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Urban energy access - challenges

Simon Trace

June 2018





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Defining energy access ...

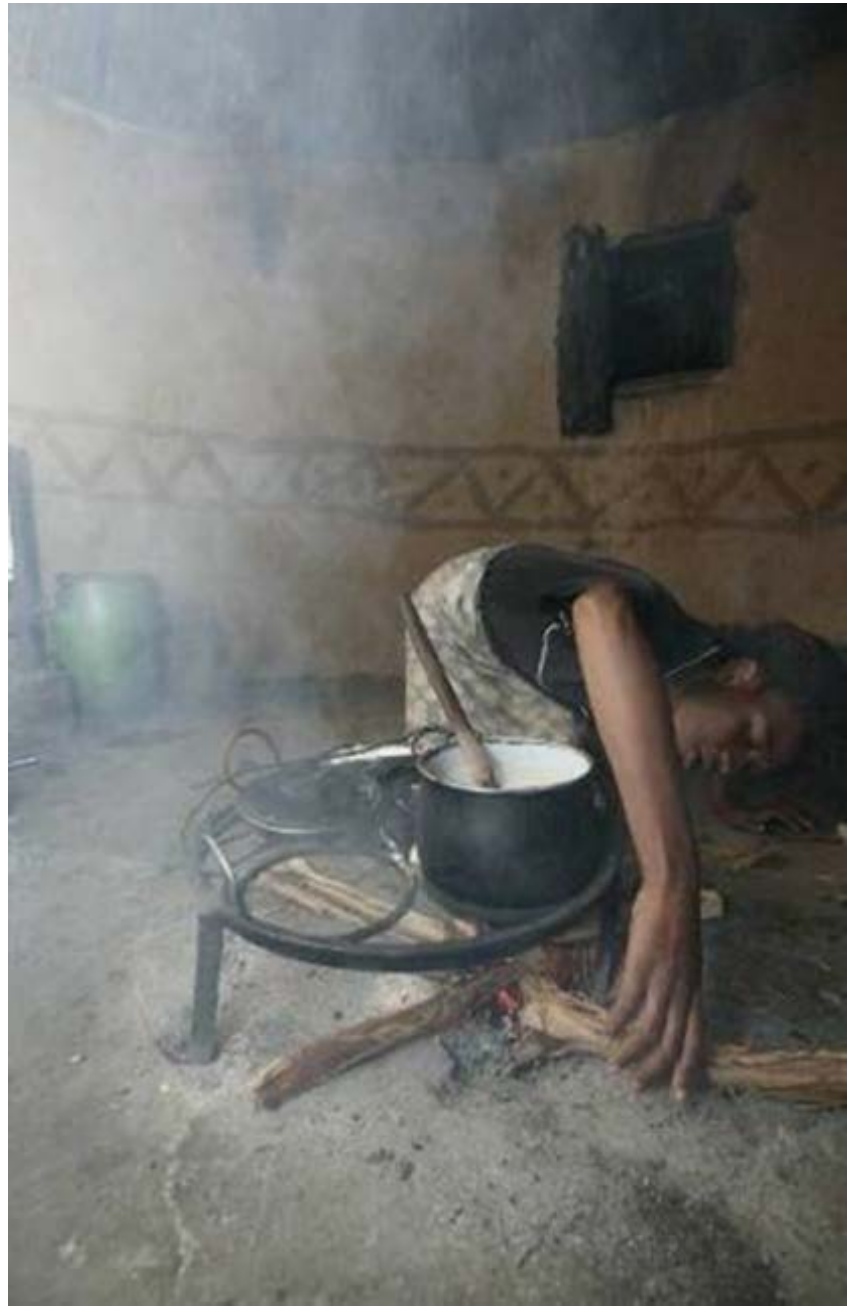




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Energy Enables Development

-  • Faster cooking
• Less smoke: saves lives
• More efficient, less wood
-  • Study after sunset
• Connection and communication
-  • Increased comfort
• Leisure and learning
-  • Less food waste
• Better nutrition







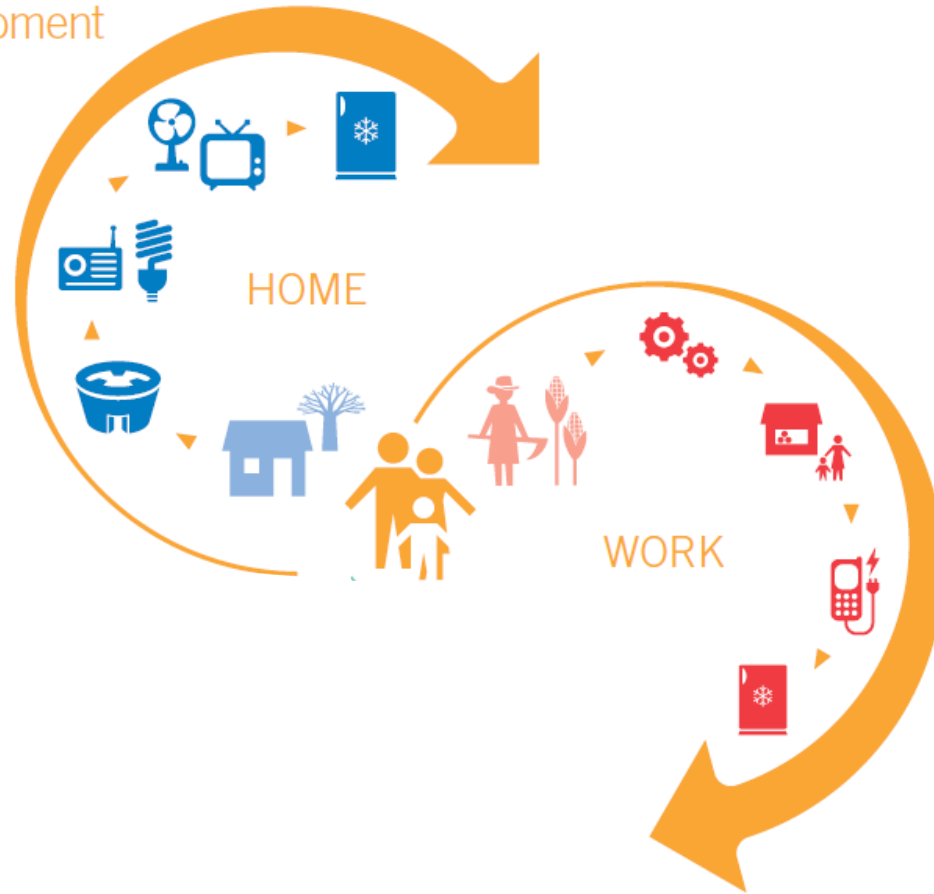






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 - Reduced physical effort
 - Faster processing
 - Cheaper price
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 - Greater range of services
 - Business after dark
- 
 - Trade without travelling
 - Access market information
- 
 - Cool and frozen products
 - Fresher for longer







HEALTH

Basic equipment e.g.

- Lighting
- Water pump
- Sterilisation equipment
- Waste autoclave & grinder
- Communications

Service specific medical devices e.g.

- Vaccine refrigerator
- Maternity equipment (suction apparatus, incubator etc)
- HIV diagnostics (ELISA test equipment)
- Portable X-ray
- Lab & diagnostic equipment



Basic equipment e.g.:

- Lighting
- Space heating / cooling
- Cooking facilities
- Water pump

Equipment for teaching e.g.:

- ICTs
- Tools for vocational training

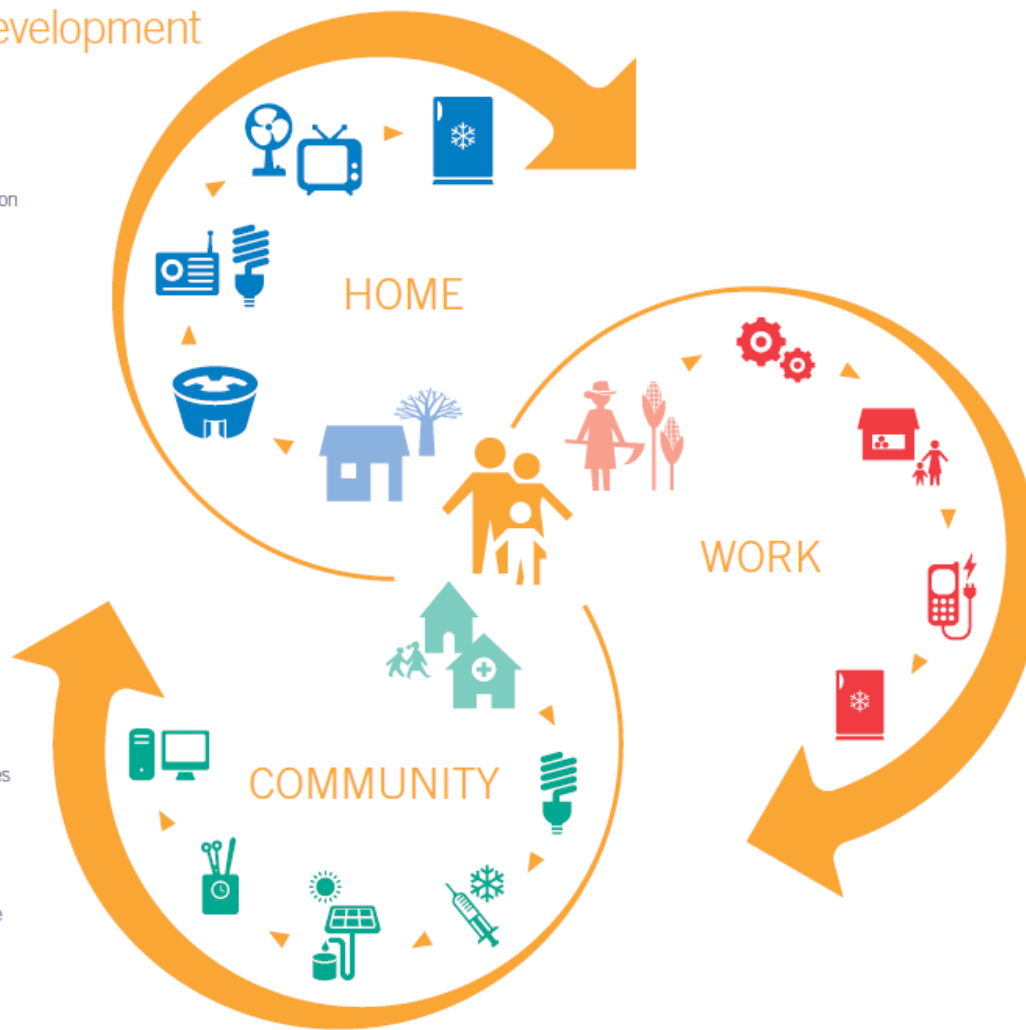
EDUCATION



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 - Medical procedures at night
 - Evening education
 - Light streets: safe communities
- 
 - Cool vaccines, less spoilage
 - Reliable and rapid testing
- 
 - Clean, reliable water supply
 - Less time spent, less distance travelled
- 
 - Sterilised equipment
 - Fewer infections
- 
 - Ordered and accessible records
 - Digitised institutions



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Is there an urban energy access problem?



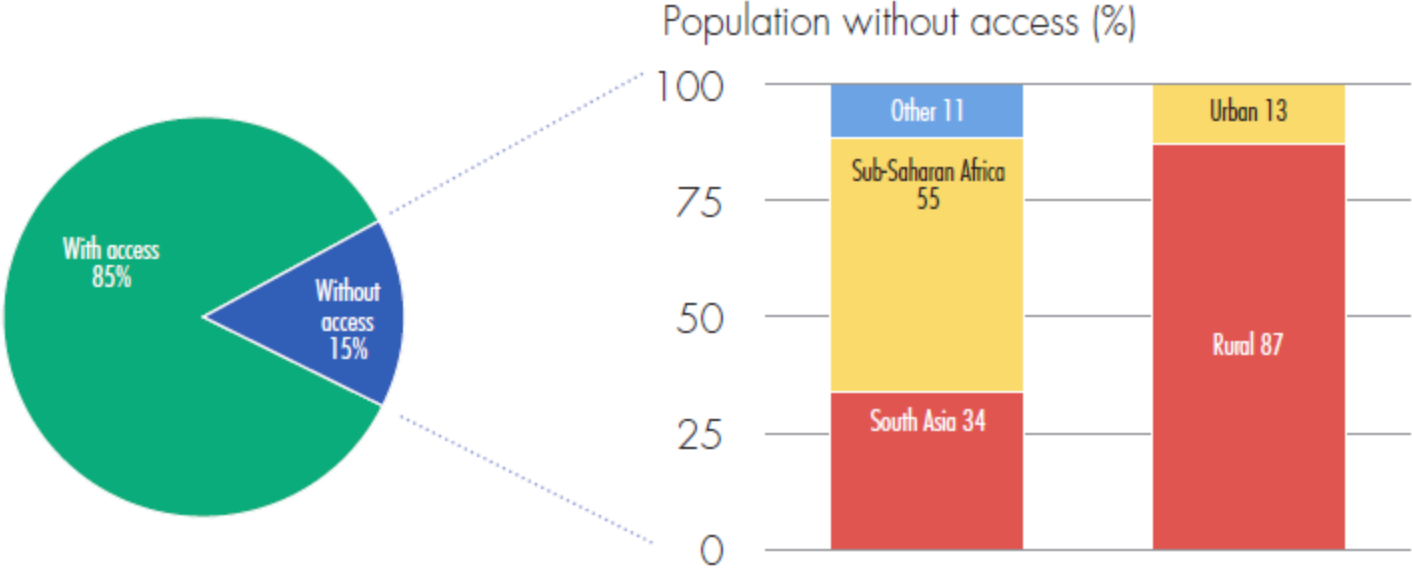


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The official statistics



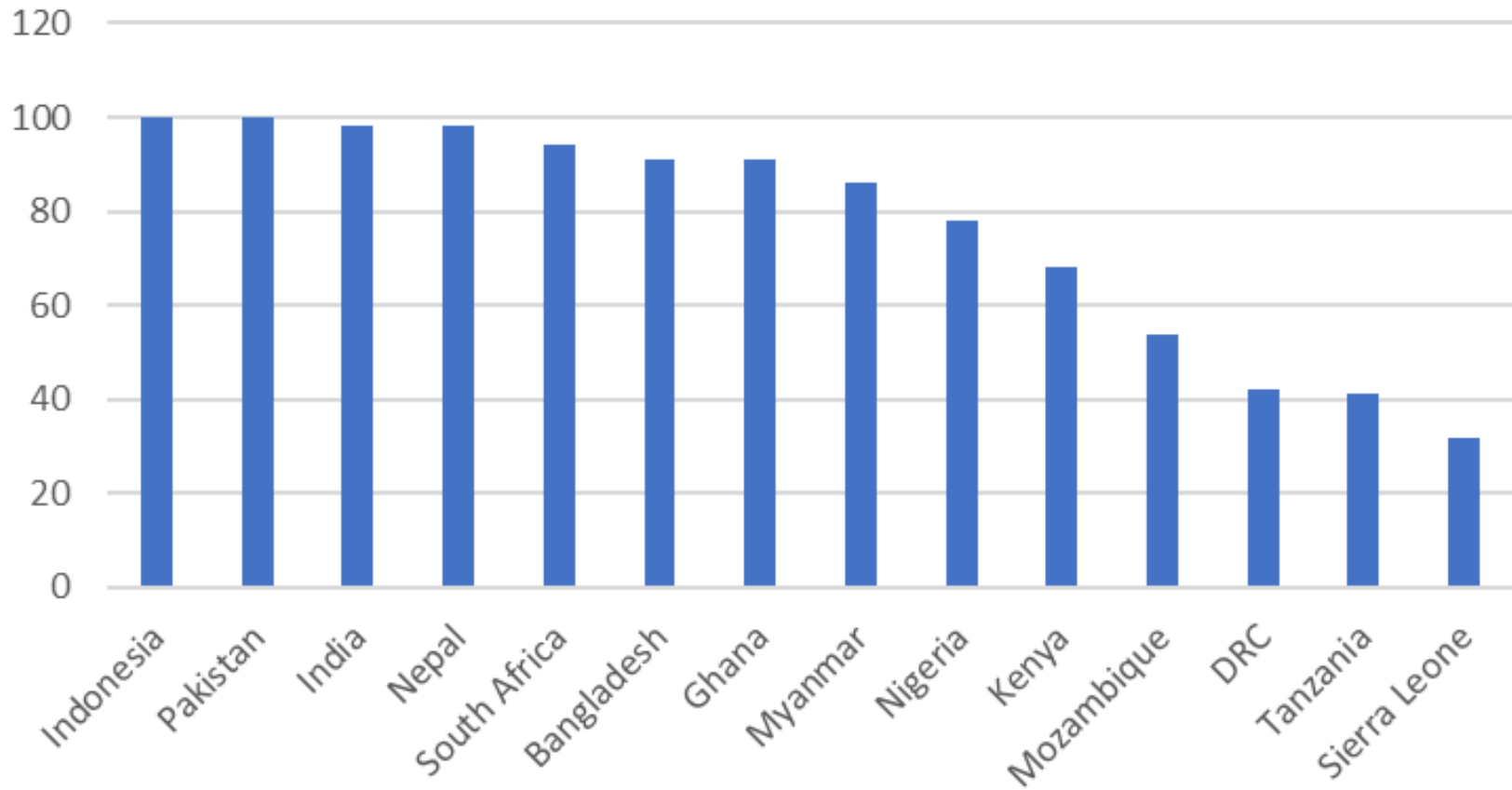
Electricity Deficit



Source: World Bank Global Electrification database 2015 (World Bank 2015).

Urban electricity access (%)

(UN SE4ALL GTF 2017)



Sierra Leone – Utility vs Self Provision

Types of power plant	Installed capacity in MW	Number of plants	State owned, private, mixed	Grid connected or decentralized
<i>Thermal Oil plant</i>	37	7	State owned	grid connected
<i>Large Hydropower plants (>10MW)</i>	50	2	State owned	Grid connected
<i>Small Hydropower plants (<10MW)</i>	6.75	4	State owned	Grid connected
<i>Auto-generators (135MW) plus two years imports (39MW)</i>	135+39 = 174	33,000	Private	Isolated
<i>Mining company generators</i>	88.5	Unknown	Private	Isolated
<i>Photovoltaic</i>	0.025	Unknown	Mixed	Isolated
Total MW	356.3			

50% generating capacity = self provision

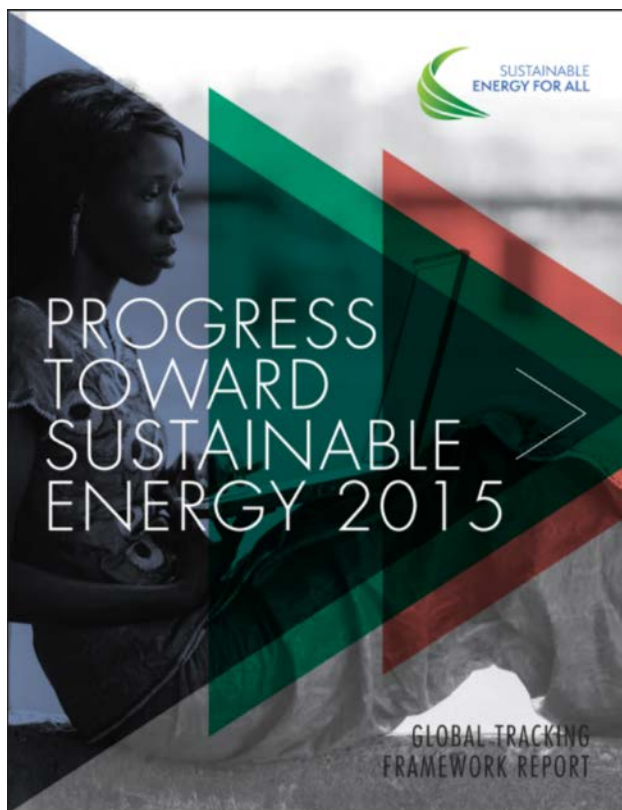
(73% including mining industry)



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Supply vs Services: Re-examining the official statistics





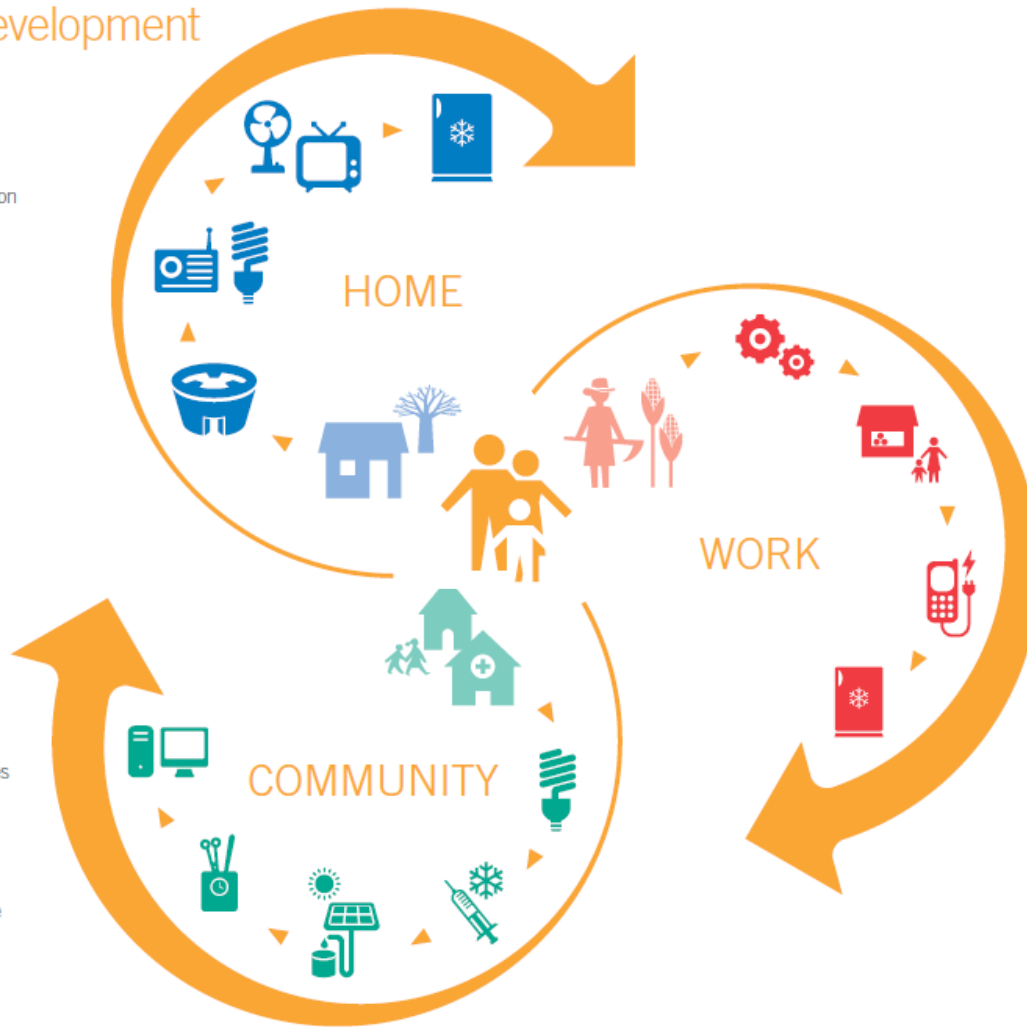
NAME	DESCRIPTION	COVERAGE (NO. OF COUNTRIES)	NUMBER OF SURVEYS (1990-2010)	QUESTION: ELECTRICITY	QUESTION: COOKING FUEL
Census	National statistical agencies	214		Is the household connected to an electricity supply or does the household have electricity?	What is the main source of cooking fuel in your household?
Demographic and health surveys (DHS)	MACRO International, supported by USAID	90	195	Does your household have electricity?	What type of fuel does your household mainly use for cooking?
Living standards measurement surveys (LSMS) or income expenditure (IE) surveys	National statistical agencies, supported by the World Bank	29 LSMS 116 IE	15 453	Is the house connected to an electricity supply? or What is your primary source of lighting?	Which is the main source of energy for cooking?
Multi-indicator cluster surveys (MICS)	UNICEF	65		Does your household have electricity?	What type of fuel does your household mainly use for cooking?
World Health Survey	WHO	71	71		What type of fuel does your household mainly use for cooking?

TABLE 2.1 DESCRIPTION OF HOUSEHOLD SURVEYS

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Multi Tier Framework

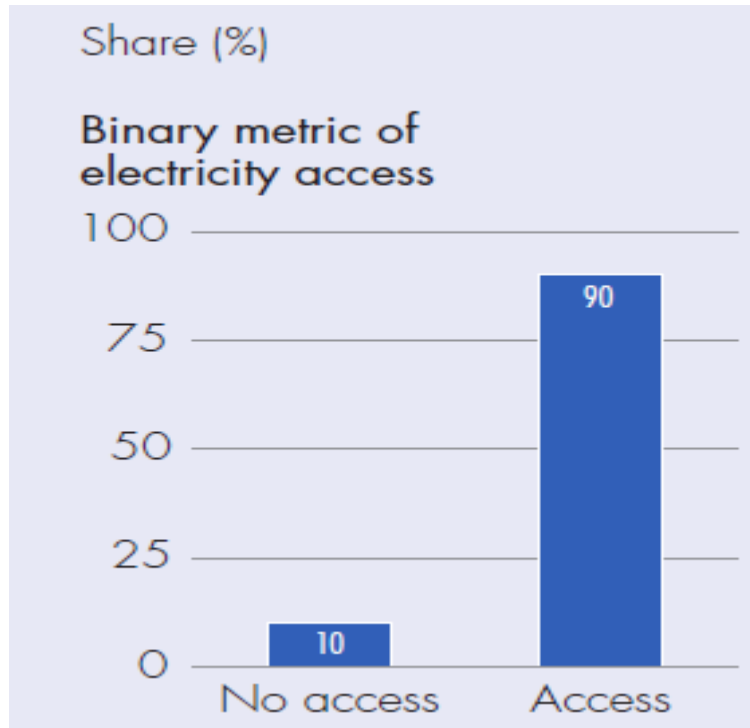


Table 5.3. Multitier matrix for access to household electricity supply

		Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Attributes	1. Peak capacity	Power	Very low power, minimum 3 watts	Low power, minimum 50 watts	Medium power, minimum 200 watts	High power, minimum 800 watts	Very high power, minimum 2 kilowatts
		and Daily capacity	Minimum 12 watt-hours	Minimum 200 watt-hours	Minimum 1.0 kilowatt-hours	Minimum 3.4 kilowatt-hours	Minimum 8.2 kilowatt-hours
		or Services	Lighting of 1,000 lumen-hours per day	Electrical lighting, air circulation, television, and phone charging are possible			
	2. Duration	Hours per day	Minimum 4 hours	Minimum 4 hours	Minimum 8 hours	Minimum 16 hours	Minimum 23 hours
		Hours per evening	Minimum 1 hour	Minimum 2 hours	Minimum 3 hours	Minimum 4 hours	Minimum 4 hours
	4. Affordability				Cost of a standard consumption package of 365 kilowatt-hours per annum is less than 5 percent of household income		
	3. Reliability					Maximum 14 disruptions per week	Maximum 3 disruptions per week of total duration less than 2 hours
	5. Legality					Bill is paid to the utility/prepaid card seller/authorized representative	
	6. Health and safety					Absence of past accidents/ no perception of high risk in the future	
7. Quality					Voltage problems do not affect use of desired appliances		

		Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Tiers	Tier criteria	-	Task lighting and Phone charging	General lighting and Television and a fan (if needed)	Tier 2 and Any medium power appliances	Tier 3 and Any high power appliances	Tier 3 and Any very high power appliances
	Indicative list of appliances	-	Very low power appliances	Low power appliances	Medium Power appliances	High power appliances	Very high power appliances
Appliances	Lighting	-	Task lighting	Multi-point general lighting			
	Entertainment and communication	-	Phone charging, radio	Television, computer	Printer		
	Space cooling and heating	-		Fan	Air cooler		Air conditioner, space heater
	Refrigeration	-			Refrigerator, freezer		
	Mechanical loads	-			Food processor, washing machine, water pump		
	Product heating	-				Iron, hair dryer	Water heater
	Cooking	-			Rice cooker	Toaster, microwave	Electric cooking
	Consumption	Daily consumption levels (watt-hours)	< 12	≥ 12	≥ 200	≥ 1,000	≥ 3,425

Access to Supply vs Energy Services - Kinshasa



SE4ALL Global Tracking Framework 2015



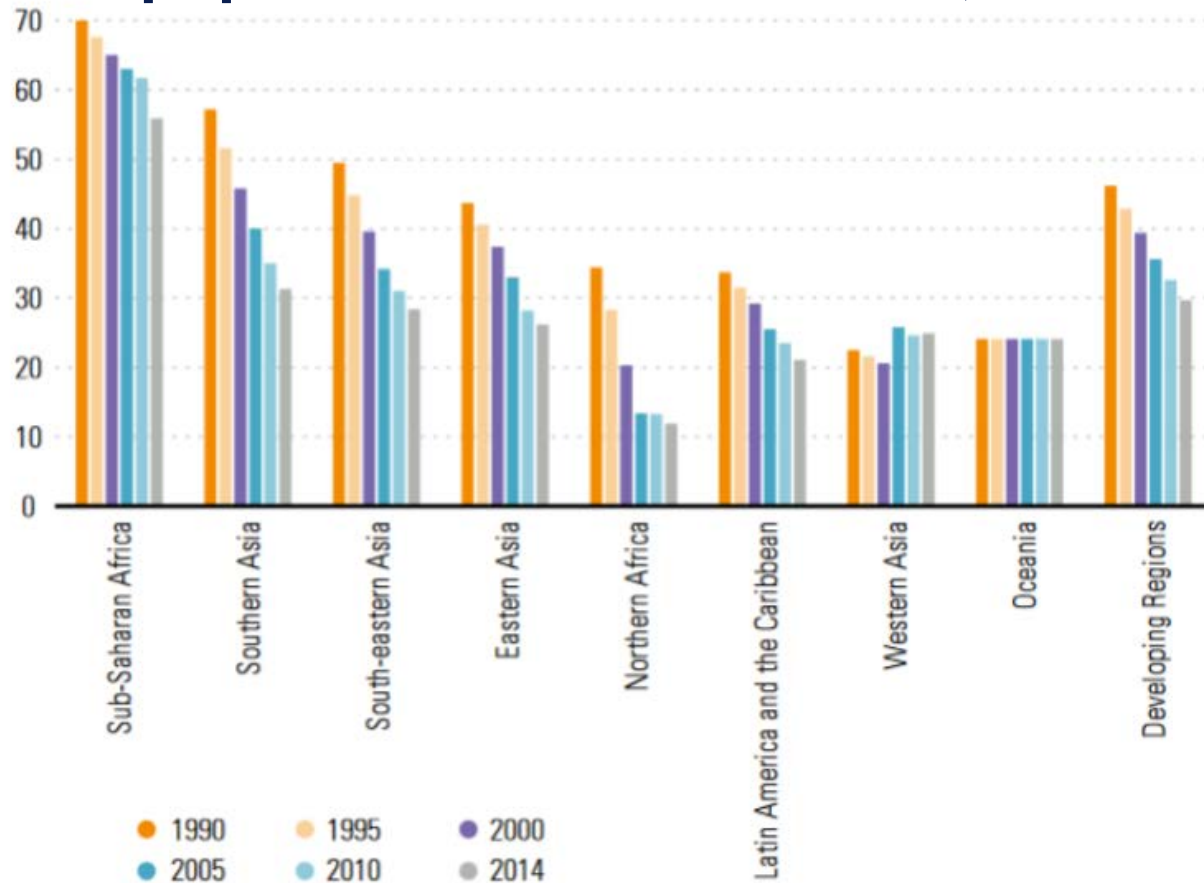
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Challenges of informal settlements



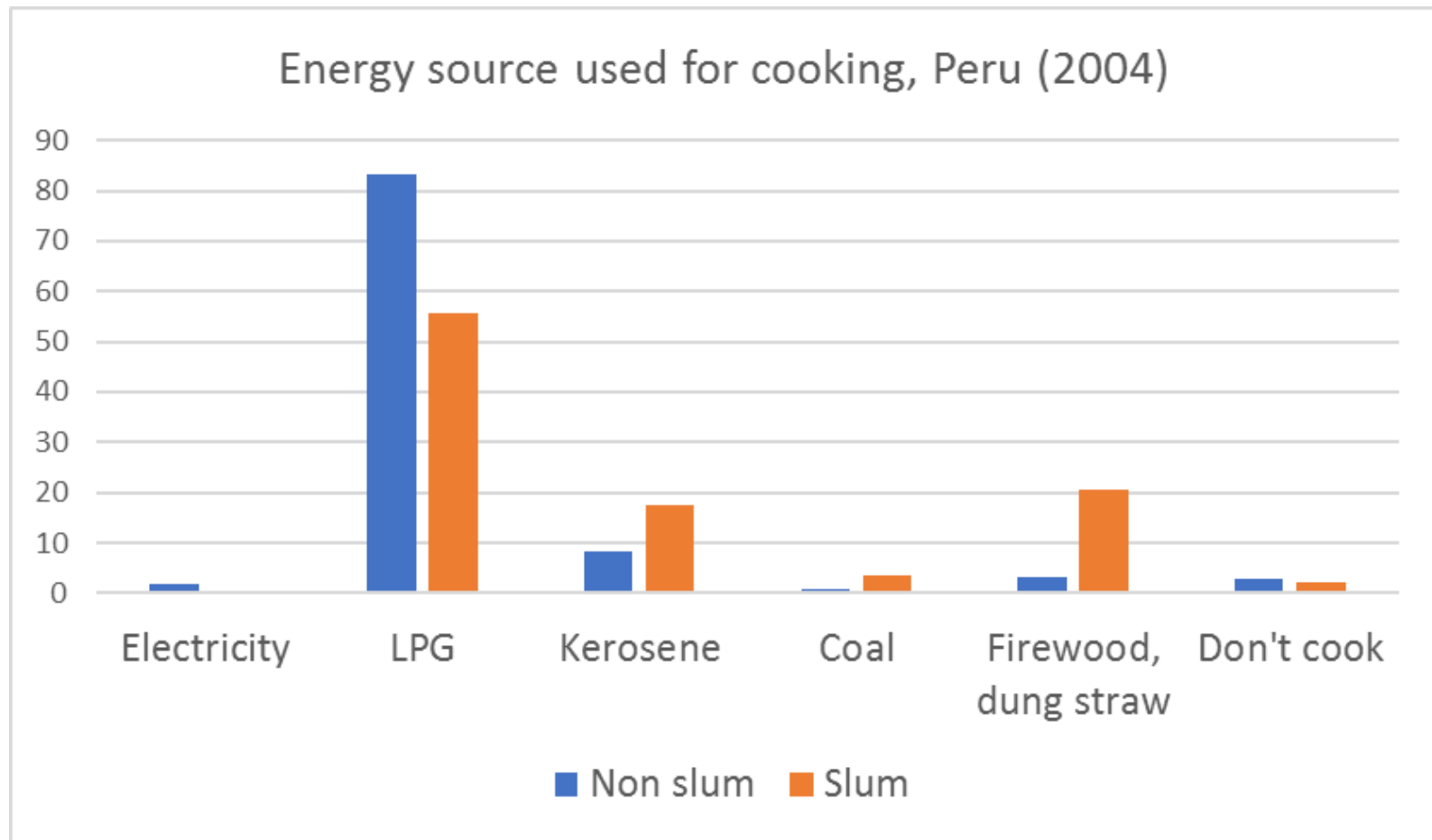
Scale

(55% of urban population informal in SSA, 30% in SA)



Percentage of urban population living in slums (1990-2014).

Energy sources different to formal settlements



Urban Development and Energy Access in Informal Settlements. A Review for Latin America and Africa, World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium 2016

Challenges

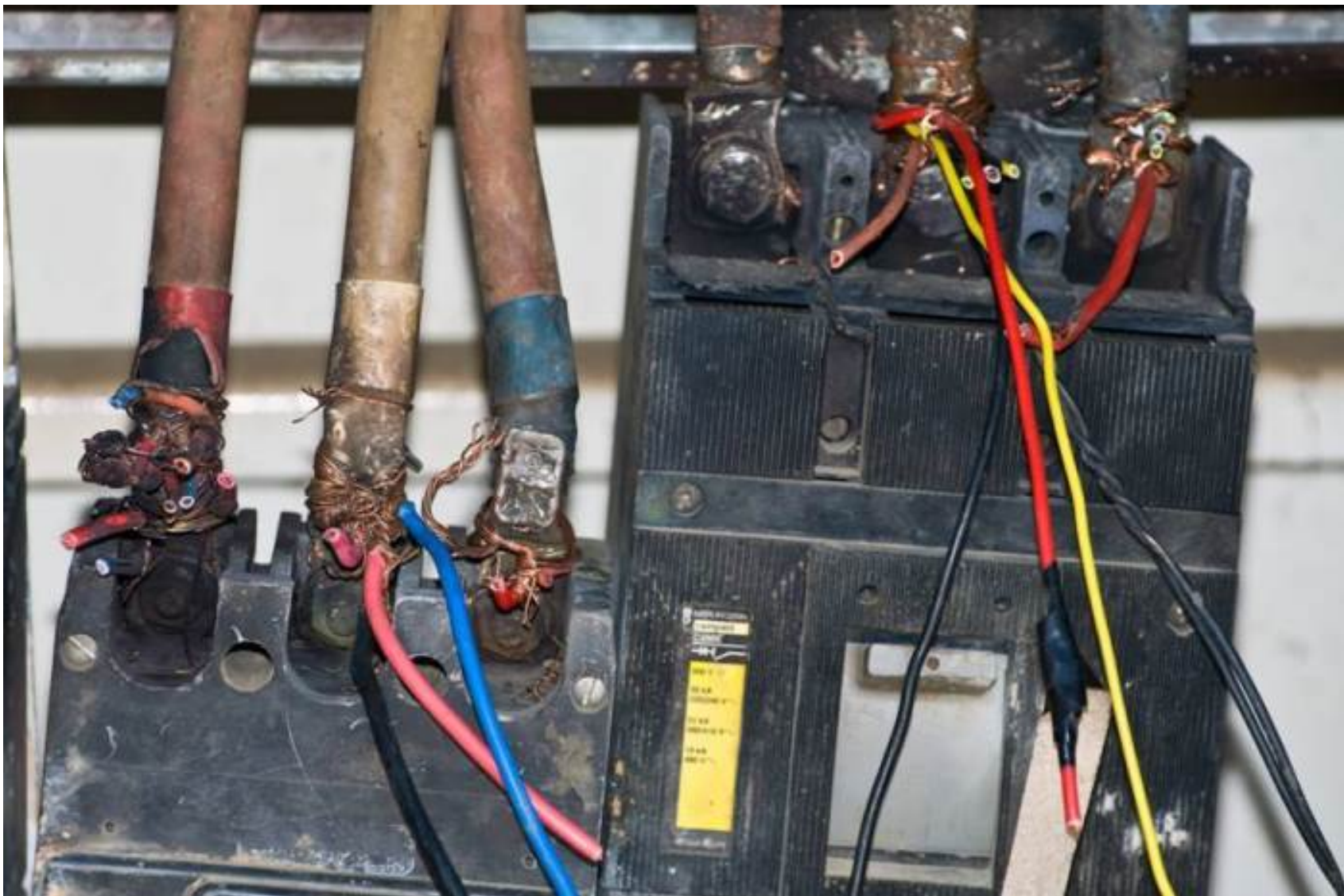
Electricity

- Lack of land tenure / 'official' address means utilities cannot connect or bill
- Limited national generating capacity and expected low consumption makes connecting informal settlements uneconomical or low priority for utility.
- High upfront costs for connection fee and house wiring
- Lack of trust between communities and utilities / security issues
- Presence of local cartels making money from illegal connections
- Tendency for most common subsidies to be regressive

Cooking

- Electricity too expensive (heaviest household energy demand by far)
- LPG:
 - Lack of land tenure / 'official' address when renting cylinders
 - Cost of stove and cylinder deposit
 - Cylinders too big (and so too expensive to re-fill)
 - Safety restrictions on shops who sell means local distribution can be difficult







Potential Policy Responses

Electricity

- **Land tenure:**
 - Slum household registration
 - Thailand temporary registration numbers or ‘quasi household IDs’
 - Ahmedabad Municipal Corporation (Gujarat, India) issue ‘certificate of non eviction’ to facilitate utility connections.
- **Trust:**
 - Working through local NGOs:
 - ✦ COELBA community agent programme, Brazil;
 - ✦ SEWA / AMC Slum Networking project – bill collection through local CBOs
 - Prepaid meters (South Africa)
- **Costs:**
 - Connection costs by instalment e.g.:
 - ✦ Kenya ‘Stima loan’ 20% up front, remainder over 12 – 36 months,
 - ✦ Mali includes internal wiring, paid back over 10 years on utility bill).
 - Less regressive forms of social tariff (by registration, Brazil; Variable Rate Tariffs e.g. Chhattisgarh India)
 - Bulk supply / community utility (Nepal - rural)

Cooking (LPG)

- **Costs**
 - Carbon credits to offset cost of stove purchase (El Fasher, Sudan)
 - Supply gas in smaller cylinders (3 – 6 kg in India, Kenya, & Thailand)
 - Allow small top ups (1 kg) to match income (Kenya)
- **Availability**
 - Relax regulations so cylinders can be sold in groceries and small shops closer to where people live (Thailand)



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Thank you

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