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MENTOR

Nadir Abdessemed

Energy in Commercial Buildings, Uganda

Accesibility, Reliability and Equal Opportunity

Achilles Ahimbisibwe

Energy Mix: national supply

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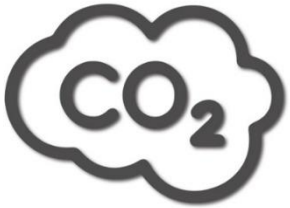
Wood Fuel = 93%

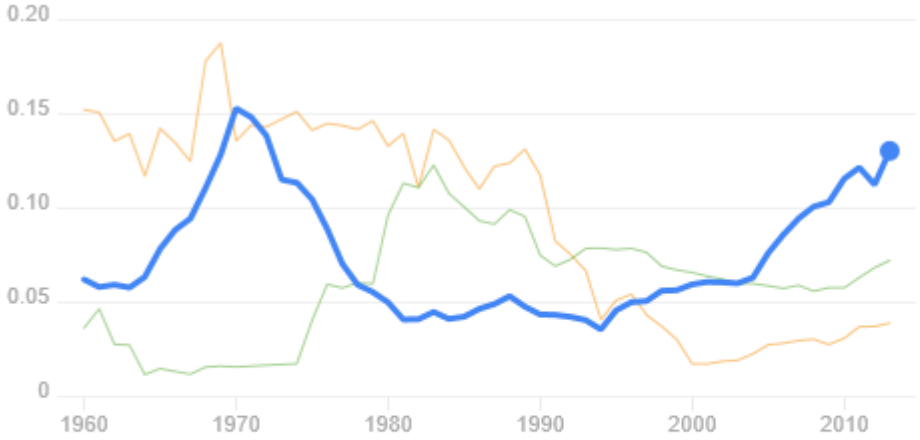
Petroleum = 5%

Hydro = 1.5%

National Energy availability is low and is heavily reliant on burning fuel.

CARBON EMISSIONS





Explore more

Sources include: World Bank

Feedback

Context: design patterns

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Kenya

Tanzania

Uganda

Rwanda

Burundi

Full Glass façades are an increasing design typology in Uganda.

Which is not suitable for humid equatorial climate

Background: professional context

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United States of America

105,000 Licensed architects

1 Architect

2,000 people

European Union

565,000 Licensed architects

1 Architect

1,000 people

The Republic of Uganda

170 Licensed architects

1 Architect

207,400 people

Practice: regulation context

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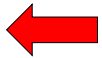
Demographic	Annual Income	Sector	Building Team
2%	> 41,208 €	Core Urban	CA MEP Co SE A
4%	≤ 13,200 €	Urban	
8%	≤ 3,684 €	Peri-Urban	
15%	≤ 2,448 €	Peri-Urban	
71%	≤ 576 €	Rural	



Architect Role

is bearly evident since most construction is NOT regulated.

Even in regulated areas Architects play a minor role

Source:
http://inequalities.sidint.net/soear/data/one-people-one-destiny/economic-dimensions-of-inequalities/2[accessed 05 June 2018]

consequence: fully glazed façades

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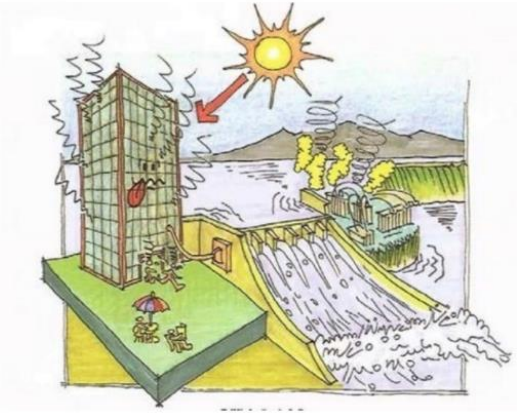

Over 70% of energy is consumed in cities

Source: http://iieng.org/images/proceedings_pdf/E0514065.pdf[accessed 15 April 2018]
https://www.researchgate.net/figure/Typical-Building-Energy-Consumption-in-Tropical-Countries_fig1_281437940[accessed 10 March 2018]

Contemporary: aspirations

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1960 **before**
0 % Air conditioning
80 % Shading devices

2017 **after**
50 % Air conditioning
0 % Shading devices

Less Shading

more air conditioning is a noticable trend even in restoration or renovation projects.

Source:
https://www.newvision.co.ug/new_vision/news/1454248/construction-women-hospital-final-stages[accessed 12 February 2018]

Challenge: … electricity context

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Hydro electricity Supply
is inadeqaute and is earmarked by load shedding and frequent Blackouts

Slow Growth

Supply	2002		2015
Supply	300 MW	→	695 MW
Demand	285 MW	→	660 MW

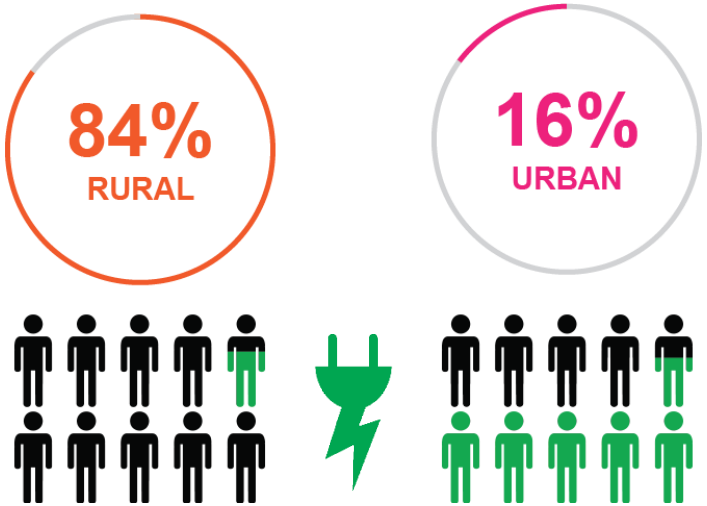
(Annual growth rate of 20%)

Weekly BlackOut !

Up to 3 days each Week!

Source:
https://www.usaid.gov/sites/default/files/documents/1860/Energy_Efficiency_Roadmap_for_Uganda_FINAL.pdf
https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-016-0094-8

Challenge: …restricted national electrification



Population

is has low access to electricity.

More supply options need to be considered.

Source:
Mbabazi, R. and Sansa-Otim, J. (2015).Uganda's energy sector: challenges and Opportunities. Online Available from:http://www.eandcspoton.co.za/resources/docs/Energy/Uganda_energy_sector_challenges_and_opportunities.pdf [accessed 10 March 2018]

Challenge: …high dependence on Diesel generators

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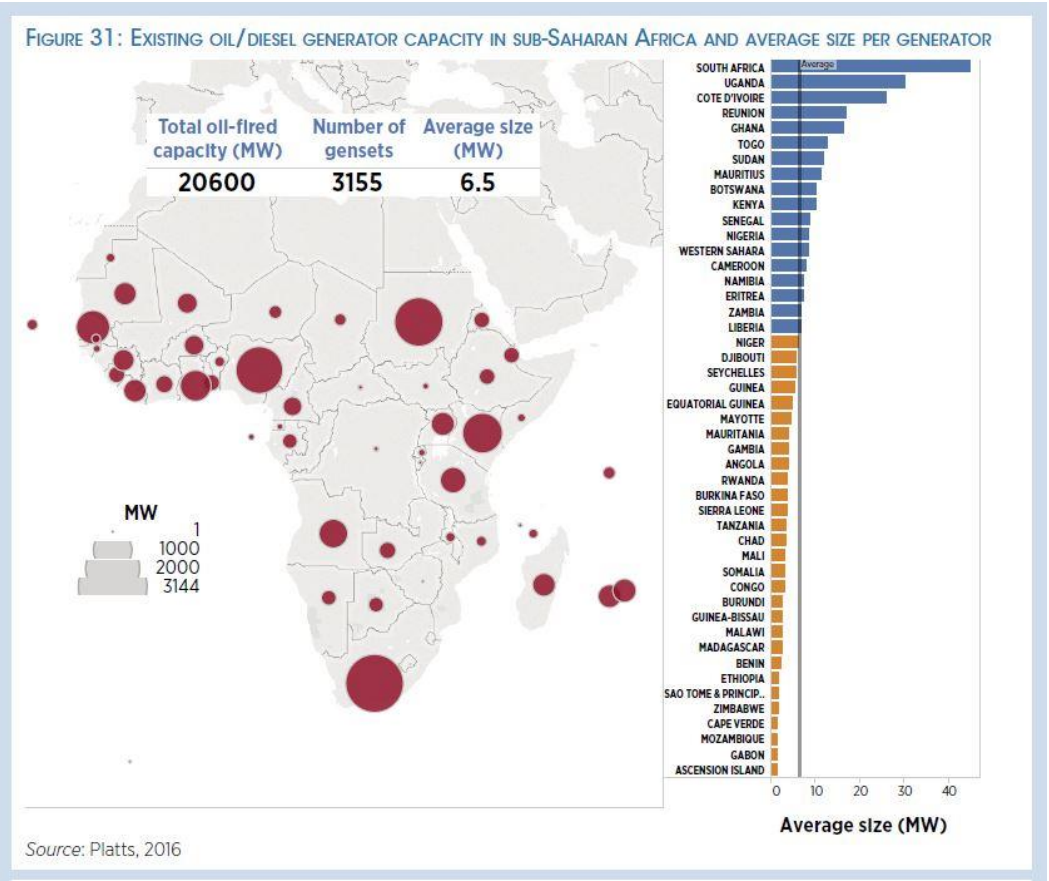

Diesel remains the dominant alternative for electricity

Source:
International Renewable Energy Agency (IRENA) https://www.africa50.com/fileadmin/uploads/africa50/Documents/Knowledge_Center/IRENA_Solar_PV_Costs_Africa_2016.pdf

Proposed Impact: Energy Use Intensity

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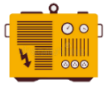
EUI Commercial Building Benchmark *(kWh/m²/year)*

High	Mean	Low
230.4	**156**	103.4

"Consume more energy because of less efficient HVAC systems.."
(Mukwaya & Okidi- Lating, 2014)

Energy demand
is directly linked to
mechanical cooling systems

energy mix for typical1000m² Office

		Demand	Tariff	Annual
		78 kWh/m²	€ 0.24 / kWh	€ 18,720
		78 kWh/m²	€ 0.19 / kWh	€ 14,820
				€ 33,540

**Commercial Bui8lding Benchmarking. http://iieng.org/images/proceedings_pdf/E0514065.pdf (Mukwaya & Okidi-Lating 2014)

Thermal Study: lower peak loads (*W/m²*), smaller systems .

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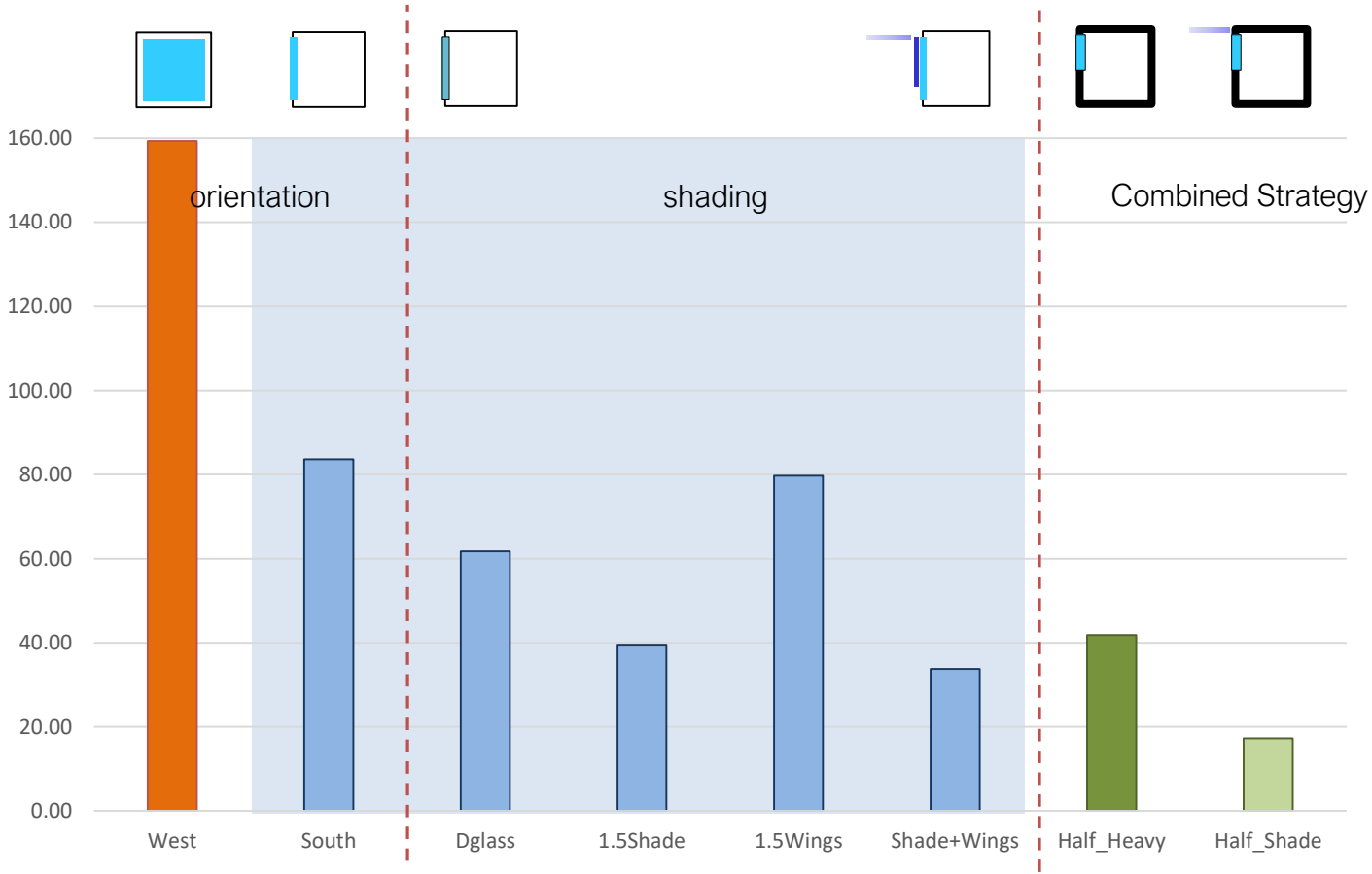

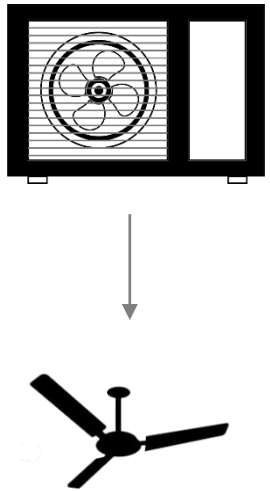

Less Demand: makes PV a viable supply alternative

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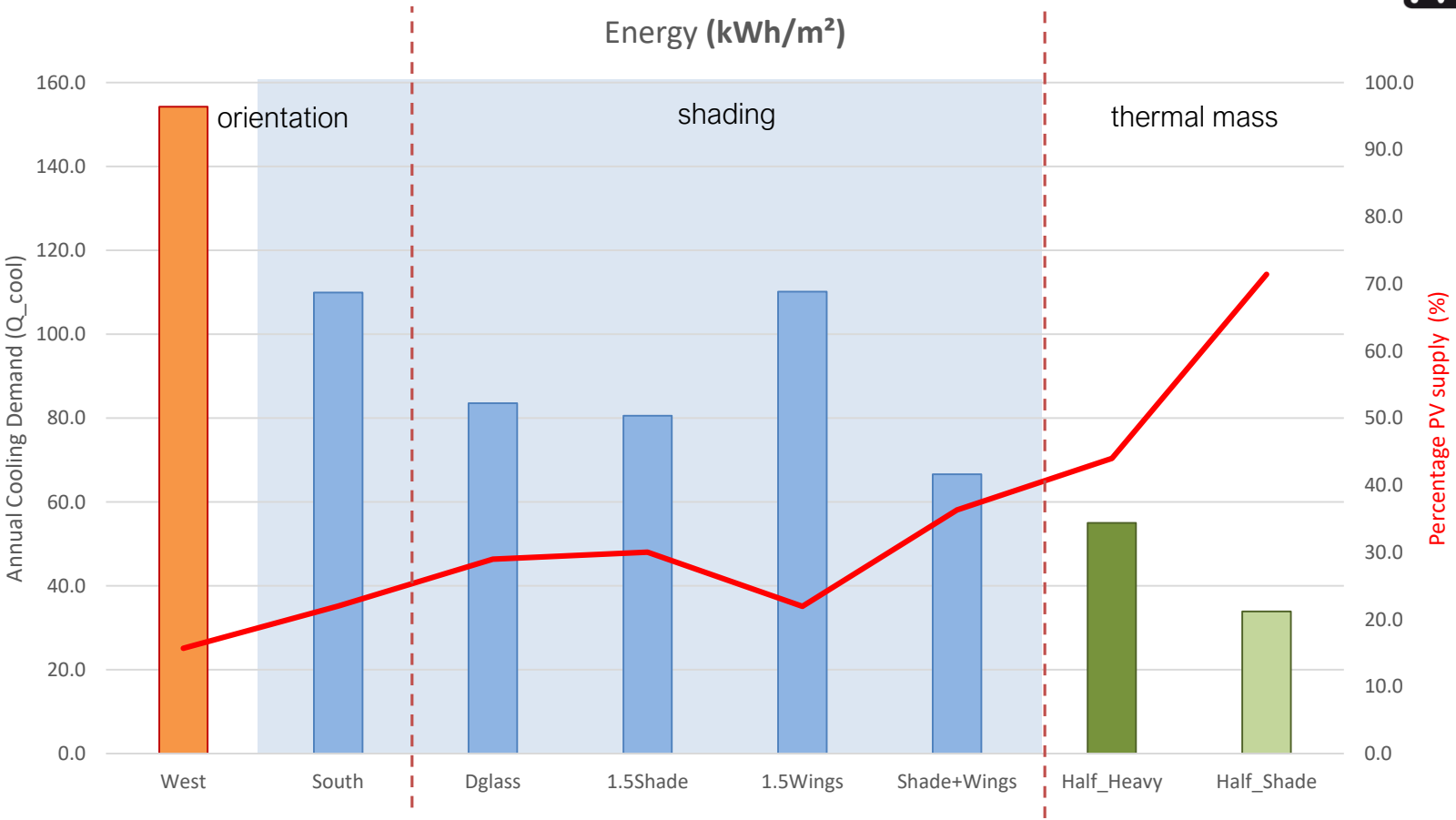
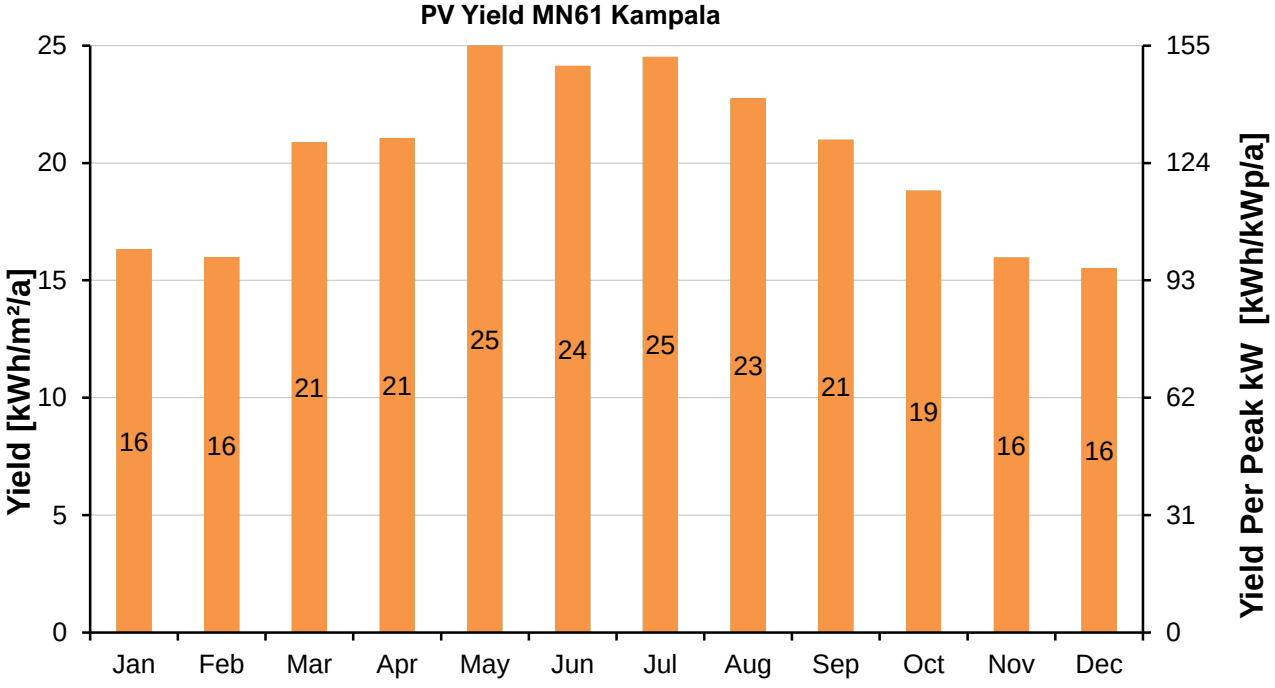


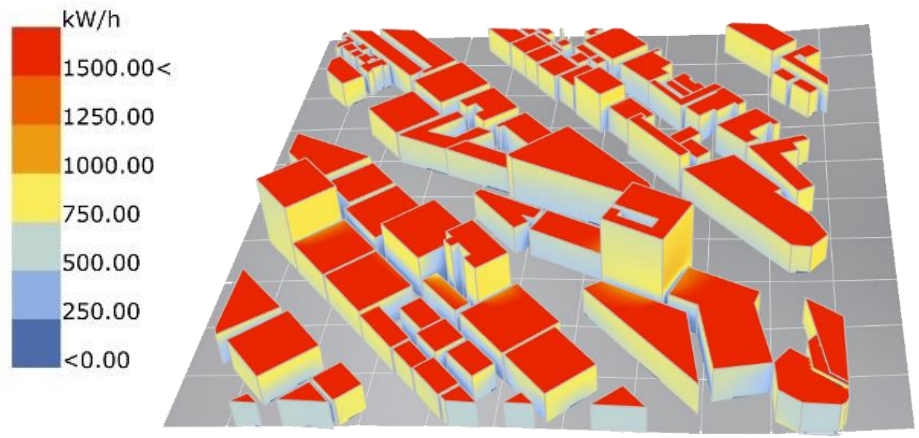
Additional Supply: potential PV yield



Slope Of Surface: 0 °; Azimuth: 0 °
Solar Radiation In PV Plane: 1724 kWh/m²/a
Specific System Production: 242 kWh/m²/a 16% efficiency
Specific System Production: 1501 kWh/kWp/a

PV
is possible supply altrenative in this context

Additional Supply: shared Investment potential



242 kWh/m²/a x 50m² x 100 = 1.21 GWh/a

Table 3-2. Additional Planned Capacity

UECTL-commissioned power plants	Planned Capacity	Completion date	Total Investment Cost	Average Investment Cost
Karuma Hydro Power dam	600 MW	2019	US$1.688 billion	US$2.8M per MW
Isimba Hydro Power dam	183 MW	2019	US$567.7M	US$3.0M per MW
Ayago Hydro power	840 MW	2022	US$1.97 billion	US$2.3M per MW

Source: Kyokunzire, 2016; Wesonga and Mugerwa, 2015; Uganda Government NDPII, 2015.

PV

Systems can be procured locally at building scale, yet can make an impact at city scale

Target: synergy between design efficiency and energy use

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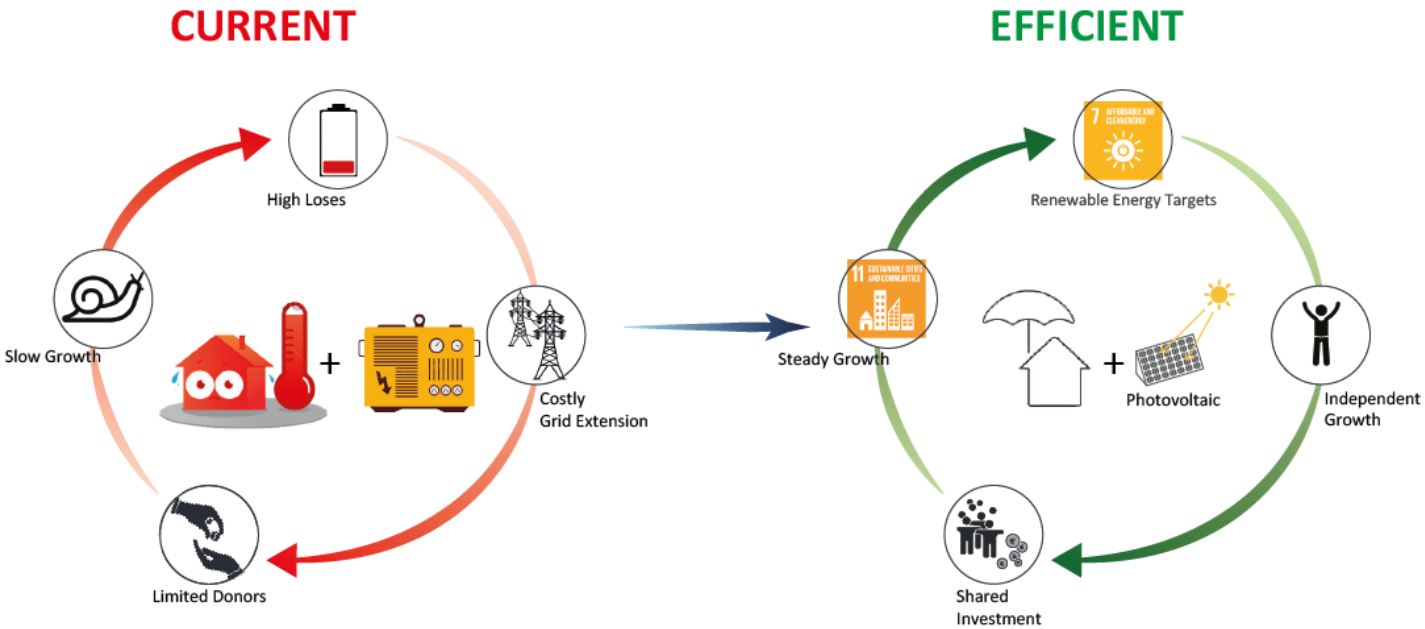

World Bank refinancing of Uganda's Bujagali hydropower scheme under the spotlight

Approach: *architects, city planners, and developers (like-minded innovators.)*

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"Innovation and community" – Sustainable design by Andrew Amara

LafargeHolcim Foundation
YouTube - Mar 18, 2018

KCCA
KAMPALA CAPITAL CITY AUTHORITY
For a better City

Jennifer Semakula Musisi Ph.D (h.c)
KCCA Executive Director
Sustainability Champion for City heads

Solar Uptake Worries UMEME Shareholders

Looking forward

this informaion shall be shared with locacl opinion leaders and innovators to maximise impact