Let there be Light: Frontiers of techno-Solar Capitalism

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I grew up in an area surrounded by miombo woodland, located approximately 200 kilometres southeast of Lake Tanganyika. In the early 1990s, when I was five, my father was employed as a correctional officer at Nsenda agricultural prison. The Urambo district, where the nearest town of Urambo is located, is approximately 12 miles away from the prison and serves as the administrative centre. Even the district centre had limited access to electricity, with only four hours of electricity in the evenings provided by a diesel generator. The first time I experienced living with electricity light was at the age of fifteen when I joined a boarding school to continue my secondary education. Before this, I had only experienced electricity during visits to relatives who lived in towns with access to it. During my early years, I had limited access to electricity and the devices that come with it. My father would occasionally buy batteries for our Panasonic radio-cassette player, and we had several battery-powered torches, a bicycle with a dynamo, and

paraffin lamps. I spent many nights studying under a paraffin lamp during my early education years. This experience instilled in me both a fascination and fear of electricity, even though I did not anticipate pursuing a career in this field. However, this fascination and fear proved helpful in my master's degree research project, which focused on solar electrification in rural Zanzibar, as well as during my PhD project on electronic waste in Tanzania.

It is important to remember that light plays a crucial role in the fight against poverty.

The introduction of solar power technologies has dramatically improved the lives of rural children. In the past, they had to rely on paraffin lamps as their only reading light. With access to solar-powered light, they no longer have to endure the same conditions as my generation did. It is important to remember that light plays a crucial role in the fight against poverty. Throughout history, people have considered light a sacred and essential element for growth. However, the adverse effects and waste associated with the production and use of artificial light are often ignored. This essay delves into why society gauges progress based on access to artificial light and explores the fascination with light. Additionally, it examines the downside of renewable technologies, particularly solar-powered light.

Light is good!!

During my master's degree research project in 2016, I had the privilege to volunteer at Barefoot College Zanzibar on their solar mama initiative. The solar mama project's main objective is to increase light accessibility for underprivileged households. What made this project unique is its focus on empowering women by equipping them with useful skills and providing them with access to solar technology. While conducting field research, I had the chance to write an article for Barefoot College about one of the beneficiaries and how access to solar light

had transformed her life. I am returning to this piece to show the impacts of projects like solar mama on communities.

Mwanapili Iddi Makame, a widow and mother of six, lives in a small village of Kandwi in northern Unguja on the archipelago of Zanzibar. She took care of her children alone and employed herself with a small rice cake business. "It was a difficult time. My rice bread was often smelling of Kerosene, and few would buy them. This was a problem for many of us in the food selling business. Those days, I was struggling to get together enough money to sustain my family", says Mrs Makame. In 2011, when barefoot started the solar power project in her village, she was chosen to be the solar mama. With four other solar mamas from Zanzibar, she was trained for six months in solar engineering at Barefoot College in Tilonia, India. For the first time in her life, she was visiting another country and continent. She became a solar engineer, something that in the rather patriarchal society of Zanzibar is considered men's work.

Picture of Yangambi Pôle Scientifique (YPS) by CIFOR, courtesy of Flickr.

Solar mamas started their work at the end of 2011. They installed solar panels sponsored by the Indian government to disadvantaged households who pay a monthly fee, smaller than average monthly costs. "We are saving a lot in energy costs. I used to pay 15,000 Tanzanian shillings weekly for the Kerosene. Now, I pay 6000 Tanzanian shillings monthly for the fee for the solar," added Mrs Makame. In 2016, five years after the training, her life had changed a lot. Mrs Makame continued working as a solar mama, making repairs and maintenance for the households with the solar systems. She also had more customers for her rice bread, which did not smell like Kerosene anymore. She had joined a savings group to save 2500 Tanzanian shillings (approx. 1$) weekly from the bread business. She planned to construct a house, using her savings for cement and bricks. And she managed to send three of her children to secondary school, quite an achievement for single mothers in Zanzibar (Ntapanta, 2016).

Materiality of light

Most off-grid portable solar photovoltaics in Sub-Saharan Africa are used primarily to produce light (Karekezi & Kithyoma, 2002). Other uses like radio and charging mobile phones are secondary. There is a fundamental argument for providing light to rural communities. Light is regarded to be virtuous. Symbolically, light represents intellectuality, holiness, civilisation and, more critically, progress. Those with access to artificial light are regarded as "modern", and those in the dark are assumed to be "backward". The West referred to Africa as the *dark continent*, especially in the pre-colonial era when little was known about the continent. The label came from the western perspective of development and civilisation in which the continent was denoted as backward and characterised by savagery and primitive life (Jarosz, 1992).The strangeness of Africa and unfamiliarity with the lifestyles of its inhabitants led it to be related to the darkness because darkness can symbolise evil, mystery or fear.

The introduction of Christianity and the Christian ideology that light is good was

regarded as a moral obligation of a white man to enlighten the savages of the dark continent. Enlighten comes from "the metaphor that ignorance is a state of being "in the dark," "the dark side", "forces of darkness", and that knowledge is "illuminating, enlightenment". Light represents the absence of darkness (evil) and exhibits power over darkness, evil, backwardness, and, recently, poverty (Edensor, 2015, p. 425). The material fear of darkness has become more pronounced in the modern age because of the massive illumination around people's lives. It is perpetuated through the electric light at night, the daytime light, and religious teachings (both to religious and non-believers) (Edensor, 2013). Light has provided the feeling of security, cleanness, health, and intellectuality. The securitisation of light can be traced back to around the 19th century in Europe with the rise of towns, cities, and modern societies (Hughes & Smith, 1987)- Before the invention of artificial light, night was considered an unpalatable time for Europe. The night was a time for witches, burglars, devils, and murderers. Houses were made with solid doors and bolts to keep out these "monsters".

In patriarchal societies where the burden of everyday life is heavy on women, the night is a time for women to rest until dawn. In big cities, night walkers, like prostitutes, the homeless and beggars, can avoid public harassment and prosecutions by hiding in the dark corners of cities (Edensor, 2013; Edensor & Falconer, 2015). In Europe, when the light was only in the centres of towns and cities, outskirts and rural areas with no lights were a symbol of "pagan obscurantism, monstrosity, and diabolism" and a cause of "moral, intellectual, and physical depravity, production of social dislocation and inimical to social and economic dynamism", so were those living in the outskirts (Edensor, 2013).

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From this perspective, the drive to increase access to light is the idea that it is an

impetus for development. Societies with no access to artificial light are still regarded as backward. Billions of dollars are invested into electrifying rural populations—the underlying meaning of these projects is the same old school of thought of civilisation mission derived from colonialism. First, access to electricity has become an indicator of development. Those with no or less access are regarded as living in poverty. Solar power offers a new paradigm of energy production without the costs of erecting large infrastructures. However, possibilities provided by portable solar power devices are wrapped in green energy politics, overshadowing their impacts. Second, solar technologies are opening up for conglomerates to accumulate even more wealth from poor communities by providing an expensive short-term solution that traps households in a never-ending cycle of buying new systems every few years. The cycle is not sustainable; instead, it is dispossession by greening or green-washing.

Green washing: The Dark Side of solar technologies

In the past decades, we have witnessed an enormous increase in investment and use of off-grid solar energy in Africa. The increase in investment by businesses, donor countries, and international and local non-governmental organisations points out a turn into new poverty eradication and developmental idealism. There are positive affects accompanying access to energy through off-grid solar power, like the story of Mrs Makame that I wrote in 2016 for the Barefoot College.

Without dismissing the role and importance of off-grid solar technologies and their adoption in rural areas, there is a gap in knowledge of the effects in communities concerning access to these technologies. For example, there is no comprehensive information how companies handle their products' afterlives or how, where, and who does that. This is because "Green" has become an uncontested concept in discussions around clean energy. However, ontologically, green energies are not as green as presented, and neither are off-grid solar technologies. The labels "green, renewable or sustainable" overshadow affects

embedded in off-grid solar in rural communities. Because of these umbrella concepts, very little attention is given to harmful changes embedded with off-grid solar energy and what happens to the afterlives of the devices (Edensor, 2013). There is a growing literature on the accompanied effects and problematic social configurations that arise with these technologies (Cross, 2019, 2020; Cross & Murray, 2018; Cross & Neumark, 2021).

Energy production is one of the main contributors to greenhouse gas emissions. To reduce emissions and their adverse impacts, solutions have been directed into technologies away from fossil fuel dependency to "green" energy sources. The adoption of eco-friendly, green, renewable and sustainable energy sources has increased tremendously. While renewable energy sources such as wind require intensive capital investment because of the infrastructure required, off-grid solar photovoltaics present a solution regarding infrastructure needed, affordability and investment. Off-grid solar systems are diversified from small to large systems. For example, the "solar mama" project in Zanzibar was installing a "solar home light system", a simple system for lighting, charging mobile phones or/and radio or TV. These systems are affordable to many households through various payment methods. Compared to other renewables, which need capital and infrastructural investment, solar systems, are diverse, and users can choose according to their economic muscles and needs.

The burden of reducing global emissions has been placed on sub-Saharans' shoulders.

Tanzania and other Sub-Saharan countries are vital for reducing greenhouse gases and the road to sustainable energy production, even though they contribute less to greenhouse emissions than large industrial nations. Dependency on biomass for energy by countries like Tanzania is mentioned to contribute to CO_2 emissions. However, the burden of reducing global emissions has been placed on sub-Saharans' shoulders. Programs like Clean Development Mechanism under the UNFCC and Reduced Emissions from Deforestation and Forest Degradation

(REDD+) have been widely implemented in Tanzania. However, some of these projects have demonstrated alerting levels of land grabbing, grievances of communities regarding access to land and resources like wood and disagreement on community access to carbon credit funds (Purdon, 2013, 2015; Purdon & Lokina, 2014).

Solar energy is a pre-emptive approach to divert energy production from biomass and sources like coal that developed countries used to industrialise. Renewables are the solutions for greenhouse gas emissions. Apart from emissions, solar technologies improve health and well-being, reducing the use of toxic kerosene lamps, smokes, children can do schoolwork at night, and aiding small businesses to flourish.

At the same time, solar technologies have opened and connected rural Tanzania direct to the market. The Tanzanian rural population has been on the margins of global capitalism. Solar technologies and mobile telephones are leapfrogging communities immediately to the techno-capitalism. Even the most interior communities in the Serengeti national park are connected directly to London and New York stock markets through energy and telecommunication companies. As a new frontier for capital accumulation, communities have become indispensable avenues for salvage accumulation (Cross & Neumark, 2021; Tsing, 2015). Let there be light and see communities flourish has turned to let there be light so that solar conglomerates can accumulate from the poor untapped by the market.

Around the landfill, several informal e-waste recyclers sort and dismantle scrap materials collected from all over Zanzibar Island.

During my recent fieldwork in Tanzania. I visited the Tunguu landfill, the only formal landfill in Zanzibar. Around the landfill, several informal e-waste recyclers sort and dismantle scrap materials collected from all over Zanzibar Island. In these workshops, rudimentary tools like hammers and methods like burning off the insulations from electric cables or pouring lead acid from batteries on soil are used. These activities release toxic chemicals into the environment. Vegetable

gardens and farms around the area and water wells are threatened by exposure to toxic compounds. At the same time, workers in these areas do not have protective gear, so they, too, are highly exposed.

Solar waste is generally found in these workshops, commonly from batteries and portable solar lights. Most solar companies in Tanzania do not have programs for handling the afterlives of their products. While the lifespan of many solar technologies is between three to five years. It means that more solar waste piles in people's homes or is collected by scavengers to end up in informal recycling centres.

Currently, in Tanzania, most solar waste is scattered throughout rural areas or handled by the informal sector, with little infrastructure to collect or handle it properly. For that matter, as the number of solar power devices increases with no mechanisms to properly recycle, rural areas are slowly turning into wastelands, creating what Jamie Cox and Declan Murray call "the gap". The celebration by citing the number of devices sold, how many rural households have access to light, we must not forget that the consumption of solar devices leads to waste in a relatively short period (Cross & Murray, 2018).

In the end, I am thinking, what is the condition of the solar devices installed by the solar mama project I studied in 2016? Most of the devices installed before 2016 when I visited might have found their way to Barefoot warehouses or lying somewhere in the beneficiary's houses. While the story for the solar mama that I started with is still accessible on the internet, giving this beautiful picture of solar technology, there is nothing of what those solar systems have become after five years.

The politics surrounding green technologies tend to overlook what happens to the devices once their lifespan comes to an end. Despite the excitement around increased investment and access to solar power and light, particularly in rural sub-Saharan Africa, the discussion of what happens to the afterlives is often missing. Unfortunately, the manufacturing process of these devices already sets

them up for a future waste.

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