

GENS

(Gender for Energy Security)

CO-DESIGN TOOLKIT

Made to support design of energy innovations for informal urban settlements taking into account the different roles, responsibilities and needs of women and men



ACKNOWLEDGMENTS

The GENS co-design toolkit was developed as part of the GENS project. The GENS project was funded by National Research Foundation (NRF) of South Africa and the Newton Fund through the British Council, includes Brunel University London, University of Nairobi and Stellenbosch University and aims to advance knowledge in the area of security of energy services in poor urban environments with a particular focus on gender equality and equity. For more information about GENS, please visit: <https://gens.sun.ac.za/>.

The GENS toolkit was developed by Brunel University London (Brunel Design School, Design for Sustainability Research Group), and in particular:

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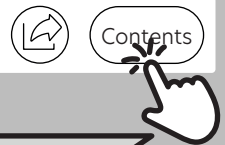
For published findings related to the initial toolkit testing, refer to:

Petrulaityte A, Ceschin F, Musango JK, Mwiti BK, Anditi C, Njoroge P (2022). Supporting the development of gendered energy innovations for informal urban settlements: GENS co-design toolkit for multi-stakeholder collaboration. Sustainability 14(10). <https://doi.org/10.3390/su14106291>

Toolkit citation:

Petrulaityte A, Ceschin F, Bradley C (2023). Mainstreaming Gender for Energy Security - A toolkit. Brunel University London, Design for Sustainability Research Group, London.

Open the related tool



You can navigate back to the contents page by clicking here!

CONTENTS

Toolkit Introduction	4
Defining the Context	5
Introduction to Gender within Energy	8
What are the Gender Energy Issues?	9
Best practices for considering gender within ideation	10
Toolkit Components and Structure	11
Fieldwork Diary	12
Problem Exploration Diagram	13
Energy Issue Card	14
Energy End Use Cards	15
Idea Generation Template	16
Energy Innovation Canvas	17
Toolkit Use Phases	18
Rapid ideation sessions	20
Company-led workshops	21
Collaborative workshops	22

Jump to the relevant section here!

If you have already used the toolkit before, or just want to view the contents. Feel free to browse here!

Fieldwork Diary

Energy Issue Card

Idea Generation Template

Problem Exploration Diagram

Energy End Use Cards

Energy Innovation Canvas

Data Collection Template

CONTENTS

Toolkit Introduction	4
Defining the Context	5
Introduction to Gender within Energy	8
What are the Gender Energy Issues?	9
Best practices for considering gender within ideation	10
Toolkit Components and Structure	11
Fieldwork Diary	12
Problem Exploration Diagram	13
Energy Issue Card	14
Energy End Use Cards	15
Idea Generation Template	16
Energy Innovation Canvas	17
Toolkit Use Phases	18
Rapid ideation sessions	20
Company-led workshops	21
Collaborative workshops	22

Toolkit components:

Fieldwork Diary

Energy Issue Cards

Idea Generation Template

Problem Exploration Diagram

Energy End Use Cards

Energy Innovation Canvas

Data Collection Template

MAINSTREAMING GENDER FOR ENERGY SECURITY

The Gender for Energy Security (GENS) co-design toolkit is a set of tools designed to equip private and public stakeholders for creating gendered energy solutions for African informal urban settlements. The toolkit was developed to be used as a knowledge source, as well as an instrument for idea generation.



Toolkit Objectives

The aim of the GENS co-design toolkit is to enable energy companies and other stakeholders along the energy value chain to:

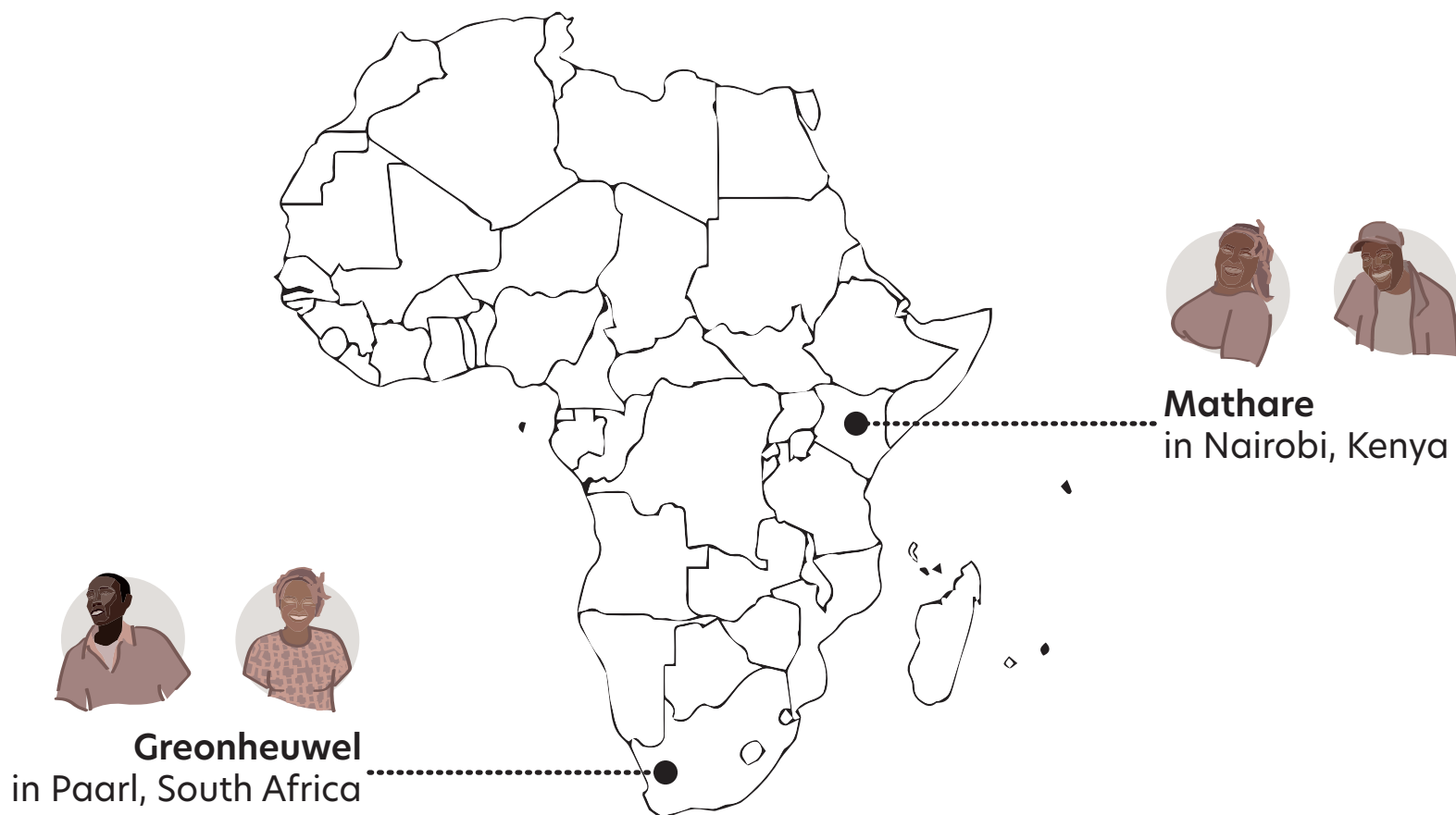
- Learn about energy-related practices, issues and existing solutions for female and male energy users in informal urban settlements;
- Generate ideas for energy solutions for informal urban settlements considering different issues, needs and capabilities of women and men.

Formulated by:

- Gaps and problems in existing toolkits/methods/handbooks focusing on gender mainstreaming and energy;
- Input from African energy companies;
- Ethnographic data collected by the project partners in two informal urban settings in Kenya and South Africa.

INFORMAL URBAN SETTLEMENTS - DEFINING THE CONTEXT

The creation of this toolkit is based on findings collated from two informal urban settlements in Kenya and South Africa; Groenheuwel and Mathare. Insights can be applied to similar contexts. Rapid Remote Ethnography (RRE) and literature reviews have been conducted to identify the context barriers and best practices for implementing gender within energy product, service and system design. To foster context-specific primary data collection, the toolkit can guide the user in collecting data from different contexts through the use of the fieldwork diary.



INFORMAL URBAN SETTLEMENTS - DEFINING THE CONTEXT

MATHARE - KENYA

Mathare is a large informal settlement in Kenya. Dense populations have increased energy scarcity and limited accessible energy supplies. Lack of dependable income opportunities further exacerbates energy issues.

Established in the 1960s, like many other informal settlements in Kenya.

Comprises of 13 villages across a land of less than 8km².

Home to 206,564 people, with a population density of 25,820 per km².

61% of the households are male-headed.

Women play the leading role in deciding which energy sources to obtain, go to collect them, and use them. Men pay for household's energy sources.

93% of the households are connected to the national grid, of which 50% are illegal and unmetered, thus cheaper and preferred by the residents.

Basic service provision, such as clean and safe water and disposal of waste, is either extremely poor or entirely non-existent.



80% of structures are attached.

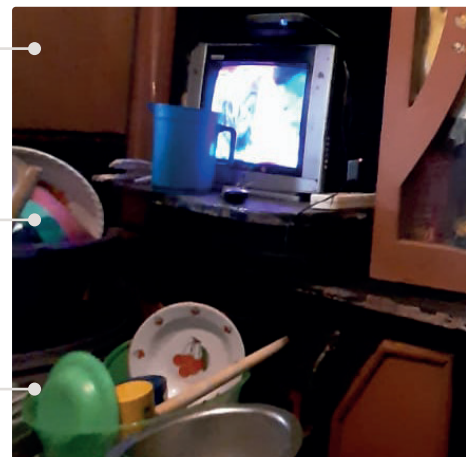
An absolute majority of the residents are tenants without title deeds. They live in fear of eviction and do little to manage or develop their households.

65% of the residents are engaged in non-regular work working from time to time.

A combination of private and public land, with some parts owned by the Government of Kenya, others owned by private local investors.

Lack of spatial planning hinders effective service provision within the settlement: only 4% of the total land area is left for movement and circulation.

Kerosene is the most preferred fuel followed by charcoal for cooking, heating and boiling water.



INFORMAL URBAN SETTLEMENTS - DEFINING THE CONTEXT

GROENHEUWEL - SOUTH AFRICA | Located in the Paarl, Groenheuwel is a large informal settlement with exponential expansion. COVID-19 has increased informal housing dependency since, impacting energy security.

Established in the early 1990s, newly developed and continually transforming.

Home to 10,834 people, with a population density of 2,889 per km².

Solar PV, biogas and generators are not used in the settlement.

Most of the structures are owned by the residents with a title deed and/or ownership certificate.

The unemployment rate is 77%, with most of the residents living on social grants.

88% of structures are freestanding.

Frequent load shedding pushes families to seek alternative energy sources.

"Free electricity" is offered by the Government to some households under the Free Basic Electricity (FBE) tariffs program that is meant to benefit the very poor.

Comprises of 8 different sections across a land of less than 4km².



Characterised by rural-urban migration and new family formations which make planning difficult.

The area with a low socio-economic profile, characterised by financial and food insecurity, violence, drug, and alcohol abuse.

54% of the households are female-headed.

Women play the leading role in the household energy chain: they decide which energy source and device to acquire, pay for them and use them.

80% of the households are connected to the national grid provided by the Government of South Africa, further 13% are connected illegally.

Fuel stacking is common among the households, with most households combining electricity, candles, LPG, charcoal, and paraffin to fulfil their household energy needs.



INTRODUCTION TO GENDER WITHIN ENERGY

Both men and women can impact energy value chains. However, within low-income contexts, **social inequalities are evident, particularly from a gender perspective**. Women are considered key actors within the energy value chain, particularly due to their role of performing household chores; sourcing and using energy supplies.



Without considering different roles, responsibilities and needs of women and men, energy innovations are more likely to benefit men only.

By focussing on the provision and use of energy supplies, women's roles can be streamlined and improved to facilitate gender equity within communities. Poor energy consuming devices evokes poor health, finance and opportunities for energy users. For example, fossil fuels and biomass can result in respiratory issues, particularly for women and children.

Gender roles should be encompassed within proposed energy systems to allow for integration with current community practices, and to identify the key beneficiaries. Improving energy value chains can allow for greater education, income generation and social inclusivity through the reduction of illness, fuel collection times and negative societal perceptions. Sometimes women are responsible for the reliability and availability of energy supplies within the household and low-quality energy devices can further impede on gender equity.

WHAT ARE THE MAIN GENDER ENERGY ISSUES?

Throughout this toolkit references to energy issues and end uses are explored. Insights have been gathered through indepth analysis of literature, as well as primary data collection practices. As a result, we have identified six areas of focus and seventeen energy issues. By using this toolkit, you will get familiar with these gender energy issues.

What are the six main focus areas?

ACCESSIBILITY OF ENERGY

Energy sources within settlements may be limited. The collection practices can be time consuming. Local shops may face shortages. It can take women up to 4 times longer than men to source energy supplies.

AFFORDABILITY OF ENERGY

Families may be on tight budgets. Both women and men feel the pressure to provide for their families by being able to afford reliable, clean, efficient energy sources and devices.

RELIABILITY OF ENERGY

This takes into consideration the energy connections, supplies and maintenance of energy using devices. Women are the ones most affected by poorly designed and serviced energy using devices.

HEALTH AND SAFETY

Safety-at-home, pollution and energy related-risks can pose issues for users. Whilst women and children are the most vulnerable due to the lack of safety within the home, men are at greater risk of harm due to the potential dangers of owning modern devices and unsafe practices poor energy devices require.

SOCIO-CULTURAL FACTORS

There can be stigma around particular energy sources used within the home. Whilst women feel more social pressures than men about the energy sources and devices they use, men as breadwinners are expected to provide their families with modern and safe energy sources and devices.

INCOME GENERATION

Increase the opportunities available for residents. Women can find it difficult to engage in income generation because of the burden of unpaid care and domestic work, unfavorable financial support by governments, cultural norms, lack of skills, etc.

BEST PRACTICE PRINCIPLES

Women should be seen as key actors within the energy value chain, and should be considered within the design phase. **Without considering the roles, responsibilities and needs of both women and men, energy innovations are likely to only benefit men.** The following best practice principles for gender mainstreaming within the energy sector have been based off of Emili et al. (2018) and Pueyo (2019).

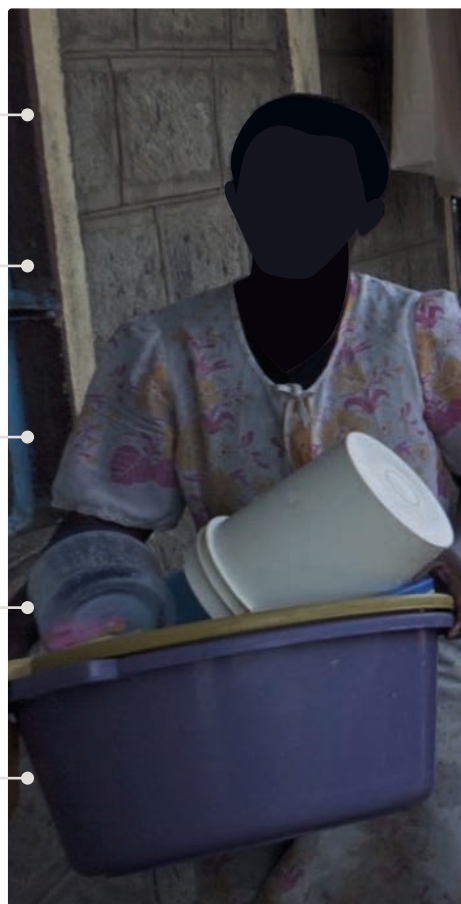
Focus on women as essential actors and change agents in the energy value chain.

Understand local context and gender roles by collecting qualitative and quantitative sex-disaggregated data.

Provide access to gender-sensitive financing so women (and men) customers can afford energy products and their servicing.

Consider employing women along the entire energy value chain, from design, installations, and distribution to service support, billings, and collections.

Provide training and mentorship to women (and men) customers to increase adoption and ensure servicing of energy innovations.



Make sure product distribution chains are established to avoid stock-outs.

Collaborate with local women networks to increase awareness and acceptance of energy innovations.

Support women as energy entrepreneurs through the principles above.

Inform policy development towards gender-sensitive laws and regulations.

Disseminate success stories of women in the energy sector.

Offer high quality certified energy products with reliable after-sales services.

Toolkit Introduction

Contents

TOOLKIT COMPONENTS AND STRUCTURE

The toolkit can be used and integrated within any type of design process to support three particular purposes: **problem exploration, idea generation and idea detailing**. At the end of the toolkits use, you should have a defined concept, with roles, stakeholders and intended benefits identified. Concepts act as a basis for future implementation.

PROBLEM EXPLORATION

Supporting materials aim to help participants define the problem they would like to solve. Insights gathered should infer future design decisions. Exploration of the context **identifies the causes, context and gender roles** within the community.

IDEA GENERATION

Idea generation combines the data gathered within the problem exploration to **form initial ideas**. Ideas can be discussed to highlight or combine key features for future development.

CONCEPT DETAILING

Ideas can be combined to formulate one or more concepts. Detailing concepts within the **Energy Innovation Canvas** can help to refine the actors within the proposed product, service or system. This phase helps to understand the scale of the proposed concept, and what further steps are required to make the system viable.

FIELDWORK DIARY

GENS ethnographic research: FIELDWORK DIARY

This diary is made to record data collected during the ethnographic fieldwork.

Your name: _____

Group name / session which the fieldwork takes place: _____

Name of your participants: _____

Date: _____

Beginning time of fieldwork: _____

End time of fieldwork: _____

PROBLEM EXPLORATION DIAGRAM

PROBLEM EXPLORATION DIAGRAM

HOUSEHOLD ENERGY ISSUES

HOUSEHOLD ENERGY USES

HOUSEHOLD ENERGY SOURCES

ENERGY END USE CARD

ENERGY END USE CARD

1A ACCESSIBILITY

COOKING

ENERGY ISSUE CARD

ACCESSIBILITY

Energy sources

ENERGY ISSUE CARD

IDEA GENERATION TEMPLATE

IDEA GENERATION TEMPLATE

Step 1: What specific challenge, goal, or need is your project addressing?

Step 2: What are the key challenges?

Step 3: What are the key opportunities?

ENERGY INNOVATION CANVAS

ENERGY INNOVATION CANVAS

Value Proposition

Channels

Relationships

Revenue Streams

Cost Structure

Key Resources

Key Activities

Key Partnerships

ADDITIONAL COMMENT CARD

ADDITIONAL COMMENT CARD

Can you further understand the issue in your context?

Explore

Ideate

Define



Contents

FIELDWORK DIARY

The fieldwork diary provides a blueprint on how to **collect primary data from the target community** with a range of questions, data specific to household energy issues and uses. If used, should be completed prior to toolkit use.

Recommended Time

1 - 5days

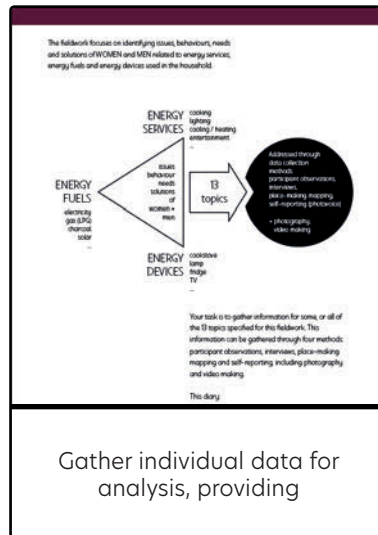
Print Size & Format

A4 Portrait

Before using the toolkit to generate ideas, collect primary data from within the target community.

GENS ethnographic research FIELDWORK DIARY

This diary is made to record data collected during the ethnographic fieldwork.



Your name _____

Street name takes place _____

Please ask your participants the following questions to understand which topics you are going to focus on in this household.

- Unreliable electricity connections ☐ YES ☐ NO Is your household directly or indirectly connected to electricity or solar PV? If yes, do you have issues with these connections?
- Shortage of energy fuels ☐ YES ☐ NO Do you feel that the fuels you use are not enough to satisfy household needs?
- Long fuel collection and/or preparation ☐ YES ☐ NO Do you spend significant amount of time collecting and/or preparing the fuels you use?
- Indoor air pollution ☐ YES ☐ NO Do you use smoke-emitting fuels indoors (e.g. for cooking)?
- Need for fuel-saving ☐ YES ☐ NO Do household members intentionally save fuels they use?

Learn about the household energy issues within the target community

1 Unreliable electricity connections

11 Who in the household deals with unreliable electricity connections? Please specify gender.
Suggested data collection methods: Observation, Semi-structured interview

Photograph ☐ Video ☐ Audio recording ☐ Please mark each visual/audio file 11

12 What do the household members do to solve unreliable electricity connections? (e.g. Do they have a back-up energy source?)
Suggested data collection methods: Observation, Scenario-based interview, Self-reporting

Photograph ☐ Video ☐ Audio recording ☐ Please mark each visual/audio file 12

13 When are these connections most likely to fail? What causes the failures?
Suggested data collection methods: Observation, Semi-structured interview

Define the context. What are the household energy uses? How can you assist and supply the community?

A3 Landscape



ENERGY ISSUE CARDS

There are 17 energy issue cards, with the aim to support data collection and ideation. Using this card, users will **identify causes, context and solutions**. Should be used in collaboration with communities to maximise data collection and relevancy of ideas.

Recommended Time

15 - 60mins

Print Size & Format

A5 Landscape

Information gathered from the use of the **Household Energy Issue** cards should be documented on the additional comment cards for reference during the ideation phase.

ENERGY ISSUE CARD

A ACCESSIBILITY
Shortage of energy sources

Energy sources: All

Step 1: Identify the cause

- > Lack of grid electricity access in informal urban settlements
- > Inability to enter formal electricity provision and pay bills
- > Insufficient electricity allowance by the municipality
- > Supply shortage at retail places
- > Inconvenient opening hours of retail places
- > Reckless use of energy sources in households
- > Low quality energy using devices consuming more energy
- > Low levels of solar heat earlier and later in the day
- > Inability to collect free firewood far from urban areas
- > Seasonality (rainy season and winter)

Also check G: Unreliable electricity connections

Also check H: Poorly designed energy using devices

Also check D: Limited ability to afford energy sources

Women are 2x more likely than men to be responsible for making sure there is no energy shortage in poor urban households. As a result, women suffer from stress induced illnesses

Step 2: Specify the context

- 1 | Who in the household makes sure there is no shortage of energy sources? Specify gender.
- 2 | Which energy sources are scarce?
- 3 | What are the reasons of the shortage of energy sources?
- 4 | What do household members do to solve the shortage of energy sources?
- 5 | When are household members most likely to feel the shortage of energy sources?
- 6 | How does the shortage of energy sources affect each household member? Specify genders.

Refer to existing case studies as inspiration during the ideation phase.

Step 1. Identify the household energy causes related to your design challenge.

Step 2. Identify the context you are designing for. If possible, ask participants from the community to bolster your findings

Step 3. Use these questions to guide your ideation phase.

ENERGY END USE CARDS

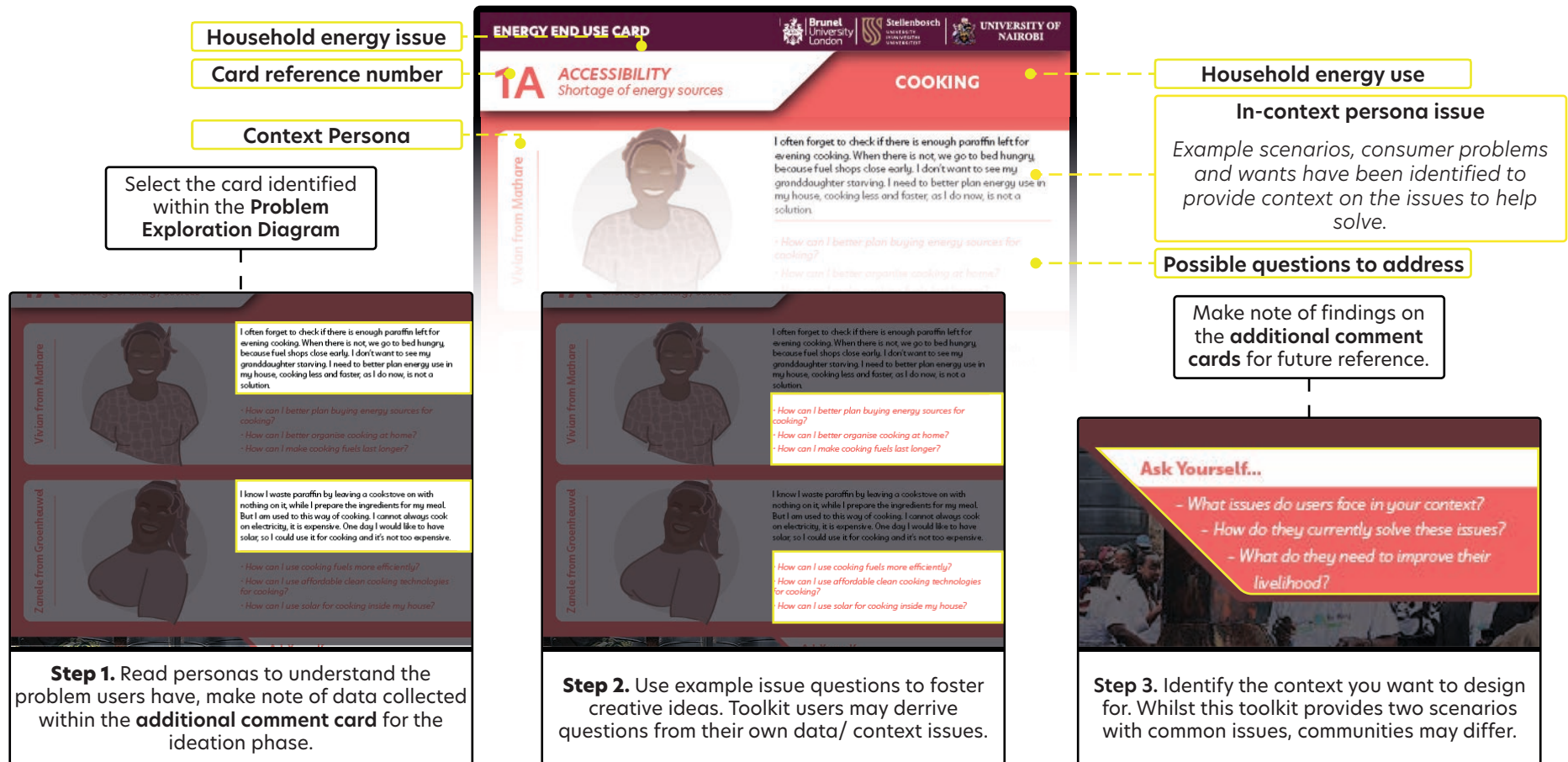
Includes first-hand persona stories to provide example issues faced by inhabitants of Groenheuwel and Mathare. Related questions for ideation, and case studies for reference. These cards should be *used to aid problem exploration and idea generation*.

Recommended Time

15 - 60mins

Print Size & Format

A5 Portrait



IDEA GENERATION TEMPLATE

Recommended Time

15 - 60mins

Print Size & Format

A3 Landscape

A space for users to **make note of ideas** and describe the problem you are addressing. Generation techniques such as; brainstorming, storyboarding and/or drawings can be used to communicate ideas.

Ideas can be combined to generate inclusive and robust concepts

Design methods can be used to define ideas. i.e Storyboarding, drawing, brainstorming etc.

Ideation questions can be found on the **Energy End Issue** and **End Use Cards** to aid your ideation.

Step 2. Use data collected on the **additional comment card** to inform your ideation process.

Optional: Within ideation, consider the implementation barriers of your solution, and how you can secure funding.

Step 1. Define your challenge, goal or unmet need that you aim to solve.

Explore Ideate **Define**



Contents

ENERGY INNOVATION CANVAS

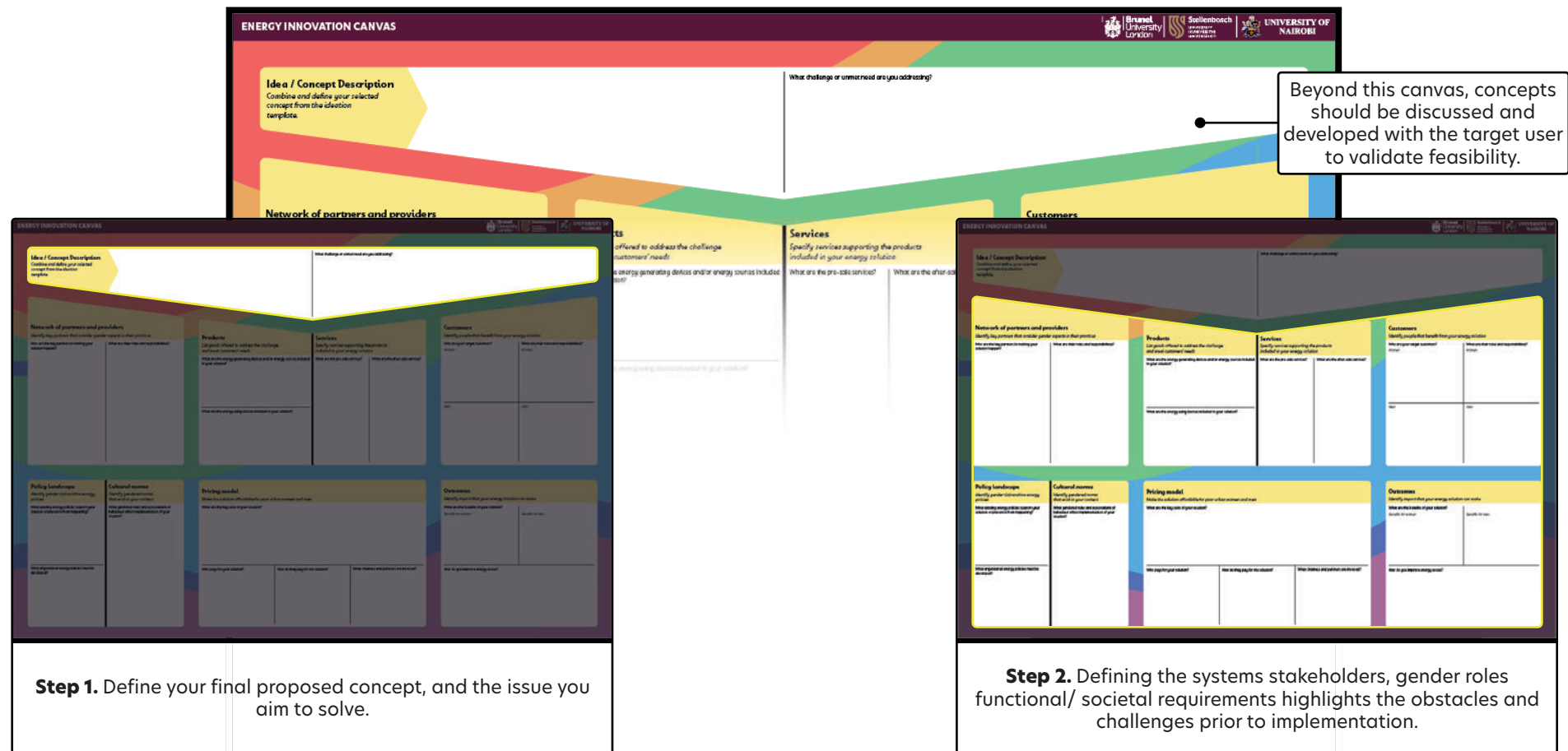
Aim of this tool is to describe parts of your concept. Answer the questions to help **define the concept**, highlighting potential challenges to implementation and development. This identifies stakeholders, roles and benefits within the communities.

Recommended Time

30 - 90mins

Print Size & Format

A2 Landscape



POSSIBLE USES

GENS WORKSHOP



GENS TOOLKIT: POSSIBLE WORKSHOPS

This document presents three possible ways to utilise this toolkit, however elements can be expanded through other tools to further ideation and concept generation i.e assistance of storyboarding, journey mapping, brainstorming etc.



RAPID IDEATION SESSIONS (COMPANY-LED)

REQUIRED: 1 x FACILITATOR; COMPANY EMPLOYEES

COMPANY-LED workshops can be held without community input. It is recommended that participants should have prior-knowledge of the context, however it is not necessary. Energy Issue Cards as well as p.4-6 can be used for reference. Initial conceptual designs can be achieved, but clarification is required before implementation.



COLLABORATIVE WORKSHOPS

REQUIRED: 1x FACILITATOR; COMPANY EMPLOYEES; COMMUNITY END USERS AND POLICY MAKERS.

1 person should be designated the facilitator of the session. This person should have previous experience of hosting workshops. Company employees who are involved in the design, installation and manufacture of solutions should be involved in the workshop, with community members referenced for data collection. Rapid ideation with limited context knowledge.



COMPANY-LED WORKSHOPS with DATA COLLECTION

REQUIRED: COMPANY EMPLOYEES

Data collection should start in the intended community, with data referenced during the ideation phase. Data collection and resulting workshop should be held with company designers, engineers, installers etc - Community members are not required within workshop due to primary data collection.



RAPID IDEATION SESSIONS (COMPANY-LED)

Quick company sessions can be held to rapidly ideate. Use elements the Energy End Use and Energy Issue cards to understand the context of Groenheuvel and Mathare (A), and design accordingly (B). Prior to implementation, community members and leaders should be included within the development phase.

Potential Participants
Designers, Engineers,
Sales, Marketing,
Installers

Recommended Time
90 - 180 mins

PROBLEM EXPLORATION

IDEA GENERATION

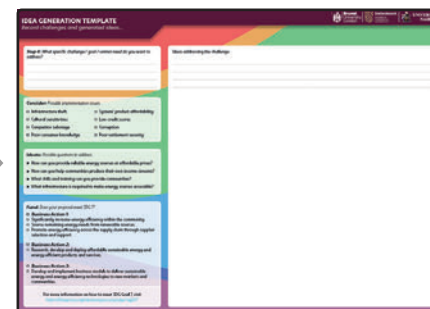
CONCEPT DETAILING

ENERGY END USE CARD

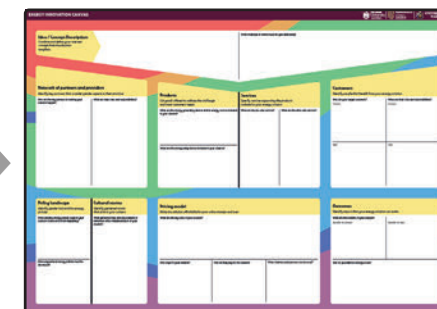


ENERGY ISSUE CARD

IDEA GENERATION TEMPLATE



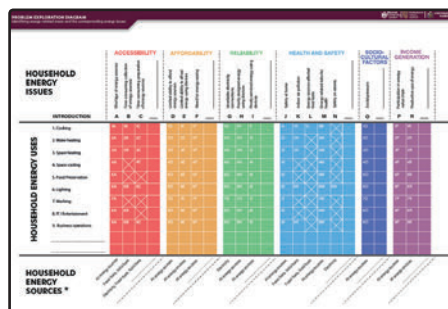
ENERGY INNOVATION CANVAS



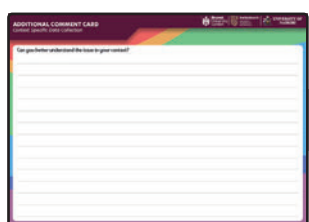
FIELDWORK DIARY



PROBLEM EXPLORATION DIAGRAM

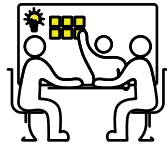


Additional Comment Card



Possible workshop schedule

Phase	Task	Time
Session Introduction	Outline session (aims and objectives)	15mins
Problem Exploration	Problem Exploration Diagram	10mins
	Energy Issue Cards	15mins
Ideation	Energy End Use Cards	15mins
	Idea Generation Template	30mins
Concept Detailing	Energy Innovation Canvas	30mins



COLLABORATIVE WORKSHOPS

Discuss with community member to identify energy issues within your target context. Combine the knowledge of company employees and community members to generate feasible ideas. Utilise the Energy Issue Cards to drive conversation (A) and facilitate ideation (B).

Potential Participants
Energy end users,
community leaders,
compant employees

Recommended Time
180 - 240 mins

PROBLEM EXPLORATION

IDEA GENERATION

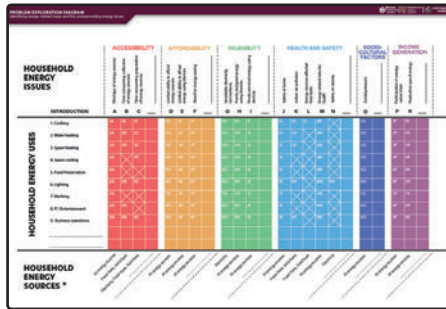
CONCEPT DETAILING

ENERGY END USE CARD

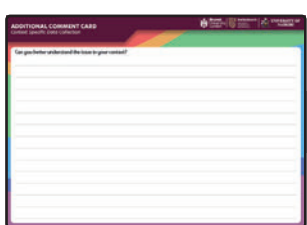
FIELDWORK DIARY



PROBLEM EXPLORATION DIAGRAM

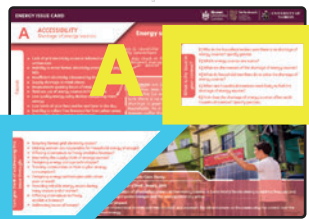


Additional Comment Card

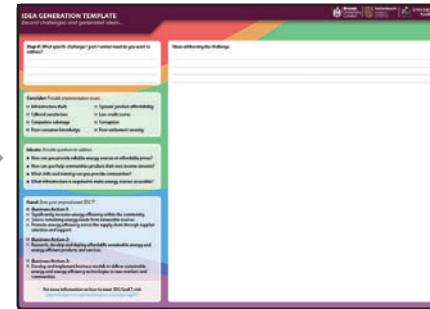


B

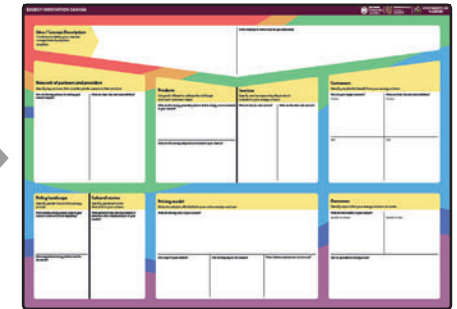
ENERGY ISSUE CARD



IDEA GENERATION TEMPLATE



ENERGY INNOVATION CANVAS



Possible workshop schedule

Phase	Task	Time
Session Introduction	Outline session (aims and objectives)	15mins
Problem Exploration	Problem Exploration Diagram	10mins
	Energy Issue Cards	35mins
Ideation	Idea Generation Template	45mins
Concept Detailing	Energy Innovation Canvas	45mins



COMPANY LED WORKSHOPS with DATA COLLECTION

Start by entering the community. Utilise the Fieldwork Diary for a data collection template. Once completed, use the Energy Issue Cards to identify the context (A) and possible solutions (B). Primary data collection will allow for targetted design solutions. Ideally, community members should be included within the development phase to ensure feasibility.

Potential Participants
Designers, Engineers,
Sales, Marketing,
Installers

Recommended Time
1 - 5 days data collection
90 - 180 mins workshop

PROBLEM EXPLORATION

IDEA GENERATION

CONCEPT DETAILING

ENERGY END USE CARD

FIELDWORK DIARY

PROBLEM EXPLORATION DIAGRAM

Additional Comment Card

B

ENERGY ISSUE CARD

IDEA GENERATION TEMPLATE

ENERGY INNOVATION CANVAS

Possible workshop schedule

Phase	Task	Time
Data Collection	Ethnographic study - Fieldwork diary	1-5 days
Session Introduction	Outline session (aims and objectives)	15mins
Problem Exploration	Problem Exploration Diagram	10mins
	Energy Issue Cards	15mins
Ideation	Idea Generation Template	30mins
Concept Detailing	Energy Innovation Canvas	30mins