SESA
Smart Energy
Solutions for Africa

SESA Capacity Building Plan

VERSION 1.5

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Summary Sheet

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1. Introduction

The Capacity Building Plan, developed through Smart Energy Solutions For Africa (SESA) project, intends to assist the SESA project and its partners and the local communities engaged to strategically identify capacity and skills development topics, methods and tools to support a further uptake of sustainable energy use in selected urban and rural areas in Africa known as "Living Laboratories" ("Living Labs" in short). The project Living labs are real-life test beds for innovative energy solutions, which will enable the project to experiment in different environments. The urban and rural areas under discussion are as follows: Kisumu and Homabay, **Kenya** (Demonstration Living Lab); Ga North Municipal Assembly and Atwima Nwabiagya, **Ghana** (Validation Living Lab); Alicedale, **South Africa** (Validation Living lab); Rural areas, **Malawi** (Validation Living Lab) and lastly, Marrakech, **Morocco** (Validation Living lab).

The Capacity Building Plan is informed by comprehensive capacity and skills needs assessments on energy use undertaken in five Living Lab countries mentioned above. The needs assessments for Ghana, Kenya, Malawi, Morocco and South Africa will use qualitative research methods to 1) Assess the present capacity of local innovators and authorities on Sustainable Energy Development 2) Understanding the future capacity (desired state) based on the city's vision for the Sustainable Energy Use, 3) Identifying gaps between present capacity and future desired skills, and 4) Selecting tools and training modules to fill these gaps.

This Capacity Building Plan consists of five chapters. **Chapter 1** presents an overview of the Capacity Building Plan and its position. **Chapter 2** describes the methodology used to develop the capacity needs and assessment and therefore the Capacity Building Plan, including the research methods, ethical consideration and limitations. This is followed by the capacity and skills needs assessments for Kenya, Malawi, Ghana, Morocco and South Africa in **Chapter 3**. The capacity and skills needs assessments for each country in Chapter 3 details the following: an overview of the country context and background; SESA's Living Lab project sites in the country; The countries energy governance structure; the various policies, plans and strategies that are relevant to the country's energy landscape; the present capacity of local innovators and authorities on sustainable energy development; the future capacity (desired state) based on the Living Lab's city vision for the sustainable energy use; the gaps between present capacity and future desired skills identified; and the relevant tools and training modules to fill the gaps. **Chapter 4.** outlines the next steps to be undertaken for the Capacity Building Plan as well as the timelines for these steps. The concluding remarks together with some recommendation are provided in **Chapter 5.**

About SESA

SESA is a collaborative project between the European Union and nine African countries (Kenya, Ghana, Namibia, Malawi, Morocco, South Africa, Nigeria, Rwanda and Tanzania) that aims at providing energy access technologies and business models that are easily replicable and generate local opportunities for economic development and social cohesion in Africa. Through several local living labs, it is expected to facilitate the co-development of scalable and replicable energy access innovations, to be tested, validated, and later replicated throughout the African continent. These solutions will include decentralised renewables (solar photovoltaics), innovative energy storage systems including the use of second-life electric vehicle batteries, smart microgrids, waste-to-energy systems (biomass to biogas), climate-proofing, resilience and adaptation, and rural internet access.

Running from October 2021 until September 2025, SESA is the result of a strong partnership between leading European and African universities, research centres, industry actors, local governments, knowledge and implementation organisations and networks. These will be strengthened via peer-to-peer exchange, policy dialogues, regional and international events among others.

2. Methodology

Four primary methods were used to determine the current capacity and needs in the urban and rural sites selected and thus inform the Capacity Building Plan. These four methods include 1) desktop research of existing documents for the various Living Lab sites, 2) virtual engagements with the Living Lab implementation teams 3) in-depth, semi-structured interviews/questionnaires with selected stakeholders in the various Living Lab sites and 4) a focus group discussion with all the Living Labs stakeholders to reflect on the findings obtained during the interviews. This chapter provides a detailed description of these methods as well as the limitations experienced along the way.

2.1. Desktop research

The capacity and skills needs assessment on energy use in the Living Lab sites began by undertaking extensive desktop research on each country and were possible, the local site areas in the countries. The desktop research included the review of both peer-reviewed journal articles and grey literature. Grey literature included sources such as government and documentation developed through other work packages under the SESA project (for example, the Implementation plans developed for the Living lab sites under the SESA project's Work Package 4). While desktop research was underway, virtual engagements were held with the five Living Lab in Ghana, Kenya, Malawi, Morocco and South Africa as there was limited information available online.

2.2. Engagements with living labs

The engagements with the five living Labs in Ghana, Kenya, Malawi, Morocco and South Africa were arranged in order to (1) enhance the limited desktop findings (2) advise the type of questions that might need to be included in the interview questionnaires (3) identify which stakeholders should be contacted for interviews/questionnaires and (4) some possible recommendations on how to reach these stakeholders. Findings from this engagement were added to the desktop findings where possible and formed the basis for the initial version of the capacity needs assessments as well as the Capacity Building Plan. The findings from the desktop research and living lab engagements do require confirmation during the interviews as very little information was available during the desktop review process and living labs had limited information available.

2.3. Semi-structured interviews/questionnaires

Following the desktop research and the engagements with the Living Lab teams in Ghana, Kenya, Malawi, Morocco and South Africa the capacity and skills needs assessments as well as the Capacity Building Plan will be enhanced even further by undertaking interviews with selected stakeholders.

Targeted sampling was used in order to select the interview participants for the semi-structured interviews in the five countries Living Lab sites. Interview participants in each country were selected with support from the Living Lab site partners. More specifically, each of the Living Labs provided the key government departments, organisations and/or project implementation site beneficiaries (eg. school and institution heads) that forms a vital part of the Living labs implementation process. In addition to these [participants, the SESA Living Lab partners themselves will be interviewed for each site.

The interviews will be guided by a set of questionnaires developed for each country. In addition, each interview participant will be required to complete a SESA project consent form, in line with the Ethic strategy. The questionnaire that will be used to guide the interviews aim to enhance the understanding of the present and future capacity in terms of sustainable energy solutions more generally as well as the capacity in terms of the site-specific energy solutions being implemented. Doing so will aid in determining the possible capacity gaps and in term the possible tools and training that can be developed through SESA to address those gaps.

2.4. Focus group/kick off workshop

A focus group discussion with all the relevant stakeholders from Ghana, Kenya, Malawi, Morocco and South Africa will take place in the form of a "Kick-off workshop" after which the capacity building activities will start to take place. During the kick off workshop the interview/questionnaire findings will be unpacked and form part of a broader visioning exercise. The workshop will be a one-day event which will either take place in a hybrid (in-person and virtual) or virtual format (depending on the time and resources available).

The exact structure of the workshop will be determined after all the interviews have been completed as the interview findings will inform the final thematic areas and points to be discussed during the workshop but particular attention will be put on designing a highly interactive session to allow a for a context-sized consolidation of the findings.

2.5. Ethical considerations

At the start of each interview as well as the focus group discussion (which will be undertaken in English), all participants will be sent a participation consent form which provided them with a brief overview of the study as well as the measures taken to secure ethical compliance prior to collecting data, as well as alerted them to their rights as research participants, this included their right not to participate or not to answer; their ability to withdraw from the interview or study at any point; confidentiality of the information shared during interview and focus group discussions and lastly, anonymity of their identities. In addition to taking detailed notes, if permission is granted by the participants, the interviews and focus group discussion will also be voice recorded using a cell phone or laptop allowing for more substantive engagement and record of the interview.

2.6. Limitations

In terms of smart energy solutions in the Living Lab countries, there is limited information, especially peer-reviewed information available from which to extract relevant information from. Furthermore, it is essential to highlight that at this stage, all five Living Labs' smart energy technology solutions still need to be implemented and finalised. As a result, the exact capacity skills and needs required are not fully known. However, given that the semi-structured interviews/questionnaires and the focus group/kick-off workshop still need to be carried out in the upcoming weeks it means that the Living Labs implementation plans and progress should be further along and therefore will hopefully enhance the findings obtained during these data collection processes. As a result, it is worth noting that the capacity building plan is a living document at this stage, which will be revised following the interviews and focus group/kick-off meeting.

3. Capacity and skills needs assessments

This chapter details the capacity and skills needs assessment for Kenya, Malawi, Ghana, South Africa and Morocco respectively. The capacity and skills needs assessments for each country in this chapter details the following: an overview of the country context and background; SESA's Living Lab project sites in the country; The countries energy governance structure; the various policies, plans and strategies that are relevant to the country's energy landscape; the present capacity of local innovators and authorities on sustainable energy development; the future capacity (desired state) based on the Living Lab's city vision for the sustainable energy use; the gaps between present capacity and future desired skills identified; and the relevant tools and training modules to fill the gaps. It is important to note that the capacity and skills needs assessments are currently informed by desktop research and initial engagements with Living Labs. As a result, the capacity and skills needs assessments will be enhanced once the semi-structured interviews/questionnaires and focus group/kick off workshop have been concluded.

3.1. Kenya

3.1.1. Country context and background

Kenya is a country located in the east of Africa, bordered by Somalia (to the east), Ethiopia (to the north), Uganda (to the west) and Tanzania (to the south), with its south-eastern border on the Indian Ocean. It covers an area of about 569,000 square kilometres, most of which (80%) is considered either arid or semi-arid.

One of Kenya's greatest natural resources, Lake Victoria, is the largest freshwater lake in Africa and a key source of livelihood for the rural and urban communities adjacent to it. The Lake is an important revenue earner for the country as a huge proportion of fish distributed in Kenya is sourced from the lake and irrigation schemes are also dependent on it. The agricultural and fishing sectors dominate as key income drivers. In addition, there is a large number of micro and small businesses, mostly consisting of market trade, small retail products, artisanal services, small scale construction and transport as well as some larger wholesale outlets.

As a developing country, Kenya is still characterised by high levels of poverty and unemployment, a lack of clean drinking water as well as low access to electricity. However, as espoused in the 2018 Kenya National Electrification Strategy (KNES), the country wants to achieve universal electricity access by 2028, through main grid densification, intensification and expansion, as well as off-grid solutions. The strategy has a strong off-grid component and expects to provide approximately two million new connections by the year 2022. Already by 2018, 6.9 million people had been connected to the grid.

In addition to confronting energy access issues, and in support of the Paris Agreement, Kenya has announced its commitment to achieving a 30% reduction in its national greenhouse gas (GHG) emissions by 2030, relative to the business as usual (BAU) scenario of 143 MtCO2e. Kenya's Nationally Determined Contribution (NDC) has identified six main sectors responsible for the country's GHG emissions, where mitigation efforts are focused: energy (electricity generation); transportation; agriculture; land use, land-use change and forestry (LULUCF); industrial processes and waste. However, this does not necessarily translate into a 30% emission reduction target for each of the individual six mitigation sectors, as each sector has widely differentiated mitigation potential as well as costs. The majority of Kenya's GHG emissions result from the agriculture and land use, land-use change and forestry (LULUCF) sectors, most likely due to the high reliance on wood fuel by a large majority of the population. With Kenya's Vision 2030, every effort should be made to explore renewable resources to increase energy security for the country.

In terms of **solar energy**, Kenya receives a daily solar insolation of 4-6kWh/m^2, of which only a small portion (1% of the country's energy mix) has been tapped (EPRA, 2022). Various mini-grids, embedded generation plants and utility scale plants have been implemented across Kenya. **Biogas** in Kenya is extensively produced with over 8000 biogas plants utilizing various raw materials, such as agricultural wastes, slaughterhouse waste and municipal wastes. However, currently there is no consolidated data on biogas production making it a challenge in determining the country's overall capacity (ERPA, 2022).

3.1.2. Actions planned for living labs in Kenya

Through SESA, the main objective is to develop a modular demonstration project to provide sustainable energy access solutions that are relevant for validation and replication in both urbanized and rural contexts in Africa, creating opportunities to generate sustainable off-grid electricity, with sector linkages such as cooking, lighting, fishing, water pumping, mobility and combining energy solutions with local InfoSpots for access to information, on energy and digital skills. More specifically, in Kenya the intention

is to increase sustainable energy access through Solar PV Hubs and development of productive user cases to strengthen the Lake Victoria economy and livelihoods in Western Kenya. Demonstration implementation activities will be carried out at two project sites, Kisegi in Homabay County and Katito in Kisumu County.

The figures below (Figures 1 and 2) illustrate the layout and orientation of the solar panels at the two sites in Kenya:

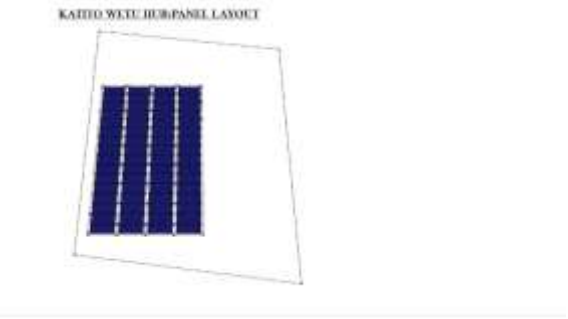

Figure 1Katito solar panel layout and orientation

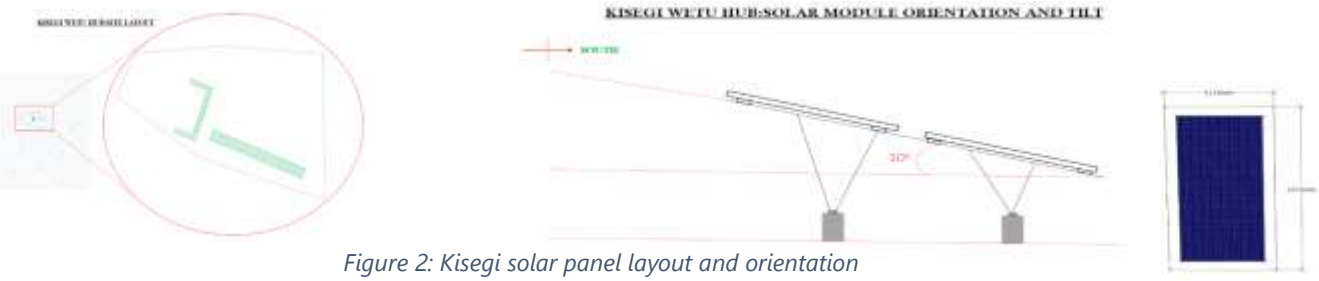

Figure 2: Kisegi solar panel layout and orientation

The key participants involved in the Living Lab in both Katito (Kisumu) and Kisegi (Homabay) are outlined in more detail in Table 1 below.

Table 1: Key living lab participants in Kenya and their role

Participant	Role and information about the participant
We!Hub Victoria Limited (WeTu)	**(*Local demonstrator*):** "WeTu" – Swahili for "ours" – is powered by the social enterprise WeHub! Victoria Ltd. and is fully-owned by Siemens Stiftung. WeTu works on innovative solutions for supplying energy and drinking water in communities surrounding Lake Victoria in Kenya. In addition, the company is deploying the first-ever electric vehicles specifically developed for rural Africa. When combined with social and ecological business models, these solutions are improving living conditions in the region, creating jobs, and establishing new economic opportunities.
Blekinge Institute of Technology (BTH)	**(*Research partner – provide technical support*):** BTH is a public, state funded Swedish institute of technology in Blekinge located in Karlskrona, Sweden.

Basic Internet Foundation (BIF)	**(*Technology provider Internet information spots*):** aims at providing "free access to basic information on the Internet for everyone in the world".
United Nations Human Settlement Programme (UN-Habitat) and United Nations Environment Programme (UNEP)	**(*Project partner - capacity building and policy support*):** UN-Habitat, under the United Nation, promotes transformative change in cities and human settlements. UNEP is responsible for coordinating responses to environmental issues within the United Nations.
Local innovators	**Local innovators** will be engaged to develop components of the innovations such as the electric two wheelers and second life appliances of lithium battery cells.

3.1.3. Present and future capacity on Sustainable Energy Development

Understanding the present capacity of local innovators and authorities on sustainable energy development and solutions is essential to mapping out the capacity and skills that might be needed to reach the desired capacity. This section unpacks the national energy governance structures and policies put in place as well as the local policies both the present capacity and future capacity (desired state) on sustainable energy development in Kisumu and Kenya.

3.1.3.1. Political and legal capacity

Kenya's national energy governance and policy landscape forms a vital component to the political and legal capacity on sustainable energy development at the county level. As a result, the national energy landscape will be outlined before discussing the present political and legal capacity on sustainable energy development in both Kisumu County and Homa Bay County.

There are a number of key public and private sector players who form a vital part of the energy landscape in Kenya. These are detailed below:

Ministry of Energy (MoE)

- The MoE is mandated to develop and implement policies that create an enabling environment for efficient operation and growth of Kenya's energy sector. The Ministry sets strategic directions to facilitate the growth of the sector while providing long term vision for all sector players (MoE, 2021).
- The core functions of the MoE (derived from the President's Executive Order No.1 of 2018 (Revised June, 2018)) are as follows:
    - National Energy Policy Development and Management
    - Thermal Power Development
    - Rural Electrification Programme
    - Energy Regulation, Security and Conservation
    - Hydropower Development
    - Geothermal Exploration and Development
    - Promotion of Renewable Energy (MoE, 2021)

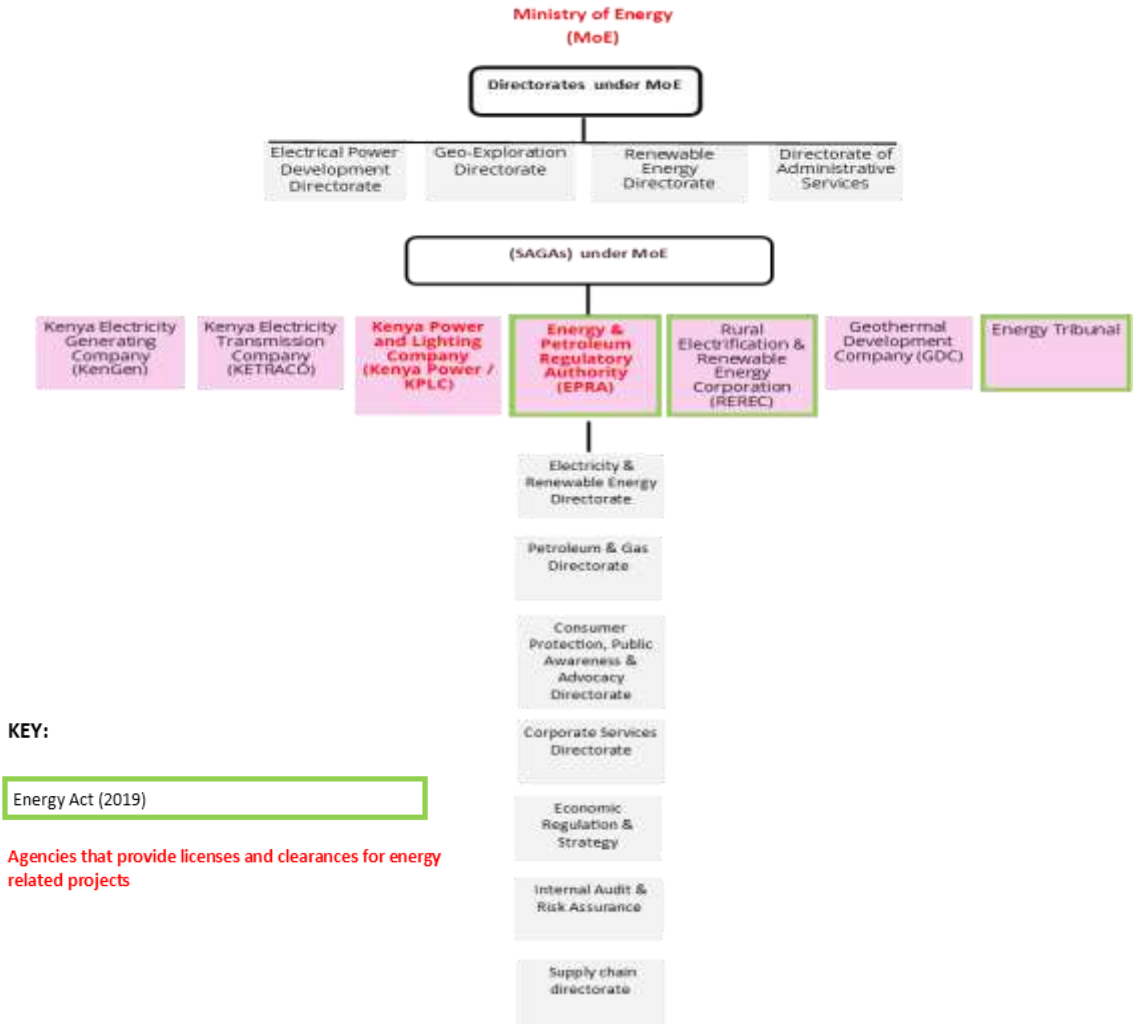

Figure 3: Directorates under the MoE and the Semi-Autonomous Government Agencies (SAGAs) under the MoE

- **The SAGA's under the MoE (also illustrated in Figure 1) are as follows:**
    - **KenGen** is the leading electricity power-generating company in Kenya, producing about 60% percent of electricity consumed in the country. The company utilizes various sources of energy to generate electricity ranging from hydro, geothermal, thermal and wind. It is 70% owned by the Government and 30% shareholding is in the hands of the public.
    - **Kenya Electricity Transmission Company (KETRACO):** The company is 100% Government owned. It is responsible for planning, designing, constructing, operating and maintaining a high voltage electricity grid.
    - **Kenya Power and Lighting Company (Kenya Power/KPLC):** Kenya Power is a state corporation. It is responsible for electricity transmission, distribution and retail sales. It operates energy purchase agreements with KenGen and the Independent Power Producers for onwards transmission and distribution.
    - **Energy and Petroleum Regulatory Authority (EPRA):** EPRA is an independent statutory body with a regulatory mandate in the operations of the entire energy and petroleum sectors. EPRA exists to protect interests of the consumer, investor and other stakeholders. It has the powers to formulate and enforce secondary legislation. EPRA is established as the successor to the Energy Regulatory Commission (ERC) under the

Energy Act, 2019 with an expanded mandate of inter alia regulation of upstream petroleum and coal (EPRA, 2021). The functions of the Authority are provided in Section 10 of the Energy Act 2019.

EPRA is responsible for leading the planning, development, implementation, promotion and execution of structures for the development and regulation of renewable energy and energy efficiency through research and planning, development of standards and regulations, compliance and enforcement. Other responsibilities include:

- Collecting and maintaining RE & EE data
- Preparing RE & EE national plans
- Initiating development of Standards and codes of practice for RE & EE
- Developing requisite regulations for recommending to the Minister for Energy
- Providing information and statistics to the Minister for Energy as he may require from time to time
- Designating energy consumers and maintaining list of accredited energy auditors
- Licensing, Monitoring and enforcement of RE&EE Regulations
- Advising the Commission, internal parties as well as external stakeholders on technical and regulatory matters pertaining to RE & EE (EPRA, 2021)

- **Rural Electrification and Renewable Energy Corporation (REREC):** The Rural Electrification Authority is charged with the mandate of implementing the Rural Electrification Programme. It is 100% Government owned. The Authority is expected to increase the speed of implementation of several projects that are lined up for implementation throughout the country (REREC, 2022).
- **Geothermal Development Company (GDC)**: This is a state-owned company responsible for geothermal resource assessments, including exploration, appraisal and steam production. It explores and develops steam fields and sells geo-thermal steam to KenGen and Independent Power Producers (IPPs) for electricity generation. (GDC, 2022)
- **Energy and Petroleum Tribunal (EPT)/Energy Tribunal**: The Tribunal arbitrates disputes between the Energy and Petroleum Regulatory Authority and other aggrieved stakeholders in the energy sector.

Ministry of Environment and Forestry (MoEF, 2021)

- **Departments under the MoEF:**
  - Administration- Finance, Accounts, Human Resources Management, Human Resources Development, Public Communications, Planning, Information Communications Technology, Supplies Chain Management, Internal Audit and Legal
  - Directorate of Environment- Policy Formulation & Implementation (PF&I), Multilateral Environmental Agreements (MEAs), Programmes, Projects &Strategic Initiatives (PP&SI), Urban Rivers Programme (URP) and Climate Change (CC).
  - Directorate of Natural Resources – Forest Conservation (FC), Wildlife Conservation (WC)
  - Kenya Meteorological Department
- **Semi-autonomous government agencies under the MoEF:**
  - National Environment Management Authority (NEMA): The National Environment Management Authority (NEMA), is established under the Environmental Management and Co-ordination Act No. 8 of 1999 (EMCA) as the principal instrument of Government for the implementation of all policies relating to environment (NEMA, 2022).
  - Kenya Water Towers Agency (KWTA)

  - Kenya Forest Service (KFS)
  - Kenya Forest Research Institute (KEFRI)
  - National Environment Trust Fund (NETFUND)
- **Environmental Management and coordination Act (EMCA) Institutions**
  - National Environment Council (NEC)
  - National Environment Trust Fund (NETFUND)
  - National Environment Tribunal (NET)
  - Public Complaints Committee (PCC)

Ministry of Devolution

- the State Department for Devolution (SDD) draws its mandate from Articles 6, 10 and Chapter 11 of the Constitution of Kenya; the Executive Order No. 1 of June 2018 (Revised) and the various Acts under which devolution is implemented including; Intergovernmental Relations Act, 2012; County Governments Act, 2012; Urban Areas and Cities Act 2011 and Public Finance Management Act 2012 (Ministry of Devolutions, 2022). The Executive Order 1 of June 2018 (Revised) assigned the State Department the following functions:
  - Devolution Policy;
  - Intergovernmental Relations;
  - Capacity Building and Technical Assistance to County Governments;
  - Management, Monitoring and Evaluation for Devolution Affairs;
  - Special Programmes; and
  - Food Relief Management and Humanitarian Emergency Response.
- The National Government established a Ministry responsible for Devolution matters in order to manage the process of implementation of the devolved system of government. The National Government thereafter provided administrative support through secondment of critical staff to assist in setting up county structures before Counties acquired capacities to do so (Ministry of Devolutions, 2022).

National Treasury

- The State Department for Planning within Treasury is divided into seven Directorates:
  - Macroeconomic Planning and International Economic Partnerships
  - Social and Governance
  - Sustainable Development Goals (SDGs) projects and programmes coordination
  - Economic Development Coordination
  - Monitoring and Evaluation
  - Infrastructure, Science, Technology and Innovation
  - Public Investments Management (PIM).
- Public Private Partnership Unit (PPPU)

Ministry of Lands and Physical Planning

- The Ministry of Lands and Physical Planning is a central player in Kenya's socio-economic development plan. Land is one of the key enablers of the 'Big 4 Agenda' and the Vision 2030. Land is acknowledged as a key determinant of social, economic and political transformation (Ministry of Lands and Physical Planning, 2022).

Nuclear Power and Energy Agency (NuPEA)

- NuPEA is a State Corporation established under the Energy Act 2019. It is charged with the responsibility of promoting and implementing Kenya's Nuclear Power Programme, carrying out research and development for the energy sector (NuPEA, 2022).

Kenya has a number of **national policies, plans and strategies** in place that promote sustainable energy development and solutions. Some of these are listed below.

- Vision 2030
- Green Economy Strategy and Implementation Plan (GESIP) (2016-2030)
- President Kenyatta's Big Four Agenda (2018)
- Kenya's Nationally Determined Contribution (NDC) (2017)
- Kenya's Climate Change Act (2016)
- National Climate Change Action Plan (NCCAP) (2018-2022): This plan aims to strengthen the country's path towards sustainable, climate-resilient development while achieving low carbon climate resilient development
- National Climate Change Response Strategy (NCCRS) (2010)
- Kenya National Adaptation Plan (NAP) (2015-2030): This plan builds on the foundation laid by the NCCRS and the NCCAP. Additionally, the NAP is the basis for the adaptation component of Kenya's INDC. The aim of the NAP is to consolidate the country's vision on adaptation supported by macro-level adaptation actions that relate with the economic sectors and county level vulnerabilities to enhance long term resilience and adaptive capacity.
- Other
    - East African Community's Climate Change Master Plan
    - National Spatial Plan (2015-2045)
    - National Climate Change Framework Policy (2016)
    - National Climate Finance Policy (2016)
    - Climate Change Bill (2014)
    - National Waste Management Strategy, Waste Policy and Climate Change Action Plan (2018-2022)

- National Energy Act (2019): An Act of Parliament to consolidate the laws relating to energy, to provide for National and County Government functions in relation to energy, to provide for the establishment, powers and functions of the energy sector entities; promotion of renewable energy; exploration, recovery and commercial utilization of geothermal energy; regulation of midstream and downstream petroleum and coal.
- National Energy Policy (2018): overall objective is to ensure affordable, competitive, sustainable and reliable supply of energy at the least cost in order to achieve the national and county development needs, while protecting and conserving the environment for intergenerational benefits.
- Devolution Policy
- Least Cost Power Development Plan (LCPDP) (2017-2037)
- Kenya National Electrification Strategy (KNES)
- Public Private Partnership (PPP) Act (2013) – amended 2017
- Feed-in Tariff (FiT) Policy (2008) – amended 2010, 2012
- Kenya Off-Grid Solar Access Project (KOSAP)
- Bioenergy Strategy (2020)
- Kenya National Energy Efficiency and Conservation Strategy (2020)
- Scaling-up Renewable Energy Plan (SREP)
- Kenya Electrification Modernization Project (KEMP)
- County energy plans
- Other:
    - Rural Electrification and Renewable Energy Corporation (REREC) Strategic Plan (2017-2021)

- Sustainable Energy for All (SE4All) Action Agenda
- Kenya Electricity Distribution Master Plan (2013)
- Kenya Electricity Sector Investment Prospectus (2018-2022)

Kisumu County's political and legal capacity

Kisumu County currently has a climate change act (Kisumu County Climate Change Act (2020)), environmental policy (Kisumu County Environment Policy (2019)) as well as an integrated development plan (Kisumu County Integrated Development Plan II (2018-2022)). While further information on the present capacity will be obtained from the interviews and kick-off workshop, some initial information from these documents can begin to paint a picture of the sustainable energy development Capacity.

The **Kisumu County Climate Change Act (2020)** was established for Kisumu to provide for a regulatory framework for enhanced response to climate change, to provide for mechanism and measures to achieve low carbon climate development, financial mechanism for implementation of climate change adaptation activities and connected purposes. Energy is one of the focal aspects of this policy.

Within the **Kisumu County Environment Policy (2019)** there are a number of statements, some of which are important to bear in mind in relation to the present capacity on sustainable energy development. For instance, under section 5.9 *Energy Use, Efficiency and Conservation* the policy statement is as follows:

> *The County Government will:*
>
> *a) Develop and promote an integrated county strategy for generation and sustainable utilization of renewable energy.*
>
> *b) Promote adaptation of the cleaner production concept in all energy production and consumption activities.*
>
> *c) Promote investments in clean energy*
>
> *d) Develop a system for energy management graduation for domestic, low and high industry consumers*
>
> *e) Create public awareness with respect to clean energy and energy efficient technologies*
>
> *f) Facilitate public access to clean and affordable energy*

Furthermore, under section 5.10 *Climate Change* the policy statement is as follows:

> *The County Government will:*
> *a) Develop and implement a comprehensive County Climate Change Policy.*
>
> *b) Strengthen capacity for county level institutions to support national climate resilience, low carbon development through integrating climate change into implementation strategies.*
>
> *c) Develop and implement awareness raising strategies and capacity development on the opportunities for adaptation and mitigation measures as per the national climate change action plan and response strategy.*
>
> *d) Strengthen and enhance early warning and response systems for climate and disaster risk reduction.*

e) Enhance the adaptive capacities of marginalized groups

f) Build and strengthen research capacity on climate change and related environmental issues. g) Put in place a climate financing mechanism that will help the county take advantage of new and emerging climate change funds and also include innovative ways to fund climate change actions domestically through committing a percentage of the annual county development budget to climate related interventions.

h) Upscale the role of private sector in combating climate change

i) Involve and empower communities in mitigating and adapting to climate change.

The **Kisumu County Integrated Development Plan II (2018-2022)** is a five-year framework which guides the county's development activities and is a requirement for receiving funds according to the Public Finance Management Act**.** There are a number of key take aways from this plan. Firstly, The "promotion of sustainable energy sources in industrialization and service sector development" and the "promotion of sustainable energy sources in industrialization and service sector development", amongst others are noted as key priorities in the Kisumu County Integrated Development Plan II; Secondly, according to this development plan, Kisumu County has " not fully tapped into the potential of solar power and renewable energy", and lastly, this plan is dated to inform the years 2018 to 2022, which means it will not be in effect as of next year. This last point will come into discussion at a later stage.

Homa Bay County's political and legal capacity

Homa Bay County, similarly to Kisumu County, has a few policies and plans in place to support sustainable energy development in the county.

Homa Bay County's Climate Change Policy (2021) aims to effectively address all climate change related communal issues while promoting socio economic activities to support a stable and thriving County. Under this policy it is stated that the County government will, amongst others, "promote adoption of renewable, sustainable and efficient energy technologies for domestic and industrial use".

In addition, Homa Bay also has an integrated development plan - **Homa Bay County Integrated Development Plan II (2018-2022)**. The County Integrated Development plan outlines ***Energy, Infrastructure and ICT Development Priorities and Strategies*** for Homabay. According to this development plan the majority of Homa Bay county residents rely heavily on fuel wood and charcoal for cooking. This, together with the expected growth in electricity demands means the County Government plans to meet the deficit by facilitating investments in solar, geothermal and biomass power generation plants, which have significant power generation potential in the County. The integrated development plan also stipulates that Homabay County Government "intends to increase energy access to the remaining population by having them connected through maximization of existing power systems network, extending system networks to underserved areas, installing more transformers in identified settlement sites or subsidizing the cost of connection." However, similar to Kisumu, it is worth noting that the duration of the integrated development plan is from 2018-2022, meaning it will not be in effect from next year (2023) onwards.

3.1.3.2. Economic capacity

The present and future economic capacity in this section will be focusing on the following sub-categories: Knowledge and awareness as well as human capacity and skills in relation to sustainable energy development solutions.

According to the implementation plan developed under SESA's work package 4, there are several companies marketing solar home systems, mainly for lighting, but also for phone charging and other small appliances such as TV, radio and torch. It is noted that some companies, such as Power Hive, are implementing solar mini-grids in some communities in the neighbouring county of Kisii and including electric motorbikes as part of their program. However, while the solar companies have reached well into rural communities, what they offer seems to be fairly limited. As a result, there is a need to further develop the sector in order to enhance access to clean energy solutions throughout the region and community residents.

3.1.4. Gaps between present capacity and future desired skills

In order to meet the future, desired capacity on sustainable energy development, and ensure the correct capacity gaps are filled through the SESA project deliverables moving forward, the various capacity gaps that have been identified for Kisumu and Homa Bay are outlined below.

3.1.4.1. Political and legal capacity gaps

As previously mentioned, it is worth pointing out that both Homa Bay County and Kisumu Country's Integrated Development Plans are almost at the end of their term. This means that there is a potential gap that will arise for 2023 onwards in terms of development planning.

In addition, there also appears to be a lack or delay in the formation or adoption of adequate legal and policy frameworks by the county administration and respective county assembly. This is exacerbated by the county assembly's lack of technical expertise and inefficiency in formulating adequate renewable energy legislation. Further information on this will be sourced during the interviews and kick-off workshop with key stakeholders.

3.1.4.2. Economic and social capacity gaps

Knowledge and awareness: A lack of sufficient knowledge on sustainable energy technologies is said to be a serious challenge in Kenya (Takase, 2021). This lack of knowledge can likely result in poor usage and/or a lack of capacity to maintain the energy technology systems. For example, in the implementation plan developed by the living lab for Kenya under SESA's work package 4, it is noted that there is still a relatively low awareness of solar power being used for charging batteries for e-mobility or for basically any use other than small lights. It will take some time for folks to get used to electric vehicles and to trust the technology.

According to the living labs (and the implementation plan) there is currently insufficient data on the energy resource use and base in and around the Lake Victoria basin region. In the region, the same is true for renewable energy sources and related technologies. There is no obvious distinction between on demand and consumption in the data given. This has been noted by the Living lab to be a problem that has to be addressed as soon as possible. The manner in which information is communicated and presented is also critical.

Human capacity and skills: As previously noted under the political and legal capacity gaps, there is a lack of technical expertise and inefficiency in formulating adequate renewable energy legislation. As a result there is a need to enhance the capacity of local authorities in updating and then implementing legal frameworks.

3.1.5. Tools and training modules to fill capacity gaps

Possible themes and curricula for sustainable energy training modules (online and/or face-to-face):

- Workshops with decision-makers on solar PV benefits and approaches for effective integration into revised development plans for target counties

Further information on this will be provided following the interviews and kick-off workshop with key stakeholders. This will further inform the possible sequence, location and timing of training, capacity and skills building activities. Including the peer-to-peer programme for partner cities (Task 2.3) the training schedule, to be undertaken by internal (and affiliated) expert organizations of SESA consortium.In addition, it will enable the development of a summary of training opportunities from partner projects and initiatives.

3.1.6. Summary of results

A summary of the results is provided in the Table below.

Table 2: Summary of results for Kenya

Thematic area	***Present capacity of local innovators and authorities on Sustainable Energy Development***	***Future capacity (desired state) based on the city's vision for the Sustainable Energy Use***	***Gaps between present capacity and future desired skills***	***Tools and training modules to fill these gaps***
Political and legal	There are a number of national and local policies, strategies and plans that support sustainable energy development.	Strengthened environment for enhancing and implementing policies, strategies and plans relating to sustainable energy development	The Kisumu County Integrated Development Plan II (2018-2022) and the Homa bay County Integrated Development Plan II (2018-2022) will both be coming to an end in a few months. Therefore, there is a possible policy gap at the local level.	Workshops with decision-makers on solar PV benefits and approaches for effective integration into revised development plans for target counties
Knowledge and awareness	There is limited knowledge on solar PV renewable energy options and affordable access	High level of awareness through events, exhibitions, training modules and education campaigns on solar PV renewable energy options and	A lack of sufficient knowledge on sustainable energy technologies is said to be a serious challenge in Kenya (Takase, 2021). This lack	Factsheets highlighting what the energy solution is and the benefits thereof Online capacity building workshops focusing on the benefits and

		affordable access	of knowledge/awareness can likely result in poor usage and/or a lack of capacity to maintain the energy technology systems amongst other things.	effective utilisation of solar PV systems Peer-to-peer learning through site visits and study tours to project implementation sites Peer exchange with cities leading the way in the field of sustainable energy solutions
Human capacity and skills of community	Low level of community understanding and skill related to solar PV technology	Enhanced capacity and skills of community members in relation to Solar PV hubs operation and maintenance	A lack of understanding on Solar PVs and more specifically, the solar PV hubs functions	Training selected community members (with guiding documents) on the operation and maintenance procedures required in relation to the Solar PV hubs
Skills of local innovators	Some level of skill amongst new, small-scale solar PV companies, however the scope of the technology is limited	Sound understanding of Kenya's energy policy landscape in order to upscale and replicate energy solution	Mapping of possible policy, strategy and/or plans entry points for replicating energy solution	Innovator training and workshops on solar PV technology production, installation, maintenance, utilisation and marketing Innovator training modules developed for workshops
Access to finance	Little access to finance to fund solar PV investment	Improved conditions to access finance to fund solar PV investment	Develop financial instruments and technical assistance to improve fiscal access	Awareness-raising and technical assistance to financial institutions and individuals to increase access to finance to fund solar PV investment Financial instruments developed for increased access to finance to fund solar PV investment

3.2. Malawi

3.2.1. Country context and background

Malawi is a landlocked country in southeast Africa. In 2017, approximately 10% of Malawi's population had access to electricity. In 2017, 87% of the population were still dependent on biomass for cooking through the use of firewood. Firewood dependency and charcoal production for cooking continues to cause severe national deforestation which exacerbates the impact of flooding disasters in Malawi (Buckland et al., 2017).

3.2.2. Actions planned for living lab in Malawi

In Malawi the traditional use of biomass in everyday household work is associated with significant negative environmental and health effects such as deforestation and indoor air pollution. The adoption of clean and efficient cooking technologies requires attention on how to bring the stove adoption to scale. Adoption is affected by various factors that cut across the value chain. Therefore, the challenge is to implement the stoves fired with sustainable biomass and render tangible health, environmental, and social benefits to the target populations. A circular energy solution for clean cooking, clean water and agriculture in rural areas of Malawi is the BioCooker, which will be produced at the demo site in Waliranji-Mchinji in Malawi.

The objective of the Malawi demonstration innovation is to:

- adapt and validate the BioCooker to a small-scale and commercial product, in order to be easily implemented in the selected region;
- develop a local material supply chain by testing new biomass alternatives for the selected regions to reduce deforestation and pressure in forest;
- enhance the recovery of nutrients by producing secondary bio-products: soil improvers as biochar and to develop new value chains and acircular business model for local entrepreneurs, supporting them in an acceleration process.

There is a need to shift from unsustainable biomass energy sources to sustainable and diversified renewable energy production hence the BioCooker will play a great role as it converts biomass fuels producing heat for cooking and biochar. The biochar is used as an affordable water purification system and enriching soil for agriculture. The BioCooker also has USB ports to provide electricity. The demo will provide a circular & sustainable business model with high replication potential, to be available to local entrepreneurs. The project partners include: The Research Institute of Sweden AB (RISE) (Research partner – support testing activities in the demonstration); Make it Green Solutions (SME) (responsible for providing test units of the BioCooker, blueprints for the local production, supervision and checks of the production, as well as organising the fuel chain); and Going Green (local partner). The key participants involved in the Living Lab in Malawi are outlined in more detail in Table 3 below.

Table 3: Key living lab participants in Malawi and their role

Participant	Role and information about the participant
Research Institute of Sweden AB (RISE)	(***Research partner – support testing activities in the demonstration***): RISE Research Institutes of Sweden is Sweden's research institute and innovation partner. Through international collaboration with industry,

	academia and the public sector, RISE ensures business competitiveness and contribute to a sustainable society.
Make it Green Solutions	***(A Small Medium Enterprise responsible for providing test units of the BioCooker, blueprints for the local production, supervision and checks of the production, as well as organizing the fuel chain)***: Make It Green Solutions AB is a Swedish cleantech company. They undertake research and development of sustainable solutions for clean energy, water and agriculture. The results are an innovative range of products, services and consulting intended for a global market aimed at reducing the overall carbon footprint.
Going Green	The ***local partner*** who will manufacture the BioCooker locally according to blueprints work with the distribution, training and supervision on how to properly use the cookstove.

3.2.3. Present and future capacity on Sustainable Energy Development

This section unpacks the present and future (desired state) capacity on sustainable energy development in Waliranji-Mchinji, Malawi.

3.2.3.1. Political and legal capacity

There are a number of key public and private sector players who form a vital part of the energy landscape in Malawi. These are detailed below.

Ministry of Energy

- **Department of Energy Affairs (DoEA)**: Currently DoEA is the only constituent department of the Ministry of Energy. DoEA's core functions:
    - The formulation and coordination of energy policies, planning, information communication and technology.
    - The provision of rural electrification services.
    - The provision of alternative energy and energy conservation services.
    - Coordination of research and development in the sector (MoE, 2022)

Minister of Natural Resources, Energy and Mining (MoNREM): acting through the Department of Energy Affairs (DoEA) and Malawi Energy Regulatory Authority (MERA) (MiNREM, 2022).

Electricity Supply Corporation of Malawi (ESCOM) Limited: responsible for the transmission and distribution of electricity in Malawi;

Malawi Energy Regulatory Authority (MERA): responsible for the regulation of the Petroleum Industry; the electricity industry, the renewable energy industry, ethanol, coal industry and all biofuels production and utilisation.

National Oil Company of Malawi (NOCMA): responsible for management of the country's strategic fuel reserve facilities, promote competition in the oil and gas industry and to promote oil and gas exploration activities for stability and security of supply of liquid fuel and gas products

Electricity Generation Company (EGENCO): responsible for generation of electricity in Malawi

Power Market Limited: responsible for single operating single buyer functions

Ministry of Finance (MoF): Mandate is to formulate economic and fiscal policies that seek to manage government financial and provide strategic guidance on economic and development planning based on accurate and reliable statistics for attainment of social economic development.

The Ministry headquarters provides leadership for the whole Ministry. The Ministry headquarters is headed by the Secretary to the Treasury (MoF, 2022).

The Malawi Renewable Energy Partnership Group (MREPG): formed immediately on publication of the Malawi Renewable Energy Strategy (2017) and was tasked with delivering the actions within the Malawi Renewable Energy Strategy (2017) as well as recommending new actions in future as the sector develops.

Community Energy Malawi: Community Energy Malawi (CEM) provides services in Networking of organisations and individuals with interest in renewable energy; Raising Awareness on potential of renewable energy; Capacity building in Renewable Energy Technologies; Lobbying and advocacy on Renewable Energy and; Fundraising for and funding Renewable Energy Technologies.CEM will endeavour to provide detailed and timely support on community energy projects. The organisation will also help in bringing together policy makers, energy suppliers, installers and users as a way of finding new innovative ways of developing community energy. CEM have produced a toolkit on Renewable Energy Technologies (Community Energy Malawi, 2022)

Rural Electrification Fund: Funds the **Malawi Rural Electrification Programme (MAREP)**

Rural Electrification Management committee

District Energy Officer: According to the Malawi Renewable Energy Strategy (2017) and Buckland et al (2017), the Government of Malawi is expected to implement a District Energy Officer role to support energy sector decentralisation (expected in all 28 Malawi districts by 2022). These officers will perform a range of duties from advising the general public to informing local energy plans, all to meet the aims and objectives of the MRES. According to the Renewable Energy Strategy (2017), there is currently a pilot project ongoing to determine the exact role of the district energy officers.

Malawi also has a number of **national policies, plans and strategies** in place that promote sustainable energy development and solutions. Some of these are listed below.

- Malawi's National Energy Policy (2018)
- Malawi National Renewable Energy Strategy (2017): **The National Energy Policy (2018)** and the **Malawi Renewable Energy Strategy (2017**) build on the targets laid out in the Sustainable

Energy for All Action Agenda (2017) and provide high-level policy direction, complemented by detailed technical analysis made available in the most recent Integrated Resource Plan (2017).

The Government of Malawi (GoM) Renewable Energy Strategy sets out a detailed set of priorities and actions to achieve the following vision for renewable energy in Malawi: Universal access to renewable electricity and a sustainable bioenergy sector.

- Malawi National Electrification Strategy & Action Plan (2019)
- Sustainable Energy for All Action Agenda (2017)
- Integrated Resource Plan (2017)
- Regulatory Frameworks for Mini-Grids (2019)
- Malawi Feed-in Tariff Policy (2012)
- Malawi Biomass Energy Strategy (2009)

Further information on this will be sourced during the interviews and kick-off workshop with key stakeholders.

3.2.3.2 Economic capacity

Similar to Kenya, the present and future economic capacity for Malawi will be focusing on the following sub-categories: Knowledge and awareness; human capacity and skills and access to finance to upscale sustainable energy development solutions.

3.2.4. Gaps between present capacity and future desired skills

3.2.4.1. Political and legal capacity gaps

As noted in the previous section, Malawi has a number of policies, strategies and plans available at the national level. The question that needs to be explored is the political and legal capacity at the local levels in Malawi. Currently there is insufficient information available of the capacity gaps at the local level. Therefore, this aspect will need to be enhanced through the interviews and kick-off workshop with stakeholders in Malawi.

3.2.4.2. Economic and social capacity gaps

While the knowledge and awareness; human capacity and skills; and access to finance around the energy solutions being explored in SESA is unsure, the interviews and kick-off workshop will be able to further inform this section.

3.2.5. Tools and training modules to fill capacity gaps

Possible themes and curricula for sustainable energy training modules (online and/or face-to-face):

- Sustainable energy access solutions 101 with complementary visual factsheet documents
- Institutional training and awareness-raising to enhance policy and planning for energy resilience at different scales
- Awareness-campaigns on BioCooker technology, benefits and opportunities
- Community users training and manuals on BioCooker technology, benefits and utilisation
- Innovator training on BioCooker technology production, utilisation and marketing
- Training and awareness-raising to financial institutions on the development of financial instruments to increase access to finance to funding for BioCooker production

Further information on this will be provided following the interviews and kick-off workshop with key stakeholders. This will further inform the possible sequence, location and timing of training, capacity

and skills building activities. Including the peer-to-peer programme for partner cities (Task 2.3) the training schedule, to be undertaken by internal (and affiliated) expert organizations of SESA consortium.In addition, it will enable the development of a summary of training opportunities from partner projects and initiatives.

3.2.6. Summary of results

A summary of the findings for Malawi are provided in Table 4 below.

Table 4: summary of results for Malawi

Thematic area	Present capacity of local stakeholders on Sustainable Energy Development	Future capacity (desired state) based on the city's vision for the Sustainable Energy Use	Gaps between present capacity & future desired skills	Tools & training modules to fill these gaps
Policy and planning	Several policies and strategies are in existence relating to energy and Malawi's vision for resilience.	Strengthened environment for enhancing policies and strategies relating to energy and Malawi's vision for resilience	Development of enabling environment	Institutional training and awareness-raising for supporting energy resilience at different scales
Knowledge and awareness	Some level of awareness from events and exhibitions hosted by the Cooking Stoves Association of Malawi and Going Green	High level of awareness through events, exhibitions, training modules and education campaigns on BioCooker technology, benefits and opportunities	Development of education and awareness on BioCooker technology	Awareness-raising through events, exhibitions and education campaigns on BioCooker technology, benefits and opportunities
Human capacity and skills of community	Low level of community understanding and skill related to BioCooker technology	High level of community skills on BioCooker technology, benefits and utilisation	Development of BioCooker technology understanding and utilisation	Community training on BioCooker technology, benefits and utilisation User manuals developed for community users
Skills of local innovators	Some level of skill, especially amongst innovators in the	High level of innovator skills on BioCooker technology	Development of training for BioCooker production	Innovator training and workshops on BioCooker technology

	Cooking Stoves Association of Malawi - the body that governs anything to do with cookstoves in the country in collaboration with GIZ	production, utilisation and marketing		production, utilisation and marketing Innovator training modules developed for workshops
Finance	Little access to finance to fund BioCooker production	Improved conditions to access finance to fund BioCooker production	Develop financial instruments and technical assistance to improve fiscal access	Awareness-raising and technical assistance to financial institutions and individuals to increase access to finance to fund BioCooker production Financial instruments developed for increased access to finance to fund BioCooker production
Infrastructure	Partial access to materials required for BioCooker production	Increased access to all materials required for BioCooker production	-	Value chain developed to improve production line and access to materials required for BioCooker production

3.3. Ghana

3.3.1. Country context and background

Ghana pans the Gulf of Guinea and the Atlantic Ocean to the south, sharing borders with the Ivory Coast in the west, Burkina Faso in the north, and Togo in the east. Ghana's National electricity coverage has expanded over the years but there is still over-reliance on hydropower sources and fossil-fuel (thermal) energy sources. In Ghana, though electricity remains the main source of power for lighting for 88.6% of urban households, electricity use for lighting in rural households is less than 50%. Nationally, energy for cooking is largely dependent on the use of wood (41.3%), charcoal (31.5%) and gas (22.3%). In urban areas 43.6% of households use charcoal for cooking (Energy Commission, 2021) .

3.3.2 Actions planned for living lab

The demonstration project in Ghana will explore clean cooking through waste-to-energy solutions and solar lighting. The demonstration will encompass business models, capacity building on construction and maintenance of the plants, and other activities to deliver a complete value chain. The demonstration will partner with four public Second Cycle Schools, namely: St. Johns Grammar Senior High School and Amasaman Senior High/Technical School in Ga North, and Nkawie Senior High/Technical School and Toase Senior High School in Atwima Nwabiagya, to set up Biogas/Solar Energy plants. The key participants involved in the Living Lab in both sites in Ghana are outlined in more detail in the table (Table 5) below.

Table 5: Key participants in Ghana and their role

Participant	Role and information about the participant
Akenten Appiah-Menka University Of Skills Training and Entrepreneurial Development (AAMUSTED, Kumasi)	(Local Demonstrator)
Leitat Technological Center, Spain	(Technology provider - bioelectrochemical system)
Technalia, Spain	(Technology provider - solar PV - micro smart grids)
Local Small Medium Enterprises	(Support in local implementation of demonstration activities)

3.3.3. Present and future capacity on Sustainable Energy Development

3.3.3.1. Political and legal capacity

There are a number of key public and private sector players who form a vital part of the energy landscape in Ghana. These are detailed below.

- Ministry of Energy
- Commission and the Integrated Resource
- Resilience Planning (IRRP) team
- Volta River Authority (VRA)
- Bui Power Authority (BPA)
- Ghana Grid Company, Ltd. (GRIDCo.),

- Electricity Company of Ghana (ECG)
- National Electricity Distribution Company
- (NEDCo.)
- Enclave Power Company (EPC)
- Public Utilities Regulatory Commission
- (PURC)
- Energy Commission of Ghana (EC)
- Ghana National Petroleum Corporation
- (GNPC)
- Ghana National Gas Company Ltd. (GNGC)
- local District Medium Term Development Plans (DMTDPs) of the municipality

Despite significant efforts to mainstream sustainable energies into Ghana's national policies, the extent to which such energies are integrated into local government plans in Ghana remains unclear (Akrofi & Akanbang, 2021).

Ghana has a number of **national policies, plans and strategies** in place that promote sustainable energy development and solutions. Some of these are outlined below.

The **Ghana Renewable Energy Master Plan (REMP) (2019),** which has set a 10% renewable energy in Ghana's electricity mix by 2030 and renewable energy to 1,000 off-grid villages by 2030, is a recent government policy initiative that attempts to explore Ghana's renewable energy potential. REMP also aimed at promoting local content and participation in the renewable energy sector (Ministry of Energy, 2019).

However, as noted in the draft SESA demo implementation plan, there is only a little amount of effort taken on the ground to meet these new renewable energy targets. Both governmental and non-state enterprises are working on solar energy projects in Ghana. Ghana, on the other hand, has not progressed from demonstration projects to large-scale adoption of solar and other new renewable energy. At the moment, new renewable energy makes up less than 1% of the grid's energy mix.

The broad strategies proposed for the successful implementation of the REMP are as follows:

- Boost and sustain local assembly and manufacture of RETs through a systematic phasing out of import duty exemptions on RETs where the country has a competitive advantage;
- Strategically recommend consideration for tax exemptions on components and materials for assembly and manufacture to make RETs competitive on the local and sub-regional markets;
- Provide support to existing RET assembling/manufacturing companies including preferential procurements under public financed projects;
- Guarantee local market through local content and local participation actions;
- Support the private sector through concessional financing and government on-lending facilities to RE investments;
- Institutionalise competitive procurement to achieve cost reduction in tariff for utility scale renewable energy projects;
- Continuously provide investment support for the upgrading of the National Interconnected Transmission System to accommodate the planned renewable energy power targets;
- Incorporate land requirements for renewable energy projects in the national spatial planning framework;
- Develop legislation to ensure that increased development of renewable energy projects does not become detrimental to the environment;
- Intensify awareness creation;

- Build capacity in various aspects of renewable energy development;
- Support research and development.
- Explore opportunities to develop a market and production hub for electric vehicles in Ghana.

In line with the Renewable Energy Act, 2011 (Act 832), the Ministry of Energy will implement the plan through the REMP Coordinating Unit (REMP-CU).

Ga North policy and legal capacity

Ga North Municipal Assembly has an Annual Action Plan (Ga North municipal Assembly (GNMA) Annual Action Plan (2022)). However, the policy landscape at the local level is currently not readily available to the public. Therefore, additional information on the current capacity in Ga North will need to be obtained through interviews and the kick-off workshop with selected participants in Ghana.

Atwima Nwabiagya policy and legal capacity

Similarly, the policy landscape for Atwima Nwabiagya is currently not readily available to the public. As a result, additional information on the current capacity in Atwima Nwabiagya will also need to be obtained through interviews and the kick-off workshop with selected participants in Ghana.

3.3.3.2. Economic and social capacity

The present and future economic and/or social capacity in this document will be focusing on the following sub-categories: Knowledge and awareness; human capacity and skills and access to finance to upscale sustainable energy development solutions.

Education and awareness: According to the SESA implementation plan developed for Ghana, the current level of education and awareness around Solar PVs and biogas technologies is still relatively low. Public misunderstanding about such technologies results in a slow uptake or transition to these sustainable energy solutions.

Human capacity and skills: The current human resources and technical skills to operate and maintain the renewable energy technologies being implemented through SESA, is noted to be relatively low.

Access to finance: The present and future capacity in terms of financing sustainable energy development is not clear. Therefore, additional information on the current capacity will need to be obtained through interviews and the kick-off workshop with selected participants in Ghana.

3.3.4. Gaps between present capacity and future desired skills

3.3.4.1. Political and legal capacity gaps

As noted, despite significant efforts to mainstream sustainable energies into national policies, the extent to which such energies are integrated into local government plans in Ghana remains unclear (Akrofi & Akanbang, 2021). Akrofi & Akanbang's (2021) study explored the status and factors affecting the integration of sustainable energies in local level planning using the Wa Municipality in the Upper West Region as a case study. "Access to sustainable energy especially in rural areas can be greatly enhanced if national policies promote decentralised development planning and service delivery, especially when local governments are given the mandate and capacity to address community energy needs. Havet et al., stress the fact that the involvement of local people and institutions in the planning and implementation of sustainable energy projects can enhance government accountability in delivering modern energy services" (Akrofi & Akanbang, 2021).

3.3.4.2. Economic and social capacity gaps

Knowledge and awareness: According to the SESA implementation plan for Ghana, there is poor or a lack of public awareness; poor or a lack of information about the cost and benefits of renewable energy technologies; as well as public acceptance of renewable energy technologies.

Human capacity and skills: The SESA implementation plan for Ghana notes that there is a lack of technical skills to operate and maintain renewable energy technologies, project development skills as well as a lack of adequate training centres.

Access to finance: The SESA implementation plan for Ghana notes that access to finance and long-term capital is an additional gap.

Further information will be sourced during interviews and the kick off workshop with key stakeholders.

3.3.5. Tools and training modules to fill the capacity gaps

Possible themes and curricula for sustainable energy training modules (online and/or face-to-face)

- Sustainable energy access solutions 101 with complementary visual factsheet documents

Further information on this will be provided following the interviews and kick-off workshop with key stakeholders. This will further inform the possible sequence, location and timing of training, capacity and skills building activities. Including the peer-to-peer programme for partner cities (Task 2.3) the training schedule, to be undertaken by internal (and affiliated) expert organizations of SESA consortium.In addition, it will enable the development of a summary of training opportunities from partner projects and initiatives.

3.3.6. Summary of results

A summary of the findings for Ghana are outlined in Table 6 below.

Table 6: Summary of results for Ghana

Thematic area	Present capacity of relevant stakeholders on Sustainable Energy Development	Future capacity (desired state) based on the city's vision for the Sustainable Energy Use	Gaps between present capacity & future desired skills	Tools & training modules to fill these gaps
Political and legal	There are numerous national policies promoting sustainable energy development in Ghana. In addition, Ga North municipal Assembly (GNMA) has an Annual Action Plan (2022)	Strengthened environment for enhancing and implementing policies, strategies and plans relating to sustainable energy development	Despite significant efforts to mainstream sustainable energies into national policies, the extent to which such energies are integrated into local government plans in Ghana remains unclear (Akrofi & Akanbang, 2021).	Policy review and integration working session with selected national and local authorities

Knowledge and awareness	Low level of awareness on waste-to-energy technology High level of suspension about the sanitation and hygiene of waste-to-energy technology	High level of awareness through events, exhibitions, training modules and education campaigns on waste-to-energy benefits and opportunities Improved understanding on the hygiene practices for safe waste-to-energy utilisation	There is a lack of public awareness; a lack of information about the cost and benefits of renewable energy technologies; as well as public acceptance of renewable energy technologies.	Factsheets highlighting what the energy solution is and the benefits thereof. Online capacity building workshops focusing on sourcing, utilisation and production of waste-to-energy systems Site visits/study tours to where projects are being implemented Peer exchange with cities leading the way in the field of sustainable energy solutions
Human capacity and skills	Low level of community understanding and skill related to waste-to-energy technology	High level of community skills on waste-to-energy technology, benefits and utilisation	There is a lack of technical skills to operate and maintain renewable energy technologies, project development skills as well as a lack of adequate training centres.	Training selected community members (with guiding documents) on the operation and maintenance procedures required as well as various project development aspects.
Access to finance	Little access to finance to fund waste-to-energy technology	Improved conditions to access finance to fund waste-to-energy technology	Access to finance and long-term capital to access resources to fund waste-to-energy technology.	Awareness-raising and technical assistance to financial institutions and individuals to increase access to finance for waste-to-energy systems

3.4. South Africa

3.4.1 Country context and background

The SESA living Lab in South Africa will be trialled in Alicedale, located in the Eastern Cape. Alicedale is a small settlement in Sarah Baartman District Municipality, Makhanda Local Municipality in the Eastern Cape province of South Africa, situated on the banks of the Bushman's River. According to a 2011 census, the town has a total population of under 4000 people (about 500 households) that is relatively young (approx 60% under 35 years of age) (StatsSA, 2011)

3.4.2. Actions planned for living lab

The demonstration project in South Africa aims to test, validate and replicate a containerized off-grid renewable energy system comprising solar PV panels and second life EV batteries for stationary energy storage.

Key dimensions:

- extending the productive use of renewable energy also to charge a small fleet of micro utility EVs (link to mobility decarbonisation) and understand the technical and commercial feasibility, performance, and replicability of the system for rural and peri-urban applications in South Africa and across the African continent
- understand performance, value and repurposing potential of EV batteries

Figure 4: Representation of the containerised off-grid solar energy system

The key participants involved in the Living Lab in Alicedale are outlined in more detail in the table below.

Table 7: Key living lab participants in South Africa and their roles

Participant	Role and information about the participant
Alicedale Community	(Use of technology)
Shamwari Community Trust	(Civil society representation of community)

Nelson Mandela University – uYilo	(Local Demonstrator)
Local SME's	(Develop and maintain energy projects)

3.4.3. Present and future capacity on Sustainable Energy Development

The present and future (desired) capacity required for containerised energy via PV panels and second life EV batteries in Alicedale, South Africa, is explored under this section.

3.4.3.1. Political and legal capacity

In terms of influencing renewable energy implementation and management, there are a number of key public and private sector players who form a vital part of the energy landscape in South Africa. Some of the key players include:

- Department of Mineral Resources and Energy (DMRE)
- National Energy Regulator of South Africa (NERSA)
- Solar Photovoltaic Industry Association (SAPVIA)
- Association of Municipal Electricity Utilities (AMEU)
- Eskom

In addition, there are various policies, strategies and plans that are worth highlighting. The **Integrated Resource Plan (IRP)** is a development plan for new-build electricity infrastructure. It aims to achieve least-cost electricity supply and meet the energy demand of South Africans, in accordance with the National Development Plan (2030), whilst meeting climate change objectives of the country. At its core, it sets out what technology should be constructed, the power capacity of the technology and the year in which it should be commissioned. Further, all electricity infrastructure is required to fall within this plan for review by the public, as well as provincial and national governments.

In 2019 the Department of Energy (now the Department of Mineral Resources and Energy) published the most recent version of the IRP (Department of Energy, 2019). For the first time, embedded generation (also referred to as distributed generation) was assigned annual capacity. This was due to multiple requests from companies, municipalities and individuals interested in starting their own projects. Up to 500MW of annual capacity has now been allocated to embedded generation up to 2030.

Further, in April 2021, a licensing exemption and registration notice was released (Department of Energy, 2021). The notice is relevant for all embedded generation systems under 100MW. Previously, systems over 1MW in size were required to obtain a generation licence. The exemption notices now specifies that:

1) Embedded generator (EG) systems with capacity up to 100KW do not require registration or licensing from the regulator (NERSA). Registration is required with the distributor as well as compliance with respective point of connection conditions
2) EG systems with capacity up to 100MW are exempt from holding a generation licence, but do require registration with the regulator. Relevant grid code compliance is needed.

Given these two policy amendments, the policy and regulation landscape provides an enabling platform for the technologies used in the SESA living lab to be developed.

3.4.3.2. Economic and social capacity

- **Knowledge and awareness**: While the national grid is unreliable in South Africa, with communities – such as Alicedale – experiencing blackouts, there is simultaneously little to no sustainable energy infrastructure currently operating in Alicedale (for several reasons including) because there is a lack of information and awareness about renewable energy solutions and the benefits thereof.

- **Human capacity and skills:** As noted in the Implementation Plan, there are no renewable energy systems operating within Alicedale, and only a few systems operating in the surrounding areas. Thus, the local community has had little to no exposure to solar PVs, battery systems and EVs as alternative sources of energy, nor the installation, maintenance and business opportunities of such systems.

- **Access to finance:** Cycles of poverty impede the local communities ability to trial and expand renewable energy. The barrier to access is intensified by the fact that there is no grants or financial support available for the energy technology being piloted. Furthermore, there is no sufficient business model for solar PV and battery provisioned energy.

3.4.4. Gaps between present capacity and future desired skills

3.4.4.1. Political and legal capacity gaps

As outlined above, there are several policies and plans and institutional arrangements guiding renewable energy in South Africa. According to the Implementation Plan the main challenge is not policy gaps but funding and capacity development to implement policy.

3.4.4.2. Economic and social capacity gaps

- **Knowledge and awareness**: There is a lack of information and education or training campaigns in Alicedale to spread awareness about accessing and using renewable energy solutions and the benefits of such technologies.

- **Human capacity and skills:** Exposure to and experience working with solar PVs, battery systems and EVs as alternative sources of energy is critical under SESA to equip the community with experience and understanding of how the technologies can be installed, operated, maintained and utilised effectively.

- **Access to finance:** Insufficient mechanisms to access funding leaves a gap and opportunity for the development of requisite financial mechanisms to support access to solar PV and battery provisioned energy

3.4.5. Tools and training modules to fill capacity gaps

Possible themes and curricula for sustainable energy training modules (online and face-to-face);

- Institutional training on mainstreaming and enhancing sustainable energy and electric vehicle
- Community-level awareness raising through roadshows and infographics on sustainable energy technology and the associated impacts
- Community users training on solar PV and battery provisioned energy
- User-Manuals for the community in local language

- Online and in-person training on installation, operation, maintenance and use of technology with innovators
- Online workshops on financial mechanisms and tools for respective technologies
- Training on suitable appliances and infrastructure for relevant technology
- Introductory training to EVs and related infrastructure
- Expansion of entrepreneurship programme to include sustainable i) agriculture, ii) tourism, and iii) transportation business models.
- Computer training including basic website design.
- Driving training for micro utility EVs.

Further information on this will be provided following the interviews and kick-off workshop with key stakeholders. This will further inform the possible sequence, location and timing of training, capacity and skills building activities. Including the peer-to-peer programme for partner cities (Task 2.3) the training schedule, to be undertaken by internal (and affiliated) expert organizations of SESA consortium.In addition, it will enable the development of a summary of training opportunities from partner projects and initiatives.

3.4.6. Summary of results

A summary of the results are provided in the table (Table 8) below.

Table 8: summary of results for South Africa

Thematic area	**Present capacity of relevant on Sustainable Energy Development**	**Future capacity (desired state) based on the city's vision for the Sustainable Energy Use**	**Gaps between present capacity & future desired skills**	**Tools & training modules to fill these gaps**
Political and legal	Basic enabling environment created through national and local government policy Little to no planning of these projects by local governments No regulations/standards on the use of second-life EV batteries.	Supportive policy and programmes for sustainable energy technology for electrification and EVs Mainstreaming of sustainable energy technology in national and local government infrastructure planning Regulations on second life batteries and their usage	Development of policy on sustainable energy technology or electrification Introduction to EVs and training on how the technology works as well as the potential benefits Policy and planning mechanisms that can support these technologies Development of second life EV regulations	Online capacity building workshops on ways in which to further support sustainable energy and electric vehicles (such as support programmes, subsidies etc.) Site visits/study tours to where similar projects with containerised Solar PV and electric vehicles are being implemented. Peer exchange with cities leading the way in the field of sustainable

				energy solutions Case study information/technical support on regulations on EVs and second life battery usage
Knowledge and awareness	Little information about respective sustainable energy and sustainability	Understanding of sustainable energy and the benefits thereof	-	Awareness raising capacity building/roadshows/infographics on sustainable energy technology and the associated impacts.
Human capacity and skills of community	Unfamiliar with using solar PVs, battery systems and EVs	Able to use for daily activities	Community gains experience and understanding how technology works Community gains experience and understanding on technology can be used for current activities Community gains experience and understanding on how to operate and, to a certain extent, maintain technology Community gains understanding of the benefits of the technology and potential opportunities	Introductory training to EVs and related infrastructure User-Manuals for the community in local language Driving training for micro utility EVs

Skills of local innovators	A high level of skill within urban centers in South Africa to design, implement and maintain technologies. Low level of skills within rural areas. Little experience with second-life battery and its uses. Little history of rural EV market in South Africa	A high level of skill within rural areas for respective technologies Understanding of second life batteries and its functioning EVs are commonly used within rural setting for transport	Rural local innovators gain understanding and experience with relevant technologies Demonstration of second life EV battery usage	Online and hands on training of technologies Site visits to companies where technologies are used Incubation and mentoring of companies Pilot projects and monitoring of second life EV battery usage Computer training including basic website design
Finance	No grants or subsidies given directly for sustainable energy technologies being piloted Existing business model of providing energy access through solar PV and batteries	Supportive grants and subsidies	Development of supportive financial mechanisms for respective technologies	Online workshops on financial mechanisms and tools for respective technologies Financial modelling to calculate appropriate financial support Expansion of entrepreneurship programme to include sustainable: i) agriculture, ii) tourism (including catering, restaurant, tours, clothing, beading,

				accommodation), and iii) transportation (shared vehicles) business models
Infrastructure	No information given	Local household and business technology is suitable for solar PV and battery use Local transport network infrastructure is suitable for EVS	-	Training/site visits/workshops on suitable appliances and infrastructure for relevant technology

3.5. Morocco

3.5.1. Country context and background

Morocco is a northwest African country bordering the Atlantic Ocean and Mediterranean Sea. Morocco acted as a host of COP7 in 2001, where the Marrakech Agreement was reached, and the COP22 in 2016 in Marrakech. More recently, Morocco acted as a powerful advocate for Africa at COP23 in Bonn and at the COP24 in Katowice. Notably COP 22 marked Morocco's increasing presence in the global arena, its leadership in the deployment of clean energy technologies, and its role as an advocate for Africa and for least developed countries. Conscious of the magnitude of challenges faced by the African continent, Morocco is now pursuing several cooperation initiatives, including the creation of excellence centres to serve African countries in the energy and climate fields (Internal Energy Agency, 2019).

Morocco has made impressive progress in electrification. According to the Internal Energy Agency, (2019), Morocco's population has full access to electricity, a key pillar of Sustainable Development Goal 7 on energy. Morocco is also leading the deployment of renewable energy in North Africa and the Mediterranean with an impressive track record in developing solar technologies, most notably concentrating solar power (CSP) and hybrid technologies with solar photovoltaic at the world's largest CSP park in Ouarzazate. Morocco has increased the hours of storage in its CSP plants and is investing in new interconnections and market integration with European neighbours, thus ensuring greater security, efficiency and flexibility of the power system. Morocco is pursuing an ambitious energy transition pathway. More investments will be needed from both the private and public sectors to meet its renewable and energy efficiency targets (Internal Energy Agency, 2019).

In Morocco, the transport sector consumes 38% of the global energy and represents the second largest CO2 emitting sector in the country. Aware of the continued growth in the motorization rate, Morocco is now accelerating its energy transition in order to avoid future issues, which are often difficult and costly. The electrical mobility in Morocco is considered to be a fundamental aspect of its energy transition. While the number of electrical vehicles in Morocco reached only 0.01% of the global market in 2017, Morocco, through the Ministry of Energy, Mines and Sustainable Development, adopted a National Strategy for Sustainable Development, which incorporates sustainable mobility.

3.5.2. Actions planned for living lab

The demonstration site in Marrakesh will use lithium-ion batteries to foster renewable energies and electric mobility, taking a circular economic perspective at the core of the approach. The choice of the validation sites for the project's activities follow the same vision of the Moroccan electrification program and aim to boost the economic development in rural areas, by promoting the creation and modernization of income-generating activities through the energy transition and the integration of off-grid solar energy systems. The targeted rural sites in Marrakech are divided into two major categories: schools and households. With the help of the Act4Community association whose main objective is to significantly, sustainably, and concretely improve the standard of living of the rural populations, 13 households and 7 schools based in 6 different rural villages, all in the ecosystem of the phosphate mines of Benguerir and Bouchane have been chosen. The selection criteria were mainly social, as the households suffer from the lack of the main vital services such as electricity, drinking water, heating, cooking and sanitation. Another criterion of selection was the proximity to the ecosystem of Green Energy Park and its living labs. The villages are within 5 to 20 km from the research centre. The project's participants include: the Blekinge Institute of Technology (BTH) (coordination, expertise in urban planning); University Cadi Ayyad (IMED Lab.) (expertise in renewable energies, electrochemical Energy Storage - Lithium batteries (LiBs), electric mobility, thermal energy storage, eco-building); Green Energy

Park (Industry/SME provision of the Green & Smart Building Park platform and staff); and National School of Architecture Marrakech (ENAM) (expertise in building materials and techniques).

The key participants involved in the Living Lab in Marrakech are outlined in more detail in the table below.

Table 9: Key living lab participants in Morocco and their roles

Participant	Role and information about the participant
Blekinge Institute of Technology (BTH)	(Coordination, expertise in urban planning): The Swedish School of Planning/Department of Spatial Planning, is one of the departments at BTH The department will coordinate the work on the demonstration case of Marrakech, which includes demonstration of rural energy and environmental efficient housing, and the transition toward solar energy for urban mobility. Together with the University Cadi Ayyad (UCA), Green Energy Park (GEP) and National School of Architecture (ENAM) the Swedish School of Planning - the Department of Spatial Planning will engage in the transition to solar energy based urban mobility and in the development of integrated rural ecological and solar energy off grid housing units.
University Cadi Ayyad (IMED Lab.)	(Expertise in renewable energies, electrochemical Energy Storage - Lithium batteries (LiBs), electric mobility, thermal energy storage, eco-building)
Green Energy Park	(Industry/Small Medium Enterprise provision of the Green & Smart Building Park platform and staff): Green Energy Park (GEP), the first platform of its kind in Africa, is leading the trend in applied research to develop reliable decarbonized energy systems and conduct more innovative projects that bring solutions relative to the integration of the renewables in our global energy system and the sustainable natural resource management, which oversees modal shift towards sustainable systems. Also, the breakthrough complementary platform GREEN & SMART BUILDING PARK (GSBP), the GEP-affiliated platform is dedicated to the R&D in green buildings, sustainable development, circular economy, energy efficiency, electrical mobility, micro and smart grids. The aim is to enhance the shift towards a more sustainable and resilient environment in Morocco, provide advanced equipment to support innovation and research and ensure capacity-building contributions.
National School of Architecture Marrakech (ENAM)	(Expertise in building materials and techniques)

3.5.3. Present and future capacity on Sustainable Energy Development

The following section unpacks several key aspects of capacity – both present and future (desired) capacity – required for a circular economy of lithium-ion batteries and e-mobility in Marrakech, Morocco.

3.5.3.1. Political and legal capacity

There are a number of key public and private sector players who form a vital part of the energy landscape in Morocco. These are detailed below.

Ministry of Energy, Mines and Environment / Moroccan Ministry of Energy, Mining, and Sustainable Development (Ministère de l'Énergie, des Mines et du Développement Durable, MEMDD)

The Ministry of General Affairs and Governance: the administrative authority responsible for price and competition policy in Morocco, which also regulates electricity and fuel prices. Before final approval, the proposed tariffs are reviewed by an interministerial tariff committee that includes the Ministry of Economy and Finance and the MEMDD.

Ministry of Economy and Finance: oversees the financial side of the energy sector. It approves the investment plans of state-owned utility ONEE and other state-owned entities.

The Ministry of Industry, Investment, Trade and Digital Economy: is indirectly involved in the implementation of energy policy, as the Ministry i) designs and implements industrial strategies (i.e. through local content components), and ii) works to enhance the competitiveness of Moroccan industry, including through efficiency

National Office of Electricity and Water (Office National de l'Électricité et de l'Eau Potable) (ONEE): state-owned vertically integrated utility that owns the transmission network and generation assets. It acts as a single buyer of electricity generated by other parties, it imports electricity and is responsible for electricity distribution (either directly or through private and public distribution companies). The planned restructuring and unbundling of ONEE is ongoing, and ONEE has to transfer its renewable energy assets to the newly created MASEN

The National Agency for Energy Efficiency (Agence marocaine pour l'efficacité énergétique, AMEE): in charge of implementing Morocco's energy efficiency policy. In 2016, it replaced the previous National Agency for Renewable Energies and Energy Efficiency (ADEREE), the successor of the Center for the Development of Renewable Energy in 2010.

National Federation of Electricity and Renewable Energies (FENELEC)

Research Institute for Solar Energy and New Energies (Institut de Recherche en Énergie Solaire et Énergies Nouvelles, IRESEN): was created in 2011 as one of the main RD&I bodies for energy. IRESEN is responsible for identifying research priorities and projects in the fields of renewable energy and energy efficiency. In addition to financing and implementing research and development projects, it also disseminates research findings and promotes their effective use by businesses.

Moroccan Agency for Solar Energy (MASEN): a limited company with public shareholders and responsible for leading and managing the deployment of renewable energy. MASEN develops integrated projects at the technical, economic and financial level, and coordinates activities through a one-stop-shop. It was previously responsible only for implementing the national solar power plan, but in 2016 its responsibilities were extended to the promotion of all renewable energy technologies. MASEN contributes to the emergence of a national renewable energy industry through training and capacity building, local development and industrial integration, preoperational research, development and demonstration (in pre-operational phases) in Morocco's renewable energy sector, including in Africa and beyond. The mission of MASEN also includes the promotion and development of renewables at the African continental level and beyond.

Moroccan Office of Hydrocarbons and Mines (Office national des hydrocarbures et des mines) (ONHYM): is responsible for managing upstream hydrocarbon resources.

Company for Energy Investments (SIE)

There are a number of sound mobility and renewable energy related policies in place. For example, through the Ministry of Energy, Mines and Sustainable Development, Morocco adopted a **National Strategy for Sustainable Development by 2030** including the following strategic axes:

- Speed up the implementation of energy efficiency and transition policies;
- Promote sustainable mobility;
- A pact on the exemplarity of the state was signed which includes measures that the administration will undertake such as the strengthening of the use of hybrid and electric vehicles;
- A roadmap for Sustainable Mobility in Morocco was established by the Ministry of Transport with the support of National and international specialized agencies;
- An implementation of charging standards and infrastructure through Morocco, launched by the Ministry of Industry;
- The Energy Efficiency 2030 strategy plans to reduce transport energy consumption by 35% in 2030;
- An inter-ministerial commission on sustainable mobility has been set up under the chairmanship of the head of government.
-

Other noteworthy policies include

- Climate Change Policy (2014)
- National Energy Efficiency Strategy (2030)
  - Amongst other things, the Energy Efficiency 2030 strategy plans to reduce transport energy consumption by 35% in 2030
- National Strategy for Sustainable Development

3.5.3.2. Economic and social capacity

Knowledge and awareness: The Implementation Plan notes that there is a high level of awareness amongst Green Energy Park stakeholders, and some awareness amongst the local population with regards to sustainable energy and e-mobility.

Human capacity and skills: While there is some awareness on sustainable energy generally, there are low levels of knowledge and skill to install, utilise and maintain electric vehicles (EVs) and second life battery technology.

Access to finance: According to the SESA implementation plan for Morocco developed under work package 4 of SESA, Morocco has established many boosting financial actions for the deployment of the electrical vehicles by: i) lowering the import duties to 2.5% instead of 17.5% and ii) implementing the exemption for the transport and luxury taxes.

3.5.4. Gaps between present capacity and future desired skills

3.5.4.1. Political and legal capacity gaps

While there are several policies, plans and institutional arrangements guiding renewable energy in Morocco, as described above, there is still a need to strengthen the enabling environment for enhancing policies and strategies for Morocco's sustainable energy and resilient mobility objectives.

3.5.4.2. Economic and social capacity gaps

- **Knowledge and awareness:** The SESA project will need to advance local communities' understanding of EVs and second life battery technology, the benefits of these sustainable solutions and opportunities associated with the technology.

- **Human capacity and skills:** Levels of local understanding and skills for installing, utilising and maintaining EVs and second life battery technology require improvement for effective sustainable transitions in e-mobility in Marrakesh. Furthermore, during the living lab engagement on 31 January 2022, it was noted that there is a need for training selected stakeholders/companies on the implementation of business models.

- **Access to finance:** While Morocco has implemented several actions to support EVs, there is a need to develop financial technical assistance and business models for EVs to increase fiscal accessibility to improve access to EVs and second life batteries.

Further information on this will be sourced during the interviews and kick-off workshop with key stakeholders.

3.5.5. Tools and training modules to fill capacity gaps

Themes and curricula for sustainable energy training modules (online and face-to-face);

- Institutional training and awareness-raising to support energy efficiency and resilient mobility at different scales and across sectors
- Awareness-raising through events, exhibitions and education campaigns on EVs and second life battery technology, benefits and opportunities
- Community-level training on EVs and second life battery technology, benefits and utilisation
- User manuals on EVs developed for community users
- Innovator training and workshops on EV and second life battery technology, mechanics and repairs
- Innovator training modules developed for workshop training
- Awareness-raising and technical assistance to financial institutions and individuals to increase access to finance for EVs and second life batteries

Further information on this will be provided following the interviews and kick-off workshop with key stakeholders. This will further inform the possible sequence, location and timing of training, capacity and skills building activities. Including the peer-to-peer programme for partner cities (Task 2.3) the training schedule, to be undertaken by internal (and affiliated) expert organizations of SESA consortium. In addition, it will enable the development of a summary of training opportunities from partner projects and initiatives.

3.5.6. Summary of results

A summary of the results is provided in the table below:

Table 10: Summary of results for Morocco

Thematic area	Present capacity of relevant stakeholders on Sustainable Energy Development	Future capacity (desired state) based on the city's vision for the Sustainable Energy Use	Gaps between present capacity & future desired skills	Tools & training modules to fill these gaps
Political and legal	Several policies and strategies are in existence relating to energy and Morocco's goals for	Strengthened environment for enhancing policies and strategies relating to Morocco's	Development of enabling environment	Institutional training and awareness-raising to support energy

	energy efficiency and resilient mobility	goals for energy efficiency and resilient mobility		efficiency and resilient mobility at different scales and across sectors
Knowledge and awareness	High level of awareness amongst Green Energy Park stakeholders Some level of awareness amongst household and school stakeholders	High level of awareness through events, training modules and education campaigns on EVs and second life battery technology, benefits and opportunities	Development of education and awareness on EVs and second life battery technology	Awareness-raising through events, exhibitions and education campaigns on EVs and second life battery technology, benefits and opportunities
Human capacity and skills of community	Low level of community understanding and skill related to EVs and second life battery technology	High level of community skills on EVs and second life battery technology, benefits and utilisation	Development of EVs and second life battery technology understanding and utilisation	Community training on EVs and second life battery technology, benefits and utilisation User manuals developed for community users
Skills of local innovators	Low levels of understanding and skills relating to business models for EVs	High level of innovator skills on business operations for EVs and second life battery technology, mechanics and repairs	Develop training for companies and small business stakeholders on implementing an EV business model	Innovator training and workshops on EV and second life battery technology, mechanics and repairs Innovator training modules developed for workshop training
Access to finance	Several actions in place to support access to EVs including significantly reducing import	Improved conditions to access finance for EVs and second life batteries	Develop financial instruments and technical assistance to improve fiscal accessibility	Awareness-raising and technical assistance to financial institutions and

	taxes and removing the transport and luxury tax on EVs			individuals to increase access to finance for EVs and second life batteries Financial instruments developed for increased access to finance for EVs and second life batteries
Infrastructure	Partial access to materials required for EVs and second life battery operations Lack of suitable infrastructure in local transport network for EVS Lack of off-grid networks Lack of training, diagnostic and test facilities, protocols and R&D on LiB end-of-life management	Increased access to materials required for EVs and second life battery operations Local transport network infrastructure is suitable for EVS Off-grid network (PV panels, LiBs), one housing unit model Training, diagnostic and test facilities, protocols and R&D on LiB end-of-life management	-	Value chain developed to improve production lines and access to materials required for EVs, second life battery operations and end-of-life management

4. Next steps

As noted in previous chapters, this Capacity Building Plan will be enhanced in the upcoming weeks. The various steps and the expected timelines for these steps to be carried out are outlined in the table below:

Table 11: Next steps for the SESA Capacity Building Plan

	Ghana	Kenya	Malawi	Morocco	South Africa
Desktop research	Completed	Completed	Completed	Completed	Completed
Draft interview questionnaires	Completed	Completed	Completed	Completed	Completed
Questionnaire reviewed by Living Lab	Completed	Completed	Ongoing	Completed	Completed
Questionnaire shared with SESA consortium for review	Completed	Completed	Completed	Completed	Completed
Interview participants selection	Completed	Completed	Completed	Completed	Completed
Participants Interviews	Planned (by 31 May)	Planned (by 31 May)	Planned (by 31 May)	Planned (by 31 May)	Planned (by 31 May)
Focus group/Kick off meeting	Planned (by 30 June 2022)				

Following the interviews and focus group/kick-off workshop discussion outlined in the table above, the Capacity Building Plan will be revised and updated accordingly. Amongst others, a detailed summary of possible tools and/or trainings to fill the capacity gaps identified will be presented. More specifically, it will include the development of:

- themes and curricula for sustainable energy training modules (online and face-to-face);
- outlines of the contributions of training material from each partner to the SESA toolbox (WP1);
- outline of the sequence, location and timing of training, capacity and skills building activities: the peer-to-peer programme for partner cities (Task 2.3) the training schedule, to be undertaken by internal (and affiliated) expert organisations of SESA consortium; this schedule will take into account the local measure implementation cycle (planning, implementation, evaluation, upscaling and deployment) as well as regional and global key events that can be synergized with SESA's capacity building activities;
- summary of training opportunities from partner projects and initiatives.

5. Conclusion and recommendations

The Capacity Building Plan indicates the present capacity, desired capacity, and possible gaps between the two for the SESA Living Lab sites in Kenya, Ghana, Malawi, Morocco and South Africa. While the interviews and kick-off workshop still need to be carried out, the findings from the desktop research and the initial Living Lab engagements, highlight as common among all the countries the present gaps in the following thematic areas: policy and legal gaps that can be addressed to further support the energy solutions being implemented; stakeholders and community knowledge and awareness on the energy solutions being implemented; limited human capacity and technical skills to either use, monitor, service and/or upscale the energy solutions as well as limited access to finance to enhance and/or update sustainable energy solutions in the site areas and countries. However, these findings will be further detailed through the information obtained through interviews and a kick off workshop with relevant stakeholders.

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