THE COOLING FOR ALL NEEDS ASSESSMENT

WORKING PAPER

SUSTAINABLE ENERGY FOR ALL
AND HERIOT-WATT UNIVERSITY

THE COOLING FOR ALL NEEDS ASSESSMENT

INTRODUCTION

Cooling is an issue of equity that is vital for economic productivity and essential for well-being through access to nutritious food, safe medicines and protection from heat for populations in a warming world. Through the Kigali Amendment to the Montreal Protocol, the opportunity to realize energy efficiency gains for cooling together with the hydro-fluorocarbon (HFC) phase down is recognized by many countries.

Yet to date, most discussions have focused on equipment, without considering the full diversity of cooling needs and the holistic approaches that are necessary to provide access to sustainable cooling for all.

To deliver sustainable cooling for all in alignment with the Sustainable Development Goals (SDGs), the Paris Agreement on Climate Change, and the Kigali Amendment to the Montreal Protocol, a full assessment of cooling needs across buildings, cities, agriculture and health services, is a necessary first step.

The implications that cooling demand has for energy systems, climate change, clean air, economics, well-being, and workforce development are currently not fully understood. An underestimation of the scale may contribute to a lack of ambition in policy, infrastructure and technology development, and could ultimately have far-reaching social, economic and environmental consequences.

In response to this, the Cooling for All Secretariat at SEforALL and Heriot-Watt University have partnered to create the **Cooling for All Needs Assessment,** a tool recommended for governments, local authorities, development institutions, and NGOs to assess the full spectrum of cooling needs and the policy, technology, and finance measures to address those needs.

The Needs Assessment is presented as a working paper. The authors recognize the need for continued refinement based on stakeholder feedback, towards an agreed methodology and a full needs-driven cooling evaluation tool-kit that can be applied consistently across planning processes, investment frameworks, Cooling Action Plans, overseas development assistance (ODA), and technical assistance to support clean and efficient cooling.

However, given heightened levels of interest, as well as the call from the United Nations Secretary General, for countries to develop Cooling Action Plans by a consistent framework for a Needs Assessment can be useful to government policymakers and development practitioners. This framework includes a presentation and scorecard, which can be used to develop an understanding of current needs and future trends.

Next steps include field testing and refinement of the Needs Assessment as a tool through early 2020. This will include the development of a detailed set of indicators and scoring system as an open-access tool-kit – led by Heriot-Watt University - that allows for an understanding of priority interventions and comparability across geographies and sectors.

Comments and recommendations to improve the Needs Assessment methodology, as well as any questions that may arise are invited to CoolingforAll@SEforALL.org.

THE COOLING FOR ALL NEEDS ASSESSMENT

Although specific estimates vary, all studies investigating cooling have projected a substantial increase in cooling demand over the coming decades.[1] And these are not likely to deliver cooling for all who need it; currently more than 1 billion people do not have to cooling and suffer the economic and health consequences. The energy demand, and consequently environmental (climate change and air pollution) implications of these growth projections are gravely concerning.

There are actions that can be used to meet cooling demand, including through behavior change, building codes that prioritize passive design, minimum performance standards for appliances, the use of renewable energy on- and off-grid, and the under-exploited, free and waste energy sources that could be used to make access to cooling more sustainable and affordable. These steps can be made if we rethink how we use, produce, store and transport cold to meet our cooling demands, and develop the necessary policies, technologies, business models and financing pathways to support new approaches.

Key to the development and effective delivery of any intervention is to recognize that the origins of demand for cooling is rooted in the services or practices that it enables, from the safe and nutritious food to eat, to the management of environments in which to live comfortably or work effectively in hot climates, from the supply and storage of vaccines and medicines to prevent the spread of disease to human safety in the event of a heatwave. Rather than begin with technology we should be asking: How do global needs for cooling arise or evolve? What are the needs for cooling as an energy service or social practice in different places? Moreover, how can these needs be both mitigated and met in the most affordable and least damaging way harnessing all energy resources?

The starting point, therefore, is a robust and rigorous needs assessment to identify not simply the perceived technology or energy needs - but rather the portfolio and size of the cooling demands, societal hotspots that most need to be addressed and the scale of the problem. This approach also will allow for tracking progress over time.

By understanding the detail of operational, market and regulatory needs and pressures, within specific social and cultural contexts, we can leverage mitigation, adaptation and technology bundles to offer new combinations of products and services that provide efficiency, flexibility, resilience, and cost-effective decarbonization.

Cooling needs must necessarily form a significant part of thinking within energy system innovation and development. As a first stage, we need a better definition of the scale of the cooling challenge; a needs assessment to provide the foundation for the development of a "fit-for-purpose" intervention roadmap and track progress. The key objectives are:

a. Model cooling service need

b. Assess the extent to which cooling service demand will be met on current trajectories or evolve in response to changing climatic conditions

c. Calculate the economic, social, energy and emissions implications of the current trajectory and cooling services gap

d. Explore a portfolio of behavior, operational, technology and aggregation options to meet the need while minimizing costs, energy and emissions

e. Provide a range of actionable outputs that can be the basis of policy interventions and financing instruments and establish a framework for tracking progress towards meeting needs

[1] Clean Cooling Landscape Assessment, University of Birmingham and Heriot Watt (2018) www.clean-cooling.ac.uk

DEFINING NEED

Equipment based projections of cooling demand are an essential element of producing meaningful emissions and energy consumption data and have generally been used in all cooling demand projections. However, in terms of protecting vulnerable populations, they suffer from three significant weaknesses:

i) **Poor quality data** – data in relation to unit stocks in each of the cooling categories are somewhat unreliable as verified sales, disposal figures, and second-hand transfers of equipment are not universally available. As a result, the equipment stock is genuinely difficult to estimate and projections can be uncertain.

ii) **Failing to capture needs** – equipment-based projections do not start from a position of understanding community needs, and how cooling demand and solutions will be shaped by these needs.

iii) **Pre-supposing a solution** – a focus on per capita equipment penetration rates risks pre-supposing a solution to specific cooling needs and could ignore additional opportunities of electricity demand mitigation by redesign of systems, demand aggregation, modal shifts, and use of waste or currently untapped resources

To overcome these limitations a needs template for the community, a regional and national needs-based analysis is presented below to provide guidance on three critical factors:

i) **The type of cooling needs** that exist across a socioeconomic spectrum ranging from the most vulnerable (rural and urban poor) to those who are preparing to purchase their first cooling device or may be able to acquire more energy efficient options.

ii) **Guiding questions** to inform next steps for demand measurement across cooling needs.

iii) **Indicators tied to relevant needs and questions** that are aligned in principle to the Sustainable Development Goals. When measured together, these can show a baseline against which to measures progress towards critical enablers of access to sustainable cooling and provide perspective on the broad set of solutions that may be fit for purpose in a given market based on current circumstance.

SDG indicators have been classified into three primary areas of cooling demand under consideration:

i) **Human comfort and safety:** for living, learning, working, and mobility

ii) **Food and nutrition security and agriculture:** for nutrition, rural incomes, and connectivity

iii) **Health services:** for safe medical clinics and the secure transport and storage of vaccines and medical products.

Where appropriate, additional measures of need have been suggested. This list is not exhaustive and governments (national, regional and local) may have access to additional data sets that could provide a deeper understanding of need. It is suggested however that this data should be collected as a minimum. When collecting data on populations, data collected should be disaggregated by age, sex, geographic location (urban/rural), and employment status.

This data will build a picture of the SDG Cooling Need. With an understanding of this it will be possible to better address the following questions:

- What are the cooling needs for the country/community under review, at present, in 2030 and in 2050?

- To what extent are these cooling needs currently being met?

- What is the gap between current cooling delivery and current and projected need?

- How will demand be affected by climate change, in both mitigation and adaptation scenarios?

In considering cooling needs, and how they will evolve and increase in the future, it is important to understand and quantify the impact of climate change on cooling demand and associated energy consumption. Changes to ambient air temperatures and the impact on food production capacity are two factors to consider.

1. Human comfort and safety: for living, learning, working, and mobility

SDG 4 Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

SDG 7 Ensure access to affordable, reliable, sustainable and modern energy for all

SDG 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

SDG 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

SDG 11 Make cities and human settlements inclusive, safe, resilient and sustainable

SDG 13 Take urgent action to combat climate change and its impacts

SDG NEED: To what extent does the population have access to the space and mobility cooling that is adequate to maintain safety and productivity, at home, in places of education and in the work environment and while moving between each?

- What are the morbidity and mortality figures related to heat stress (total and in the workplace) (8.8.1)?

- What proportion of the population is potentially at risk of heat stress due to UHIE?

- What proportion of the population has access to domestic space cooling (by technology)?

- What proportion of the urban population has access to public green spaces (11.7.1)? What is the thermal impact of these spaces?

- What proportion of learners at each level are taught in buildings where temperatures exceed that at which cognitive function is impaired? For how many days a year?

- What proportion of the population working inside (and outside?) is at risk of heat stress in the workplace?

- How many work days are lost each year due to heat stress?

- What are the economic losses attributable to heat stress-related disasters (11.5.2)?

- What are the current and projected passenger volumes, by mode of transport? (9.1.2)

- What proportion of public vehicles currently have adequate thermal management?

Cooling Need: What would the additional cooling requirements be in order to achieve thermal comfort for the benefit of all?

- What is the nationally defined thermal comfort temperature limit?

- How many cooling degree days are there each year?

- How are different climate change scenarios likely to impact on heat stress in the short, medium and long term in terms of total cooling degree days each year?

- What proportion of the existing domestic, public (non-health) and commercial building stock meets thermal envelope and energy efficiency building standards?

- What are the total construction projections for new buildings (domestic, public (non-health) and commercial)? What are the baseline thermal efficiency standards for these buildings?

- Using context appropriate estimates of numbers of different sizes of existing and projected building stock, what is the total estimated volume of space that would need to be cooled, by how many degrees and for how many days per year to achieve thermal comfort for all (at present, in 2030 and in 2050)?

- Using context appropriate estimates of numbers and modes of transport, what is the total estimated energy requirement for cooling (charging and HVAC) within the transition to e-mobility?

2. Food, nutrition security and agriculture: for nutrition, rural incomes, and connectivity

SDG 1 End poverty in all its forms everywhere

SDG 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture

SDG 7 Ensure access to affordable, reliable, sustainable and modern energy for all

SDG 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

SDG 12 Ensure sustainable consumption and production patterns

SDG 13 Take urgent action to combat climate change and its impacts

SDG 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development

SDG NEED: Is income from agriculture and fisheries sufficient to keep workers out of absolute and relative poverty?

- What is the proportion of the population below the international poverty line? (1.1.1)

- What is the proportion of the population living below the national poverty line? (1.2.1)

- What is the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions? (1.2.2)

- What is the average income of small-scale food producers? (2.3.2)

- To what extent do food price anomalies occur? (2.c.1)

- What level of connectivity to markets (local, short, medium and long distance) do farmers currently have – in terms of information flow (farm-to-fork and fork-to-farm) and physical access? (9.1.1 proportion of rural population who live within 2km of an all-season road and 9.c.1 proportion of population covered by a mobile network, by technology). What is the price differential achieved for the same product at different markets?

SDG NEED: To what extent does the population currently have access to an affordable, nutritious and safe diet?

- What is the prevalence of:
    - Undernourishment? (2.1.1)
    - Moderate or severe food insecurity (Food Insecurity Experience Scale)? (2.1.2)
    - Stunting among children <5? (2.2.1)
    - Malnutrition among children<5? (2.2.2)
- What proportion of the population achieves a healthy, nutritionally sufficient diet (metric tbc - based on a basket of goods or dietary consumption)?
- What is the current volume of production of different foodstuffs, how does this compare to what would be required to ensure a nutritionally adequate and climate sensitive diet?
- What is the volume of production per labor unit by farming enterprise size? (2.3.1)
- What is the volume and proportion of food loss and waste at each stage along the cold chain? (12.3.1)
- What are the current freight volumes, by mode of transport? (9.1.2)
- What are the morbidity and mortality statistics related to food poisoning?
- What proportion of the population has access to refrigeration (including traditional/alternative methods) for domestic use?
- What proportion of the population has access to a reliable, sustainable energy supply? (7.1.1)
- What is the number of plant and animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities? (2.5.1)

Cooling Need: What would the additional cooling requirements be if all people were to have access to an affordable, nutritious and safe diet and income from agriculture and fisheries were sufficient to keep workers out of absolute and relative poverty?

- What would the total volume of stationary and mobile storage required be to store, process and deliver the quantity of produce required to meet dietary requirements for the population, reduce food loss and waste and increase agricultural and fishery incomes?
    - What volume of different foods would be required to be stored at various temperature points?
    - How far (km) would different foods need to travel to reach markets?
    - How long would different foods need to be stored at each point along the cold chain?
- What would the additional volume of cold storage required be to ensure all households had access to reliable, safe, affordable refrigeration? (Note this metric should not by default be domestic refrigerators per household).
- What is the predicted impact of climate change on average temperatures and consequently the thermal load of the cold chain? (How many additional degrees of cooling would be required, for what volume of produce, and for how many hours in total per year)?
- What is the additional volume of cooling required (if any) at what temperature to safely store and manage plant and animal genetic resources?

3. Health services: for safe medical clinics and the secure transport and storage of vaccines and medical products

SDG 3 Ensure healthy lives and promote well-being for all at all ages

SDG 7 Ensure access to affordable, reliable, sustainable and modern energy for all

SDG 13 Take urgent action to combat climate change and its impacts (specifically 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries)

SDG NEED: Are national vaccine programs reaching their target population?

- What proportion of the target population is covered by all vaccines included in the national program? (3.b.1)
- What is the prevalence of vaccine preventable diseases? (3.3.2 and 3.3.4)
- What is the mortality from vaccine preventable diseases?

SDG NEED: Is there sufficient unbroken cold chain to ensure provision of medicines and healthcare products in everyday and natural disaster scenarios?

- What proportion (and total number) of vaccines, medicines and medical products are lost each year due to cold chain failures? What is the health, social and economic cost of this?
- What is the current number, volume and geographic distribution of cold storage facilities for health? What proportion of health facilities has a core set of relevant essential medicines available and affordable on a sustainable basis? (3.b.3) Are there communities not currently served by such facilities? If so, how many and where are they?
- What is the community level of risk due to natural disasters? What is the number of deaths, missing persons and affected persons attributed to disasters per 100,000 of the population? What is the projected level of risk of natural disasters in 2030 and 2050?

SDG Need: Are health infrastructure buildings equipped with the cooling they need to deliver existing health services?

- How many health infrastructure buildings are there in the community/region/country?
- What is the current demand and utilization of cooling services for example for effective and safe use of equipment, or safe and comfortable air temperature control for patients (degrees and volume of cooling required per year)?
- What is the current level of morbidity and mortality associated with power losses at health facilities?

Cooling Need: What would the additional requirements be if we were to achieve equitable access to cooling for health?

- How many (and what volume of) static cold storage facilities would be required to meet community vaccine, medicine and health care product needs? Where would these need to be located to have maximum health impact?
- What volume and how many km of unbroken cold chain would be required to ensure global vaccine, medicine and healthcare product coverage?
- How many and what volume of cold storage facilities would be required to ensure emergency access to medicines and healthcare products in a natural disaster? Where would these need to be located to provide maximum benefit in times of emergency?
- What additional services are planned within existing health infrastructure buildings, will these require additional cooling services, and, if so, what volume of space will need to be cooled by how many degrees for how long each year?

- How many new health infrastructure buildings are required and planned? What will their minimum and optimum cooling requirements (volume, degrees of cooling and days per year) be?

USING THE NEEDS ASSESSMENT

To establish a baseline and track progress

The needs assessment will serve as a basis to establish a critical baseline for access to sustainable cooling, through which to (i) set targets to address a country's cooling needs and (ii) measure progress. By establishing a baseline, it also becomes possible to derive the consequences of meeting these needs with current technologies, energy resources and infrastructure tools, and determine the associated environmental impacts.

To align policy and finance to desired outcomes

Allocation of scarce resources is a major issue for all societies. Policy and financing decisions made on the basis of the needs assessment must be outcome-based as far as possible, taking national, regional and community circumstances into account. The data serve as a basis to understand how to aggregate policy and finance choices towards desired outcomes, cooling demand mitigation, prioritize new interventions, and allow for system-level and service aggregation approaches to be considered to deliver both energy and economic efficiencies.

Though policy and financing choices will vary by geography and different cooling needs, their impact will be dependent on an integrated suite of interventions, which may include:

- Establishing appropriate, workable, in-country governance frameworks;
- Building supportive policy and regulatory environments;
- Development finance that is aligned to whole of life and value creation not, just up-front capital cost, as well as performance risk mitigation;
- Facilitating low emissions technology procurement;
- Undertaking knowledge transfer, skills development and capacity building.

To focus on reducing demand

There is significant opportunity to to reduce demand by behavioural change, planning and building design as well as natural and passive cooling methods from planting trees to cool roofs to use of natural airflow; passive cooling strategies and reducing thermal loads can achieve a 30%+ reduction in energy use, even in hot climates. A robust Needs Assessment will help design in best practices to mitigate demand. This includes understand future cooling needs so can adapt, design and and prepare for them in the most energy efficient ways.

To identify relevant technology and capacity building

It is essential to identify clean and sustainable technologies most appropriate to meet domestic demand and propose realistic development pathways for scale-up. This will include in-country manufacture and supply-chain readiness, capacity, not just technology readiness. A robust Needs Assessment will help identify the parameters for clean sustainable cooling technologies (with improved energy efficiency, reduced costs, increased renewable energy sourcing and reduced environmental impact) appropriate to in-country conditions, both in terms of affordability and current and potential future technical capacity to deploy and support.

With a focus on the latter, governments will likely need to explore realistic, real world opportunities for local capacity building to ensure successful outcomes to deployment interventions in terms of sustainable cold chain infrastructure operation and maintenance, both of which are crucial to the ability to effectively deliver our objectives.

To understand the implications of cooling demand for energy services and climate change:

Needs-driven assessments can consider the implications of increasingly hotter temperatures, the climate implications of cooling demand driving peak loads, and ways of meeting those capacity requirements with

sustainable energy. Understanding available energy resources enables optimum and needs- based choices for energy systems that encompass demand mitigation and adaptation measures, harnessing traditional cooling methods, and renewable energy. We also need to understand the additional stress that growth in universal access to cooling will place on energy systems in the context of the broader fundamental structural changes to these systems driven by targets to mitigate emissions and adapt to climate change.

To tailor local and community level solutions
The needs assessment allows for an understanding of cooling needs beyond national level alone, recognizing diverse local and community needs. This is crucial, as various areas will have different cooling requirements, not only due to socioeconomic variation, but also because of the range of challenges which varies depending on context. This needs assessment can therefore lend itself to different solutions, as the policies built upon it will take local and community level differences into account.

With comprehensive understanding of cooling demand, countries can use robust scientific projections to quantify the climate impact of meeting needs with different energy scenarios based on the portfolio of resources to drive roadmaps defining realistic objectives and timelines for mapping out, researching and implementing sustainable cooling strategies. One document typically used for these purposes are National Cooling Plans, for which several multilateral and development institutions provide assistance for development.

1. Data collection
Background: In order to have a National Cooling Plan that accurately addresses cooling needs for all, data must be collected across an indicator framework that reflects the full spectrum of demand, including thermal comfort, human safety, and cold chain and cooling services necessary for the agriculture, food systems, and health services.

The Needs Assessment Scorecard provides a basis for the basic data that is necessary to aggregate policy, technology, and finance measures to address cooling needs. Sources of data include, but are not limited to:

- The World Development Indicators (Sustainable Development Goals)
- Regional Development Centers
- National statistical agencies
- National/regional universities and research institutes with specialization in sustainable development and energy
- Industry associations, equipment producers, operators of equipment and servicing companies;
- Non-governmental organizations

Objectives:
- To establish a baseline for access to cooling and an indicative framework against which to track progress
- To understand the full scope of cooling demand across sectors where it originates.

2. Identify cooling needs
Background: Cooling needs exist across multiple sectors, including human comfort and safety, food, nutrition security and agriculture, and health services. The degrees of unmet need also exist across a spectrum that ranges from high to low risk. Using the results of the data collection exercise, governments should, in the development of a national cooling plan or equivalent set of measures, make a judgement on each of the following guiding questions in the needs assessment.

Human comfort and safety: for living, learning, working, and mobility

- To what extent does the population have access to the space and mobility cooling that is

adequate to maintain safety and productivity, at home, in places of education and in the work environment and while moving between each?

Food and nutrition security and agriculture: for nutrition, rural incomes, and connectivity

- To what extent does the population have access to the food they need to maintain a healthy (and socially acceptable) diet?
- Is income from agriculture and fisheries sufficient to keep workers out of absolute and relative poverty?

Health services: for safe medical clinics and hospitals and the secure transport and storage of vaccines and medical products

- Are national vaccine programs reaching their target population?
- Is there sufficient unbroken cold chain to ensure provision of medicines and healthcare products?
- Are health infrastructure buildings equipped with the cooling they need to deliver adequate and reliable health services at affordable costs?

Objectives:

- Understand the extent to which cooling needs are being and the gap between current and projected need.
- Define the priority cooling needs to be addressed through a national cooling plan.

3. Assess the implications of cooling demand for energy use, exacerbation of climate change and any associated challenges in implementation of the Kigali Amendment to the Montreal Protocol

Background: Needs-driven assessments can consider the implications of increasingly hotter temperatures, the climate implications of cooling demand driving peak loads, and ways of meeting those capacity requirements with sustainable energy. Understanding available energy resources enables optimum and needs-based choices for energy systems that could include:

- Demand mitigation and adaptation measures (reduction of energy demand needed to meet cooling needs)
- Availability and potential of traditional cooling methods
- Capacity to meet new demand with renewable energy

Objectives:

- Understand available energy resources to enable optimum and needs- based choices for energy systems
- Ensure energy demand implications of all projected cooling needs are accounted for in National Cooling Plans
- Understand how demand could be affected by climate change

4. Aggregate policy, technology, and finance choices on the basis of cooling needs and desired outcomes.

Background: Planning decisions made based on the needs-assessment must be outcome-based as far as possible, taking national, regional and community circumstances into account. The data serve as a basis to understand how to aggregate policy, finance, and technology choices towards desired outcomes, and allow for system-level and service aggregation approaches to be considered to deliver both energy and economic efficiencies.

Though policy and financing choices will vary by geography and different cooling needs, their impact will be dependent on an integrated suite of interventions identified in a national cooling plan. Options include, but are not limited to:

- Establishing appropriate, workable, in-country governance frameworks;
- Building supportive policy, procurement and regulatory environments;
- Development finance that is aligned to whole of life and value creation not, just up-front capital cost, as well as performance risk mitigation;
- Facilitating low emissions technology procurement;
- Undertaking knowledge transfer, skills development and capacity building.

A robust Needs Assessment will also identify clean and sustainable technologies most appropriate for in-country conditions and propose realistic development pathways for scale-up in a National Cooling Plan. Steps to support this include:

- Assessment of the affordability and current and potential future technical capacity
- Assessment of in-country manufacturing, maintenance, and supply-chain readiness for cooling technologies
- Identification of the parameters for sustainable cold-chain technologies (with improved energy efficiency, reduced costs, increased renewable energy sourcing and reduced environmental impact)

Objectives:

- Identify a suite of policy, procurement and finance measures that address the diversity of cooling needs
- Identify clean and sustainable technologies most appropriate for in-country conditions and propose realistic development pathways for scale-up

5. Identify opportunities for regional collaboration, finance, or technical assistance

Background: While cooling remains a nascent issue, opportunities for collaboration, technical assistance and financing of new initiatives, including national cooling plans, continue to grow. A number of institutions, including the World Bank, UN Environment, and the UN Development Program provide technical assistance for the development of National Cooling Plans, and the Green Climate Fund has expressed its interest in financing project preparation for cooling, which could include the development of comprehensive national cooling plans. Regional development banks, philanthropy, and academic institutions may also be able to provide support. Organizations that may offer support are listed below. For more information, please contact CoolingforAll@SEforALL.org

- The Green Climate Fund
- The Kigali Cooling Efficiency Program
- The World Bank Group
- Regional Development Banks
- UN Environment
- United for Efficiency
- UN Development Program
- Bi-lateral donors and philanthropy
- Heriot Watt University
- Sustainable Energy for All

Objectives:

- Identify the support necessary to implement the findings of the Needs Assessment
- Ensure implementation is supported by existing best-practices and the best available global, regional, or local expertise

COPYRIGHT AND DISCLAIMER

Vienna Headquarters
Andromeda Tower, 15th Floor
Donau City Strasse 6
1220, Vienna, Austria
Telephone: +43 676 846 727 200

Website: www.SEforALL.org

Washington, DC Satellite Office
1750 Pennsylvania Ave. NW
Washington, DC 20006 USA
Telephone: +1 202 390 0078

This work is a product of Sustainable Energy for All (SEforALL) and Heriot-Watt University, produced as a working paper for feedback and continuing refinement of the methodology presented and being developed by researchers at Heriot-Watt University. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of the members of the Global Panel on Access to Cooling, SEforALL, its Administrative Board or its donors.

This document has been produced with the financial assistance of the Kigali Cooling Efficiency Program. The views expressed herein can in no way be taken to reflect the official opinion of the Kigali Cooling Efficiency Program.

This working paper has not undergone a process of peer review. Therefore, the methodology presented should be understood as a vehicle upon which to build more robust framework, and not as peer-reviewed academic publication. It is provided in this format to encourage the exchange of ideas and data on access to cooling, and to make these findings available to practitioners and researchers, even if the document is less than fully polished.