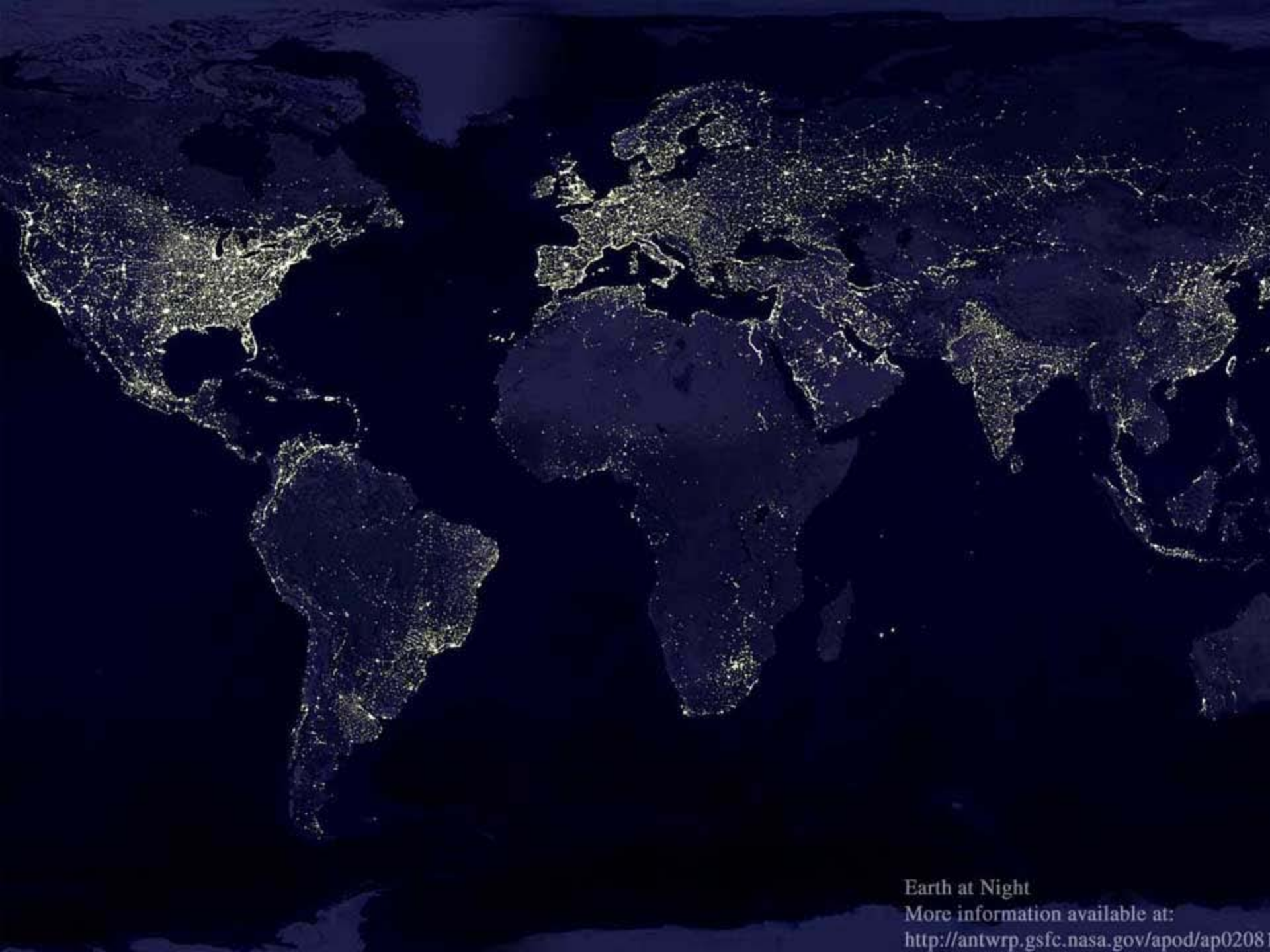


Developing Household Lighting for Rural Villages

Joe Dunlay
Iowa State University

Mali at night



Earth at Night

More information available at:

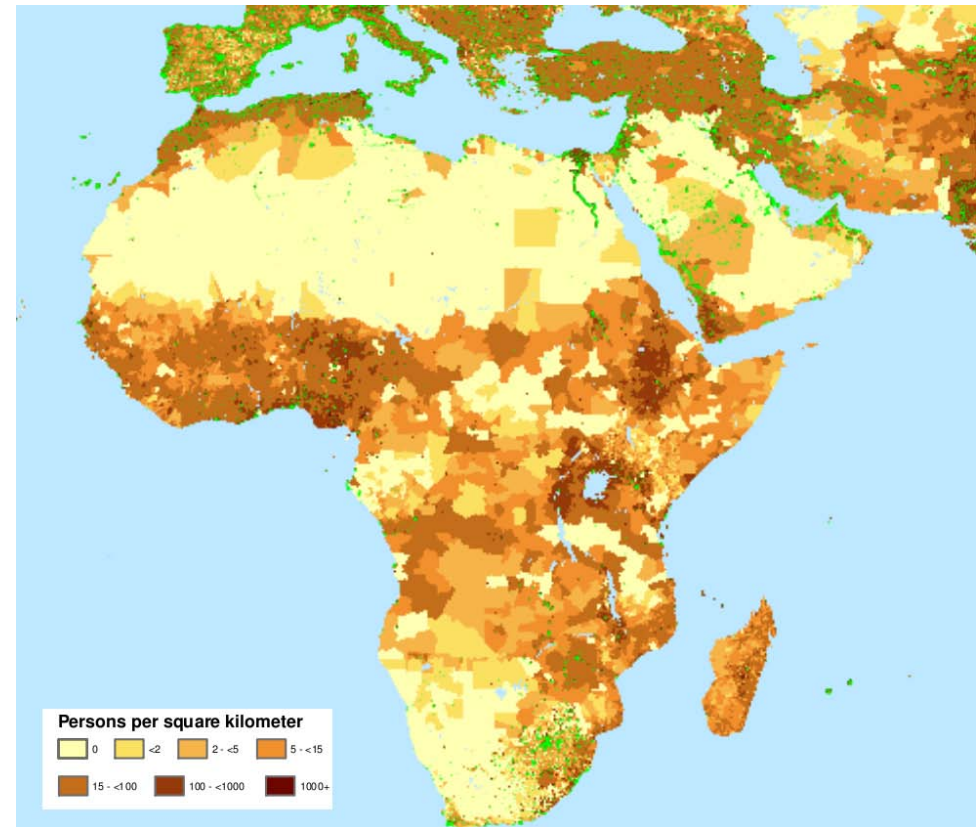
<http://antwrp.gsfc.nasa.gov/apod/ap02081>

The Importance of Lighting

- **Safety**
 - Risk of burns
 - Fires
 - Protection
- **Improves health**
 - Reduce smoke inhalation
 - Eyesight
- **Extend the day**
 - Education
 - Economic
 - Vocational

Lighting Statistics

- 1.6 billion people had little or no access to electricity in 2002
- 1.4 billion projected in 2030
- Primarily occurs in Africa, Asia and Latin America



Costs of Fuel Based Lighting

- 77 billion liters of fuel consumed per year for lighting
- Worldwide cost of \$38 billion per year
- Results in \$77 per household per year



Nana Kenieba

- Rural; population 8000 in 7 villages; subsistence farming
- Public health is central issue for welfare
- Clean water available in the past 4 years
- Initial lighting project
- Stoves development program (Penn Taylor)



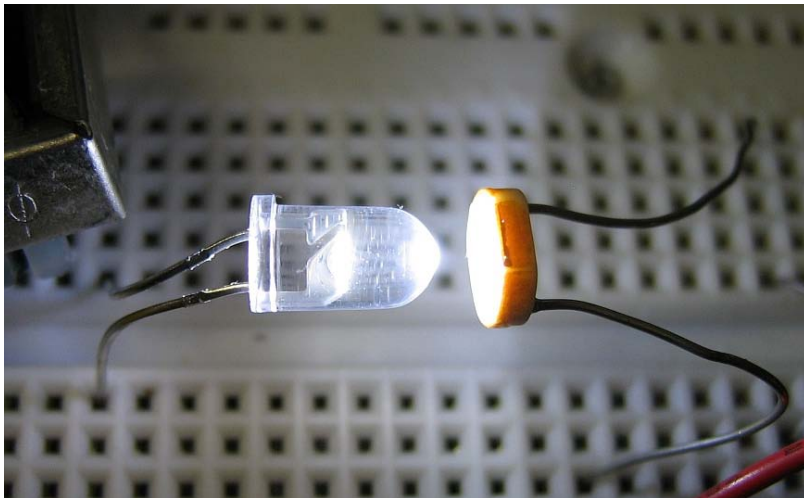
Two Methods of Obtaining Electricity

- **Grid connected**
 - **Economical**
 - **Not widely available in Sub-Saharan Africa**
- **Off-grid power generation and redistribution**
 - **PV Solar**
 - **Wind**



Types of Electrical Lighting

- Incandescent
- Linear fluorescent and compact fluorescent
- Light emitting diodes (LED)



Light Efficacies

Light Source	Typical Luminous Efficacy (lm/W)
Incandescent	10-18
Linear fluorescent	50-100
Cool white LED 5000K	45-59
Warm white LED 3300K	22-37

How we got Started

- Stoves was the initial plan
- Lighting was the villagers' desire



Evolution of the Lighting Project

- **Initial Design**
 - Individual solar panels with LEDs and fluorescents
 - Thermoelectric device with LEDs
- **Current lead acid 12v battery program**
 - 5-8W Linear fluorescent
 - Lease battery, light and wires
 - Charging station
 - Battery discharge limiter

Sustainability

- **Program is sustainable through:**
 - Variation of microfinance
 - Repayment of initial cost
 - Saving for repairs

Current Situation

- Entrepreneur profiting
 - Charging more than just leased batteries
- No payment problems to date

Where the Program is Going

- **Initial success leading to scale-up**
 - Nana Kenieba first
 - Based on that success, program will be re-evaluated.
 - Currently enough funding to scale up.