



**Global Off-Grid Solar
FORUM & EXPO**
THE BIENNIAL MEETING OF THE OFF-GRID SOLAR ENERGY INDUSTRY



ESMAP

Energy Sector Management
Assistance Program



REPUBLIC OF KENYA



Ministry of Energy and Petroleum
State Department for Energy



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Cooling Lives and Livelihoods

Leo Blyth | **World Bank /ESMAP**

Rahul Srinivasan | **Sustainable Energy for All**

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State Department for Energy



unicef | for every child

Lalita Sachdeva
UNICEF

AT LEAST 1,000 DIE IN SCORCHING HEAT DURING HAJJ



Deaths due to heat in Middle East & North Africa li 60 times by end of century

Over 80% deaths can be prevented by limiting global warming to 2°C.

By Kiran Pandey
Published Tuesday 11 April 2023



Asia / South Asia

Warming world 'brutalises' women as heatwaves deepen gender divide in India, US, Nigeria



CLIMATE CHANGE

Extreme heat could claim lives of 204,000 women annually in India, Nigeria & US: Report

Women bear the disproportionate burden of heat's devastating physical, social & financial effects, report emphasises

By Kiran Pandey
Published Friday 28 July 2023



BREAKING NEWS



Top 10 African countries facing record-breaking heat waves in 2023



Excessive heat increasing death rates at work – NSITF official



Maximum Temperatures	
Tuesday	48
Wednesday	49
Thursday	50
Friday	51
Saturday	50
Sunday	50
Pakistan Heatwave	



Sustainable Cooling Is Critical for Off-Grid Rural Communities

Rural Communities Have Diverse Needs for Sustainable Cooling

Human Comfort and Safety

- In 2050, over 3 billion people will be rural inhabitants, including 1.58 billion living in the Critical 9* countries for access to sustainable cooling.
- The proportion of rural residents above 65 years of age will also increase to 22.7 percent by 2100 from 8.3 percent in 2015

Agriculture, Food Security and Nutrition

- Approx. 2/3 of all working age African population are employed in agriculture
- 17 percent of total global food production was wasted in 2019, including from spoilage partly due to lack of cooling.
- A lack of access to cooling hinders the economic potential of farmers and exacerbates malnutrition.

Health Care

- 1 billion people in low- and lower-middle-income countries are served by health care facilities without reliable electricity
- The COVID-19 pandemic exposed vast inequities in access to vaccine cold chains in rural areas.

Climate and Gender Inequities Exacerbate the Challenge

Climate Change

- Half the global population faced extreme heat for at least 30 days in 2023.
- In 2030, 60 percent of the global heat-stress-related loss of working time will be in agriculture.
- Africa's agriculture sector will suffer 89 percent of global productivity loss in the sector due to heat.

Gender

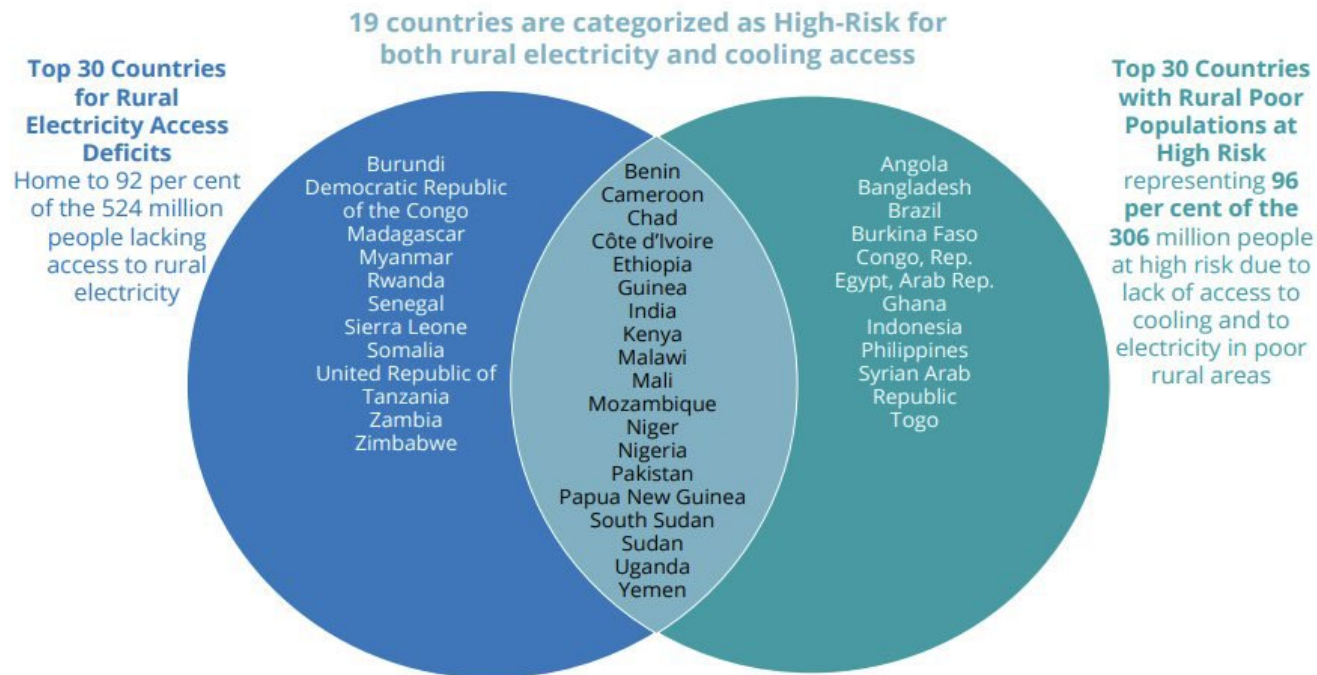
- Women and girls face specific challenges in accessing and benefiting from cooling services.
- Women represent up to 50 percent of agricultural workers, and post-harvest activities are often part of traditional women's household responsibilities.
- Women are more likely than men to experience moderate or severe food insecurity.



*The Critical 9 Countries are: Bangladesh, Brazil, China, India, Indonesia, Mozambique, Nigeria, Pakistan, and Sudan (Sustainable Energy for All, 2018)



Why Cooling – Why Care - Why now?





Technology Innovation & Advances are Improving the Accessibility & Affordability of Off-Grid Cooling

Considerable advances have been made in off-grid appropriate cooling appliances overall and the critical components within.

Innovation gains in efficiency and performance have dramatically increased the range of off-grid cooling services available, increasing accessibility & affordability;

- **Electric Fan improvements & innovations, from ceilings, to floors, desk and “wearables” combining other cooling elements**
- **Evaporative Coolers, using water to cool air in non-humid environments, often combined with fans**
- **Thermal storage or “Ice batteries” using phase change materials (even such as water) to provide nonelectrical battery dependent cooling at any time / place**

Passive solutions further reduce the need for active cooling technology, improving overall efficiency.

Multiple “unseen” dimensions of Productive & Developmental benefits from Off-Grid Cooling Access

Safety

- Vaccine Cold Chain
- Heat Stroke reduction outdoors and in confined spaces
- Reduction in heat stresses amongst vulnerable populations, especially infants, elderly, during pregnancy or illness

Productivity

- Improved personal output and reduction of health risks during work based at or from home, including housework, light commercial enterprise and entrepreneurial work
- Also improved personal output and reduction of health risks when undertaking individual farming, herding or fishing, etc.

Comfort

- Enhanced rest and sleep at home / MSME workplaces
- Improved conditions at home / MSME workplaces
- Increased ability for children, youth and adults to study and learn at home and in institutions



Overview of existing commercially available cooling devices suitable for off/weak grid applications – currently largely targeting western / industrialized work applications

**Solar
Electric &
Batteries (no
PCM / ice
battery)**

- Evaporative Air Coolers; powered by solar charged batteries/battery packs using mist or water saturated filters **for space/room cooling**
- “Wearable” fans; powered by solar charged batteries/battery packs with / without cooling plates or water reservoirs **for personal cooling in homes, workplaces, schools / training institutions & for outside work**



**Solar
Electric &
“Ice
Batteries”**

- “Wearable” ice packs; with small ice pack sachets inside scarves, hats, or a sleeve at most simple or inside vests – chilled by existing solar freezers or new devise for the specific purpose **for personal cooling in homes, workplaces, schools / training institutions & for outside work**



**Combined
Solar
Electricity,
with both
regular & “Ice
Batteries”**

- Evaporative Air Coolers; powered by solar charged batteries/battery packs using mist or water saturated filters from water reservoirs – possible ice packs/batteries inside **for space/room cooling**
- “Wearable” ice packs; with small ice pack sachets inside scarves, hats or inside vests – chilled by existing solar freezers or new custom-made device **for personal cooling in homes, workplaces, schools / training institutions & for outside work**





Integrating Access to Cooling as a critical component of Energy Access

Access to Cooling represents a new frontier for climate justice and adaptation, constituting a new basic need and essential aspect of energy access.

1. Off-grid rural communities lack access to cooling services; threatening livelihoods and even lives across multiple sectors (households, education, enterprise, food and health).
2. Passive cooling solutions need to be prioritized within an integrated approach.
3. Innovation of diverse off-grid cooling appliances present game-changing opportunities.
4. Sustainably boosting cooling and electricity access must utilize renewable energy, efficient equipment, and minimize high GWP refrigerants.
5. Policy ambition, cross-sectoral institutional coordination, and implementation of quality assurance frameworks are essential to increase adoption.
6. Climate change will only worsen this situation, and off-grid sustainable cooling in rural areas offers both climate change adaptation and mitigation benefits.





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Thank You