

02-Rural Energy Needs

A photograph of a rural village with several wind turbines and a traditional building. The scene is set in a hilly, open area with sparse vegetation. In the foreground, there is a traditional building with a tiled roof and a covered porch. In the background, several tall wind turbines are visible against a clear sky. The overall atmosphere is peaceful and suggests a focus on sustainable energy in a rural setting.

Off-Grid Electrical Systems in Developing Countries

Chapter 2.0–2.2



Learning Outcomes

At the end of this lecture, you will be able to:

- ✓ define “energy poverty” and describe the motivations for studying it
- ✓ describe the energy requirements of rural communities

Why learn about rural energy needs?

- Energy use is closely related to human development
- Any plan or project seeking to increase or enhance energy access must carefully understand the present energy uses, needs, desires, and resources in the community

Energy Poverty

Energy Poverty is:
the lack of access to modern fuels



2.8 billion people rely on solid biomass for cooking/heating



789 million people do not have access to electricity



Energy Poverty

Energy impoverished tend to:

- consume low amounts of energy overall
- rely on human and animal power for mechanical tasks
- devote considerable time to procuring and processing fuel
- spend a relatively large portion of their income on fuel



Charcoal market outside Kitwe, Zambia

Energy Poverty as a Gender Issue

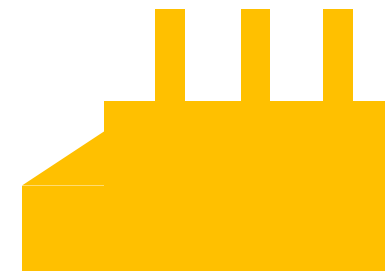
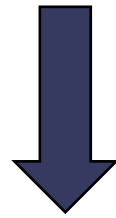
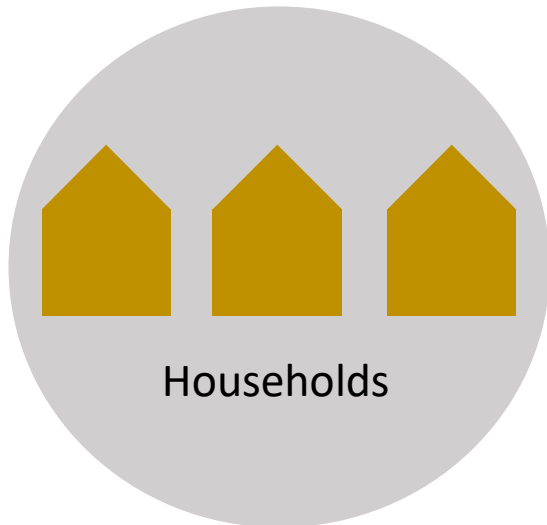
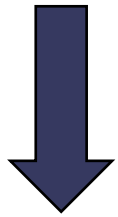
- The burden of fuel wood collection is often done by women and girls
 - Can constitute 25% of a rural woman's time
- Women and girls are more likely to cook, exposing them to smoke and particulates from burning biomass
- Women often are denied decision-making authority regarding domestic energy use
- Energy access programs often target male-dominated tasks (for example, irrigation pumping), benefiting men but not women

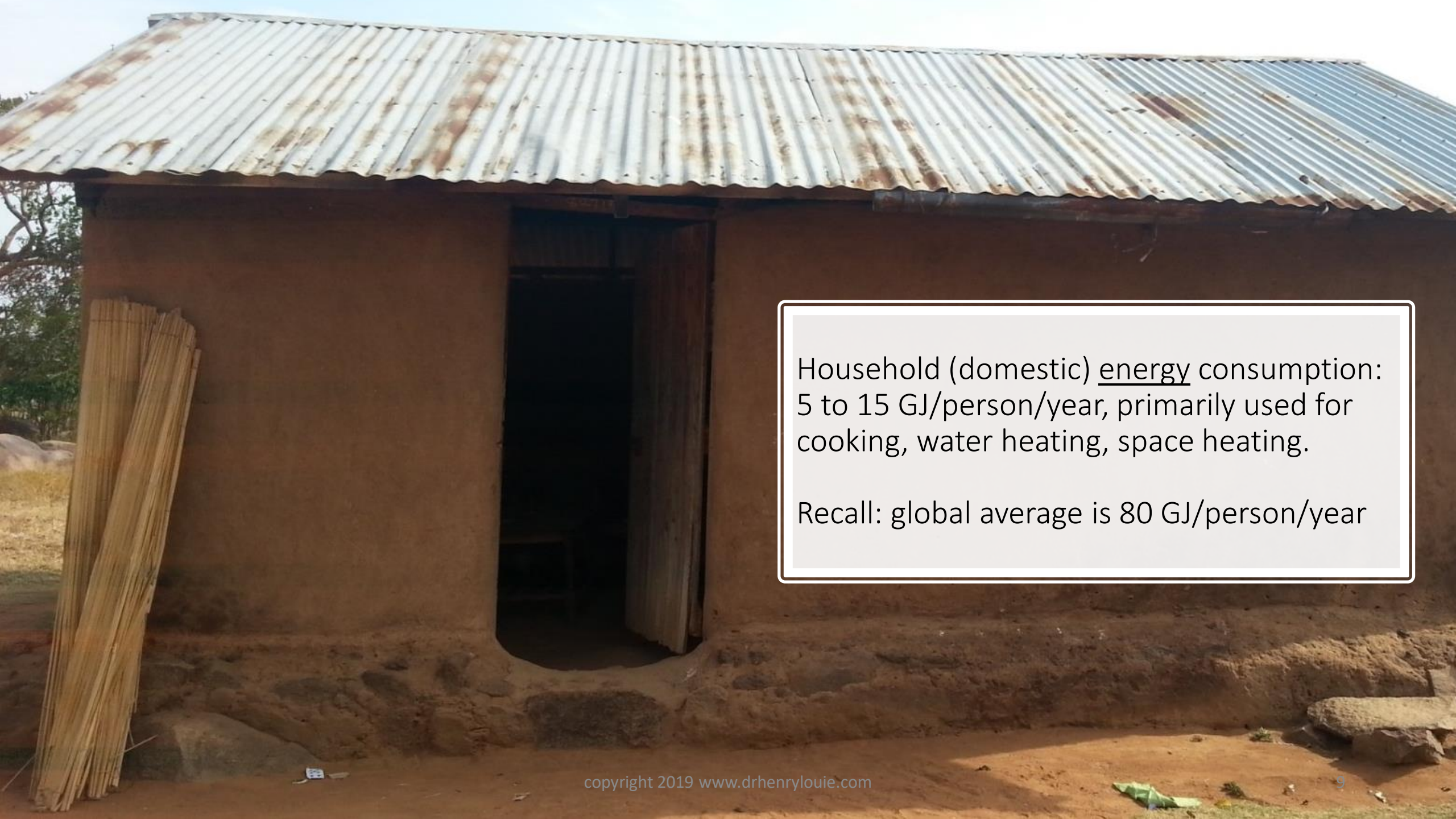


Discussion

What do you think are the energy needs of rural off-grid communities in developing countries? (e.g. energy for pumping water, or for lighting in a school)

Rural Community Energy Needs





Household (domestic) energy consumption:
5 to 15 GJ/person/year, primarily used for
cooking, water heating, space heating.

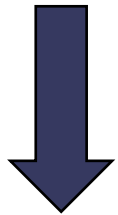
Recall: global average is 80 GJ/person/year

Fuels in Use

- Animal dung
- Batteries
- Charcoal
- Crop residue
- Electricity
- Fuel wood
- Kerosene
- Liquid Petroleum Gas (LPG)



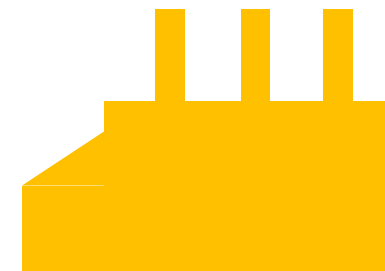
Rural Community Energy Needs



Households



Community Services



Productive Uses

Community Services

Healthcare and educational facilities, government offices, places of worship, community centers, outdoor lighting (security, pathway)



Health Post (Zambia)

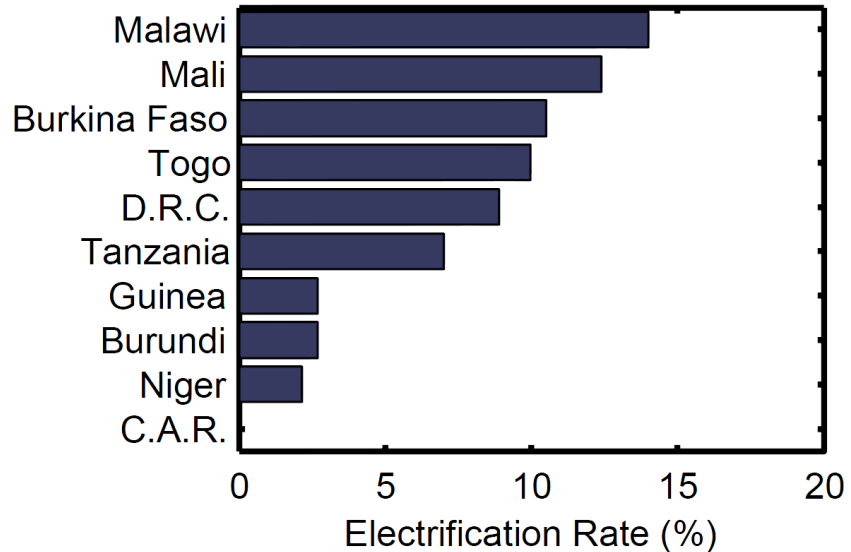


Primary School (Zambia)

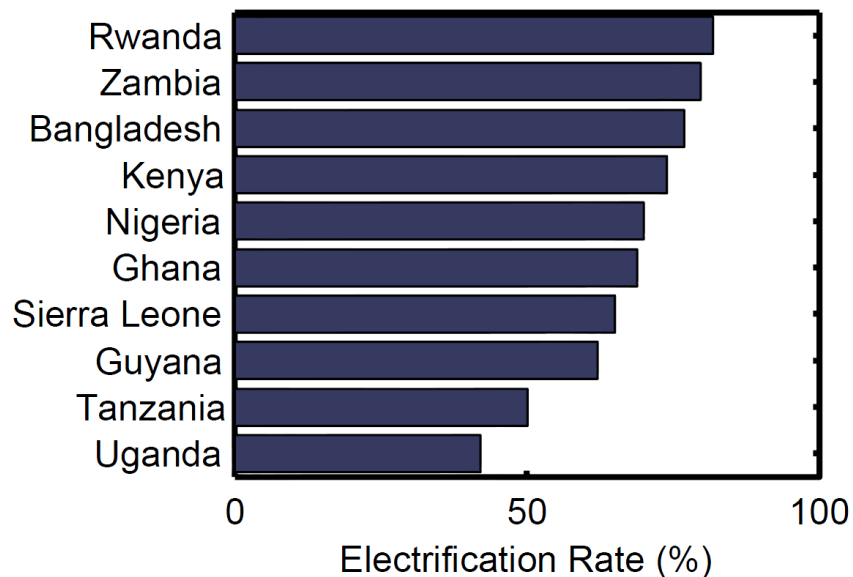


Church (Kenya)

Public Primary School Electrification Rate



Health Clinic Electrification Rate



Access Statistics

- Four out of five schools in Africa lack access to electricity
- Over 200 million children attend a school without electricity
- 1 billion people do not have adequate access to health services due to energy poverty
- Indirect benefits are important
 - 85% of teachers in Ghana cited “*lack of access to potable (drinkable) water and electricity*” for the reason they turned down positions in rural areas

Education facility electricity needs:
Internet, Telecommunications, Computers (ITC), lighting
enhanced teaching technologies (projectors, printers, digital cameras, etc.)



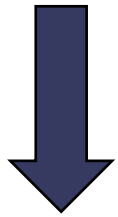
Does Electricity Access Improve Education?

- Reported positive effects:
 - reduces absenteeism
 - increases graduation rates
 - increases enrollment
 - increases test scores
- Reported negative effects:
 - Electricity at home can distract children from studying (television), and cause them to get less sleep
 - Increased economic opportunities can cause children to join the workforce at a young age

Health-care facility electricity needs:
lighting, ITC, refrigeration (vaccines, medicine)
suction machines, diagnostic equipment, hot and clean water.
Electricity must be reliable.



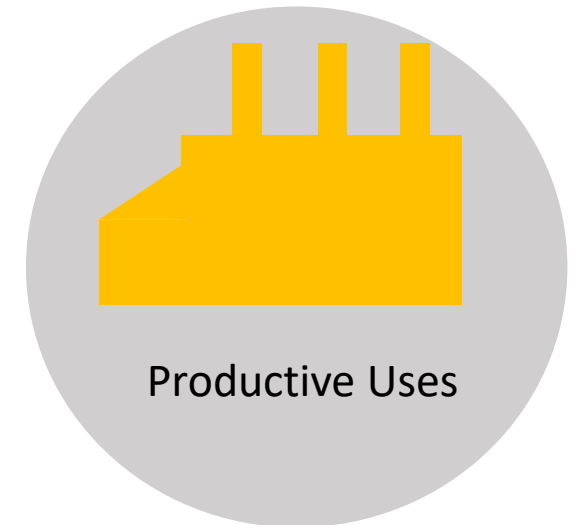
Rural Community Energy Needs



Households

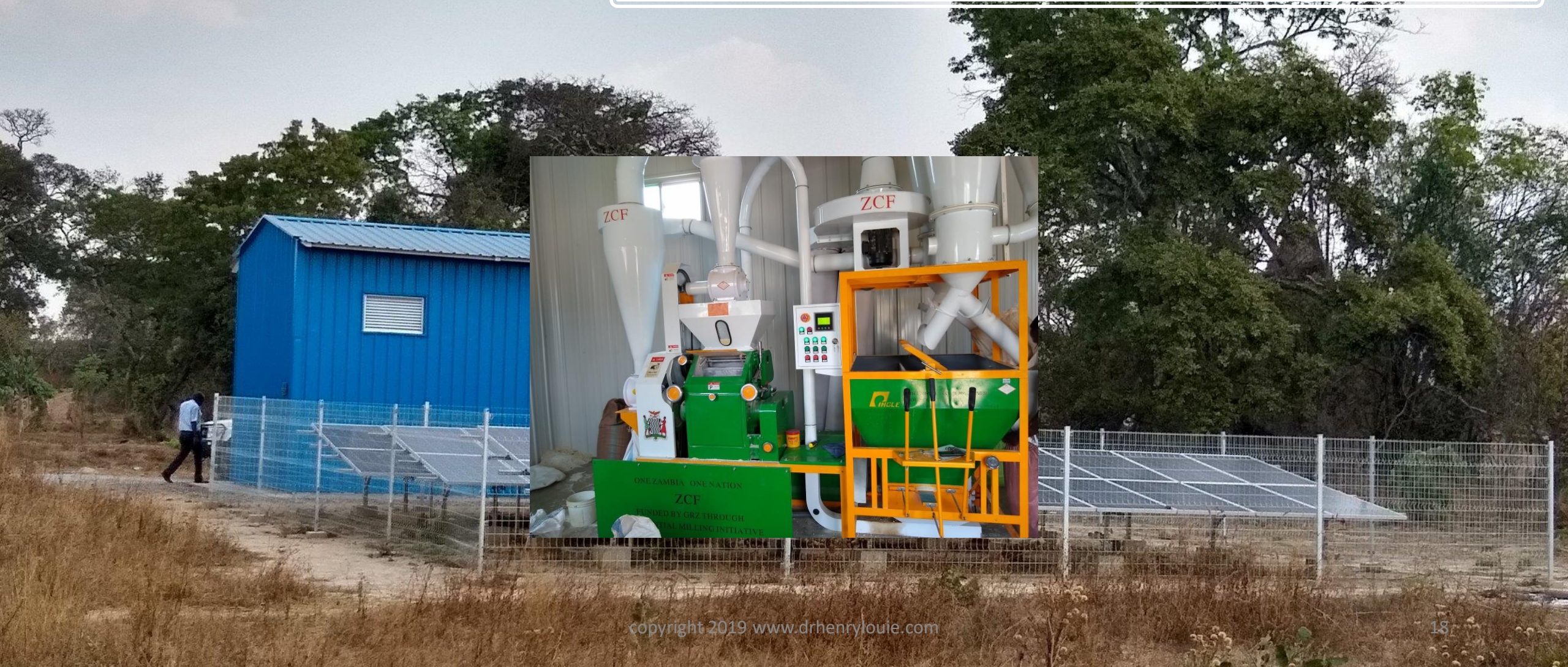


Community Services



Productive Uses

Productive use electricity needs:
irrigation pumping, milling, agriculture/forest processing,
small appliances (shavers, televisions), refrigeration, brick
making




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