charcoal Price is Hurting](#)

[Zipolopolo "FAST" Cookstove - Recycled Paper as Fuel](#)

[Zipolopolo "FAST" Cookstove - Chicken Stew Recipe](#)

[Zipolopolo "FAST" Cookstove - Meal for 4 to 6 People in 26 Minutes](#)

[Zipolopolo "FAST" Cookstove - Disaster Management and Preparedness](#)

[Zipolopolo "FAST" Cookstove - COP26, Storm Water and Tree's](#)

[Zipolopolo "FAST" Cookstove - Stop Promoting Tree Cutting](#)