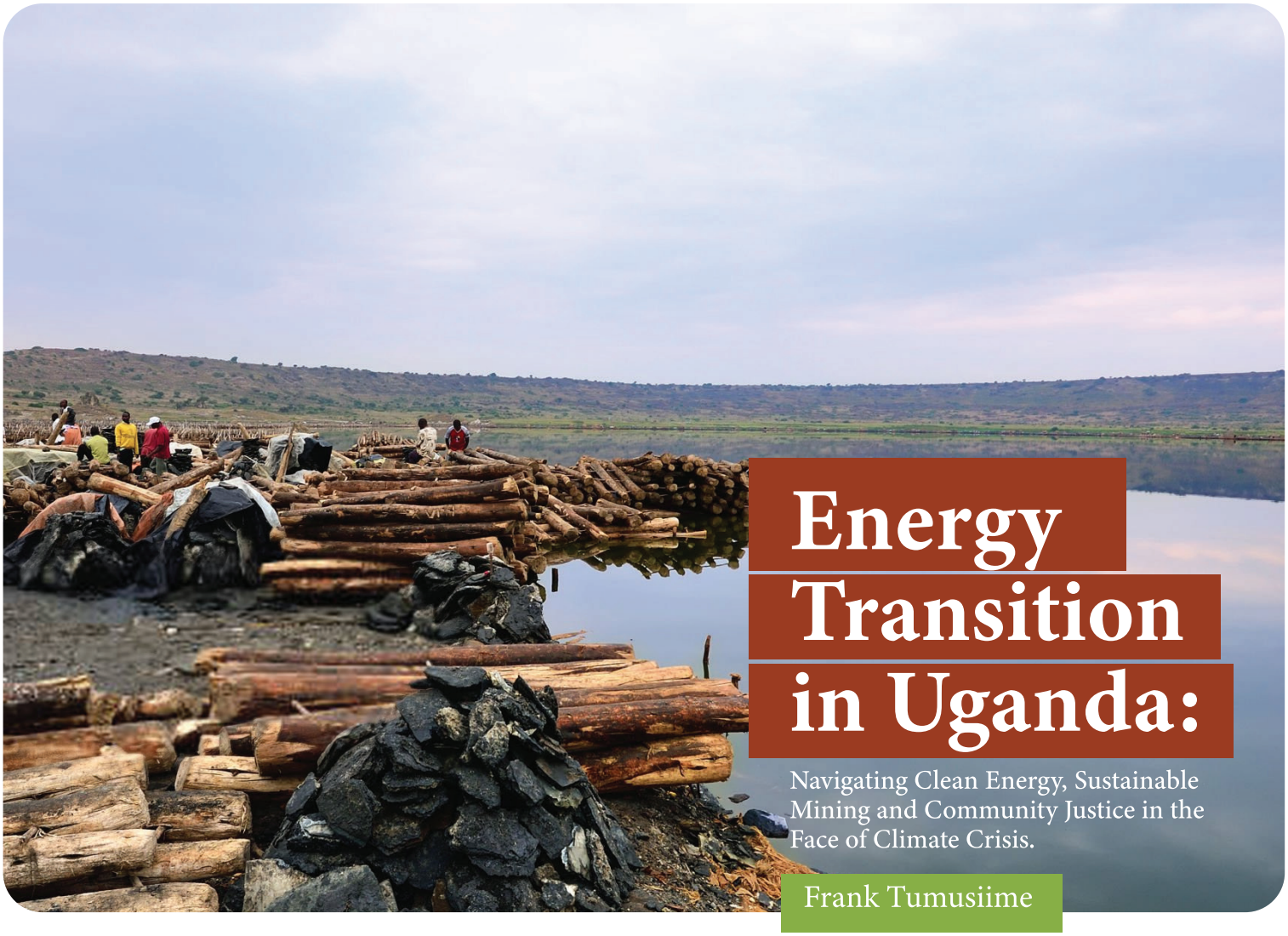

# Energy Transition in Uganda:

## Navigating Clean Energy, Sustainable Mining and Community Justice in the Face of Climate Crisis.

Frank Tumusiime


## Abstract

This paper examines the opportunities that are associated with energy transition in Uganda, focusing on the intersection of clean energy, sustainable mining, community justice and funding of the transition. The study explores international best practice in view and is also mindful of the newly launched Energy Transition Plan (ETP).

Uganda's energy consumption mix, heavily reliant on biomass, is analyzed, highlighting the need for a shift towards solar and wind energy to achieve universal energy access and lower greenhouse gas emissions. The paper delves into the government's policy initiatives, recognizing the importance of addressing climate change vulnerabilities, fostering sustainable mineral extraction, and promoting inclusive development.

To ensure sustainable growth of mining communities, safe guard the environment and prevent climate change, the paper vouches for sustainable extraction of rare earths and transition minerals such as cobalt, copper and graphite that play a critical part in supporting the energy transition.


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This study does not merely capture Uganda's energy transition; it captures a multifaceted narrative that links clean energy with economic growth, environmental stewardship and social justice imperatives.

# The following recommendations are advanced;

- Government should control her raising debt vulnerabilities and fix the governance, public finance management issues and structural weaknesses and at the same time pursue debt relief to get the fiscal space for the necessary investments for a clean energy transition and to attract international private investment by lowering country risk ratings
- There is need for a change mindset (think big and think bolder) of all players including: academic/educational institutions artisanal miners, civil society, government planners and industry players. This must be coupled with capacity building and specialized training in energy policy design, regulatory practices, and project management and financial structuring of renewable energy projects.
- Emphasis of sustainable extraction of transition minerals, by upholding rights of communities, accountability and transparency in mineral revenues, deployment of adequate environmental and social safeguards companies and modern mining technologies.
- Arrest corruption related fiscal leakages, to ensure tax proceeds, transition energy related loans and that grants are used for real development impacts
- Mainstream gender and empower the youth to participate in both the transition workforce and energy sector
- Government must offer the guarantees, exhibit political will and deploy predictable policies
- Government should create an enabling environment to attract massive investments, by leveraging the private sector, build a strong pipeline of bankable green projects, fast track decision making projects to get quick outcomes
- Leveraging technology to mobilize project development money to devise finance and know how in the transition.
- Fossil fuel use will continue in the short-medium term, and remain an important part of the energy mix even after the world has transitioned toward a low-carbon and green economy. Regardless, Uganda must implement measures to decarbonize the extractives while at the same time deploying structural reforms to transition.
- Government should start implementing the ETP and integrate the plans into national polices and across all her sectors and departments.

# Introduction

Sustainable Development Goal (SDG) number 7 affirms the need for affordable and clean energy for all through improved energy productivity, and ensuring energy for all by investing in solar, wind and thermal power, as vital for growth and protecting planet earth. The Uganda National Development Plan III and Vision 2040 acknowledge that Climate change mitigation is critical to increased household incomes and improvement of quality of life of the population. Amidst energy scarcity and escalating climate change, Uganda launched her Energy Transition Plan (ETP) in December 2023, with an ambition to reach net zero emissions in its energy sector by 2065. The imperative actor that motivated the Energy Transition Plan is to build the energy system foundations that will be necessary to power Uganda's energy future in a just, safe, secure, affordable and sustainable manner.

Though not designed to be an implementation strategy, the tenets in the ETP once implemented will help in the reduction of emissions as well as to tap into new opportunities for carbon-related financial flows. The mineral sector is key to fueling energy transition by supplying critical mineral elements, and for sustainable mineral exploitation, the use of modern technology and deployment of social and environmentally friendly methods are vital to upholding the rights of mineral rich communities and current and future generation. At the same time, the revenues from the minerals must be utilized to foster economic growth and alleviation of poverty.

Transition to clean energy is timely especially in Uganda  country punctuated by predominant use of biomass-driven energy mix, in the form of firewood and charcoal, dominates the energy consumption mix, contributing to massive deforestation and climate vulnerabilities. The need to raise funds to ensure every Ugandan has access electricity pits Uganda to explore her fossil fuel resources so as to fund her budget. However, over 70% of greenhouse gas emissions are as a result of fossil fuel related value chain. It is therefore a big question whether Uganda can carbonize and decarbonize at the same time.

# 1.1 What is Energy transition?

Energy transition refers to the global energy sector's shift from fossil-based systems of energy production and consumption — including oil, natural gas and coal to renewable energy sources like wind and solar, as well as lithium-ion batteries. The energy transition aims to reduce energy-related greenhouse gas emissions through various forms of decarbonization.

Even so, demand for fossil fuels is set to remain much too high to keep within reach of the Paris Agreement goal of limiting the rise in average global temperatures to 1.5 °C. The World Energy Outlook 20203 (WEO-2023) finds that despite the impressive clean energy growth we're now seeing, emissions are still set to push up global average temperatures by around 2.4 °C this century, based on today's policy settings.

The World Bank asserts that solar mini grids can provide high quality uninterrupted renewable electricity to underserved villages and communities across Sub-Saharan Africa and be the least-cost solution to close the energy access gap on the continent by 2030. Climate action efforts can also tap solar mini grids that offer a lower greenhouse gas emission alternative compared to diesel-fueled systems and kerosene-based appliances. Mini grids are on track to provide power at lower cost than many utilities. The cost of electricity produced by solar mini grids could be as low as $0.20/kWh by 2030, making it the least-cost solution for more than 60 percent of the population[1].

The escalating climate crisis creates an urgent need for Net zero development pathways to decarbonization. The current intergovernmental commitments to reducing green gas emissions to pre-industrial times of 1.50C can only be achieved by intensifying efforts in extracting critical minerals (e.g. lithium, cobalt and copper). The clean energy transition will require significant amounts of critical minerals which are not only vital to the manufacturing of clean energy technologies (e.g. solar panels, wind turbines, electric vehicles, battery storage, hydrogen electrolyzers and fuel cells), but they are also essential in several applications for the defense sector, ICT, pharmaceutical industries etc. and they are crucial to achieve economy-wide decarbonization objectives.[2]

According to the International Energy Agency, the continuous investment in clean energy technologies for supply sufficient to support the national climate pledges announced by governments will create a propelling huge demand for minerals such as lithium, cobalt, nickel and copper and this demand is projected to increase by 300% by 2040 and to achieve global net zero carbon emissions, mining of critical minerals will need to grow by six times by 2050.[3]

At a continental level, Africa is home to one third of the world's mineral resources, for example in 2019, about 63 percent of the world's cobalt production came from the Democratic Republic of the Congo[4].

The current global demand for Africa's minerals is increasing and might skyrocket due to global competition and sanctions created by the Russia's invasion of Ukraine. An example is a recent move by China to restrict export of minerals used in production of chips for semiconductors.[5]

This will destabilize global equilibrium of raw materials supply chains and Africa will naturally become a new frontline for sustainable access and supply of the world's most sought-after critical minerals. Already, the US government approved $150 million of funding for a graphite mining project in Mozambique, and has also held talks with Zambia and the Democratic Republic of Congo with the goal of setting up local battery manufacturing operations[6]

The growth of demand for minerals not only plays a vital role in enabling clean energy transitions, but also holds great promise to lift some of Africa's people out of poverty and contribute to public revenue growth and improve economic livelihoods of the citizens of Uganda.

[1] The World Bank's Mini Grids for Half a Billion People: Market Outlook and Handbook for Decision Makers
[2] Webinar: Critical Minerals and Africa: Avoiding a Zero-sum Game. OECD



[3] Critical minerals market sees unprecedented growth as clean energy demand drives strong increase in investment News. 11 July 2023. International Energy Agency - IEA
[4] https://www.aljazeera.com/news/2018/2/20/mapping-africas-natural-resources
[5] China to curb exports of minerals used in chip production. Accessed at https://www.cips.org/supply-management/news/2023/july
[6] US steps up efforts to access Africa's critical minerals, Bloomberg news. Accessed at https://www.mining.com/web/us-steps-up-efforts-to-access-africas-critical-minerals

However, if poorly managed, extraction, trade and supply of critical minerals may lead to a myriad of negative consequences, inter alia: conflict, emission of greenhouse gases, biodiversity loss and social disruption due to land use change, water depletion of water sources and pollution, waste related contamination, and air pollution.

Other negative impact factors include: corruption and misuse of generated mineral resources, occupational, health and safety fatalities, gender marginalization and domestic violence on women and girls. Other human rights violations include deprivation of right to own property, denial of access to information and limitations in participation and decision making.

A just energy transition would therefore require not just investment and satisfying supply chains, but also taking care of possible social economic and environmental impacts associated.

# 1.2 Just Energy Transition

In view of differentiated challenges and different levels of growth between the developed and least developed nations, the Just Energy transition is a mechanism under which developed nations are supposed to support emerging economies in moving to clean energy while being cost effective, affordable and transparent with the affected local communities. It is about defunding fossil fuels in a way that reduces inequality, shifting the costs of climate action onto wealthy polluters while prioritizing economic, social and gender justice.

***This can be done by:***

- Stopping the use of fossil fuels and utilizing renewable energy sources, while ensuring that efforts to scale up renewable energy production do not replicate the harms of the minerals, oil, and gas sectors—like taking land from people without consent and unjust compensation

- Championing climate solutions from communities, environmental and human rights defenders, and women's rights groups that have intimate knowledge of the environment and have experienced the devastating impacts of climate change

- Working with indigenous community leaders to seek their consent when rolling out renewable projects on their land.

- Lifting up the voices of the poor, indigenous communities, women and youth to be included in energy transition and planning and implementation.

- Taxing fairly high emitting corporations and individuals to help pay for the transition to renewable energy

- Making clean energy solutions affordable

- Achieving universal energy access by investing in the distribution of energy solutions and improved energy utilities

# 2.0 Energy Transition, the International Perspective and Africa Continent

Africa, despite contributing minimally to global carbon emissions, confronts the severe impacts of climate change. The discussion underscores the urgency to electrify the continent's rapidly growing yet least electrified population.

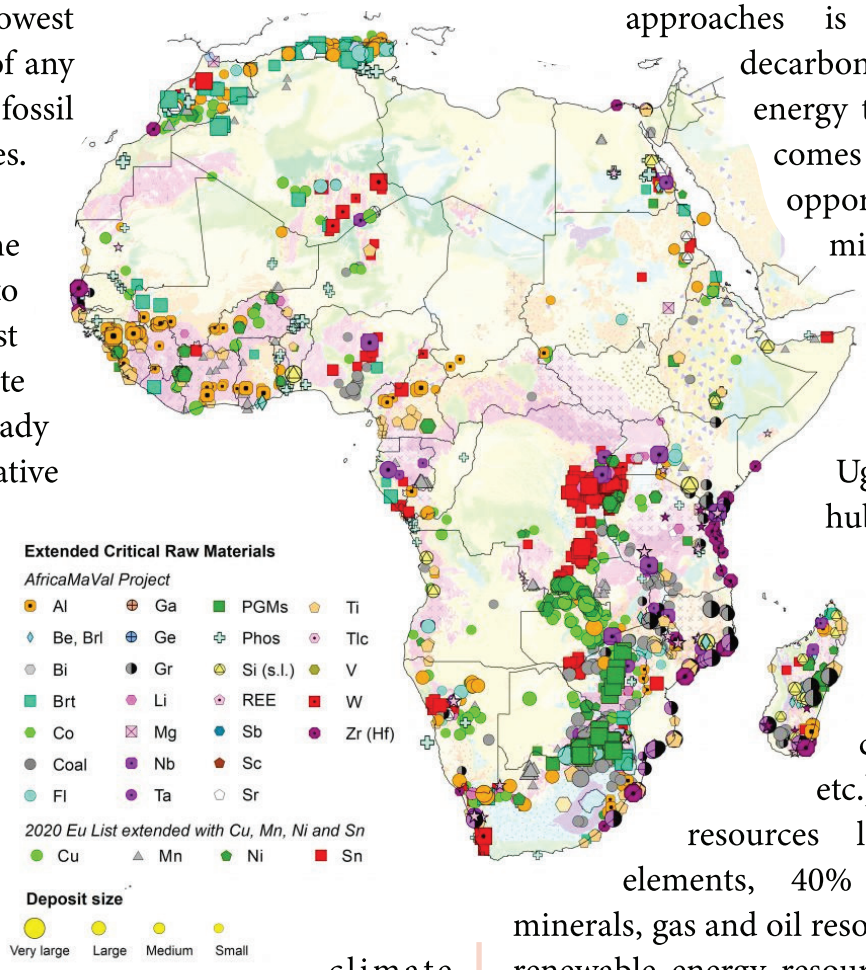
Notably, the section addresses the delicate balance Africa faces in transitioning directly to clean energy without fully exploiting its fossil fuel industry, considering historical legacies and economic development challenges. The global policy context emphasizes the surge in clean energy technology adoption and the need for enhanced national ambitions.

Extractive rich developing economies are urged to navigate a transition that safeguards citizens' rights and supports sustainable development. The section concludes by advocating for Africa to leverage its mineral rich economies for transformative growth, emphasizing the critical role of sustainable mining practices in global clean energy transitions.

## 2.1 Africa Continent

Africa holds substantial reserves of bauxite, chromium, cobalt, copper, gold, iron, lithium, manganese, platinum, and uranium to name but a few. While at the same time it accounts for less than 3% of the world's energy-related carbon dioxide (CO2) emissions and has the lowest emissions per capita of any region including the fossil fuel-producer countries.

Not withstanding, the continent is exposed to some of the worst impacts of climate change and already experiencing the negative effects of this phenomena such as water stress, reduced food production, increased frequency of extreme weather events and lower economic growth (Africa energy Outlook 2022). At the epicenter of the climate crisis is a devastating failed rainy seasons in the horn of Africa affecting over nineteen million people across the horn who face starvation. In Northern Kenya, livestock has been wiped out, in Somalia the crisis is called the great equalizer.




The continent is the least electrified but has the most rapidly growing population; in Sub-Saharan Africa, 568 million people still lack access to electricity. Globally, nearly 8 out of 10 people without electricity live in Africa. For universal access to energy, powering 380 million people in Africa by 2030 will require the construction of more than 160,000 mini grids at a cumulative cost of $91 billion.

At the current pace, only around 12,000 new mini grids serving 46 million people will be built by 2030 at a total investment cost of approximately $9 billion[7].

Investing in clean mining approaches is important for decarbonization and clean energy transition. It also comes with opportunities for mining countries such as DRC, Zimbabwe, South Africa, Tanzania Uganda that are hubs to critical minerals and rare earth elements (lithium, cobalt, nickel etc.). Vast untapped resources like rare earth elements, 40% of the world minerals, gas and oil resources, 60% of the renewable energy resources are based in Africa. Africa has the demographics of about 1,469,313,422 billion people translating to be-markets, growth etc. By 2050, the continent will be around 2.5 billion people with 1 billion under 18 years (youth). This creates an urgent need to invest in energy solutions for people to access affordable energy.

The global transition agenda is therefore an opportunity to capitalize on its mineral endowments to drive transformative sustainable growth, economic diversification as well as local and regional development through value added processing and manufacturing.


[7] Africa energy Outlook, 2022

African countries will need to determine how to optimize value from their resources to support meaningful productive transformation, integration into regional and global trade systems as well as the development of long-term prospects for industrialization, while also contributing to building diversified, resilient, and affordable supply of critical minerals for the global clean energy transition.

The big question is whether Africa can transition right away from fossil fuels-based economy to clean energy before utilizing her resources to develop her economies and infrastructure. And different opinions have been advanced viz. President William Ruto of Kenya has argued that climate change, energy access, poverty, development, and conflict are all tightly connected and are different dimensions of colonial legacies that have trapped the continent in a cycle of conflict, energy poverty, and climate shocks.[8]

The report further explains that Colonialism molded Africa's economies and societies to meet the labor and material needs of Western industrialization and development, and further emphasizes that "post-colonial efforts to correct these imbalances, increase independence, and nurture infant industries were curbed by energy crises, indebtedness, and structural adjustment policies."

It posits that for many African countries, with the bulk of energy infrastructure yet to be built, the task calls for leap frogging directly to the energy system of the future, similar to how African countries have bypassed outmoded wired telephone lines to build mobile systems.

Lord Adair Turner, Chair of the Energy Transitions Commissions argues that due to vast untapped resources and the need to grow to middle income status, Africa has to carbonize before it decarbonizes and ponders: "How to develop an energy system that does not exist in Sub Saharan Africa? Can Africa skip a generation and go straight to renewable energy by skipping developing its rich and untapped fossil fuel industry?"

What is certain is that Africa has a responsibility and potential in making an important contribution to tackling climate change by limiting emissions and driving climate restoration (for example protecting and restoring her substantial forests, grasslands, peatlands and mangroves play a critical role in slowing climate change).

Since the continent doesn't have an "old economy" that needs to be decarbonized, it can invest right away in the green economy— an economy that's net positive for the planet and the people. Importantly, to keep global warming below 1.50C, African countries should avoid growing to middle income status with a similar emission per capita as current middle-income countries.



[8] See the Forward in "Just Transition: A Climate, Energy, and Development Vision for Africa". June 2023

Africa's mineral-rich economies have potential to benefit from the increase in demand for critical minerals such as cobalt, lithium, graphite and manganese, but realizing this ambition would require targeted policies that focus on developing domestic processing capacity and supporting socially and environmentally responsible mining. The mining industry in general remains largely structured around a "pit-to-port" model that channels mineral ores elsewhere for processing.

***The continent faces a shortage of electricity supply yet processing of minerals requires enormous amounts of electricity.*** In addition, inadequate economies of scale make it difficult to position the entire mineral supply chain in a single country. To solve this supply chain challenge, some countries have already come up with the idea of special economic zones and industrial parks such as the one signed between Democratic Republic of the Congo and Zambia.

Such efforts foster regional collaboration and support economic diversification. It in this context that the African Green Minerals Strategy (currently under development) can play a pivotal role in leveraging Africa's mineral resources to the benefit of her citizens.


# 2.2 The Global Policy Perspectives on Energy transition.

International policy insights are important in shaping best practice and acquisition of know-how and skills to tackling the energy transition agenda

## 2.2.1 Deployment of Clean Energy Technologies

Clean energy technologies such as solar, wind, nuclear, water, bio energy, hydrogen and fuel cells to produce energy have a potential to lower green gas emissions.

According to the updated International Energy Agency's Net Zero Roadmap (2023); clean energy technology adoption has surged over the last two years, with solar photovoltaics (PV) and electric vehicles (EVs) as notable examples. Through a combination of effective policies, expanding markets, and falling costs, clean energy technologies are shifting the outlook for emissions.

These are expected to contribute around 7.5 gigatons in emissions mitigated across the energy sector and the existing near-term climate goals set out by countries in Nationally Determined Contributions (NDCs) are almost within reach at a global level. However, most NDCs are not yet aligned with their countries' own net zero pledges, and would need to further enhance ambition towards 2035. Most governments must go even further to keep the 1.5°C target on the table.

## 2.2.2 Transition for Extractive Rich Developing Economies

In view of the fact that most African countries possess vast untapped oil, gas and mineral resources, attention should also be drawn to how fossil fuel-producer developing economies can manage to reduce their fossil fuel dependence in a way which safeguards the rights and interests of their citizens and supports the achievement of sustainable development objectives. The Equitable Framework and Finance for Extractive-based Countries in Transition (EFFECT) provides a toolbox for these countries[9].



[9] OECD Development Policy Tools Equitable Framework and Finance for Extractive-based Countries in Transition (EFFECT) OVERVIEW AND POLICY HIGHLIGHTS

# a)Decarbonizing Extractives and Managing uncertainties

The reality is that fossil fuel use will continue in the short and medium term, and remain an important part of the energy mix even after the world has transitioned toward a low carbon and green economy[10]. Consequently, fossil fuel-producer developing countries, should ensure that fossil fuel production is as low carbon as possible. This can be achieved through a mix of regulations, policy incentives and the deployment of best available technologies and practices to reduce flaring, venting, and methane emissions across the upstream oil and gas and mining sectors. Measures to decarbonize the extractives sector should therefore be implemented at the same time as structural reforms to transition. Some of the practical remedial steps include:

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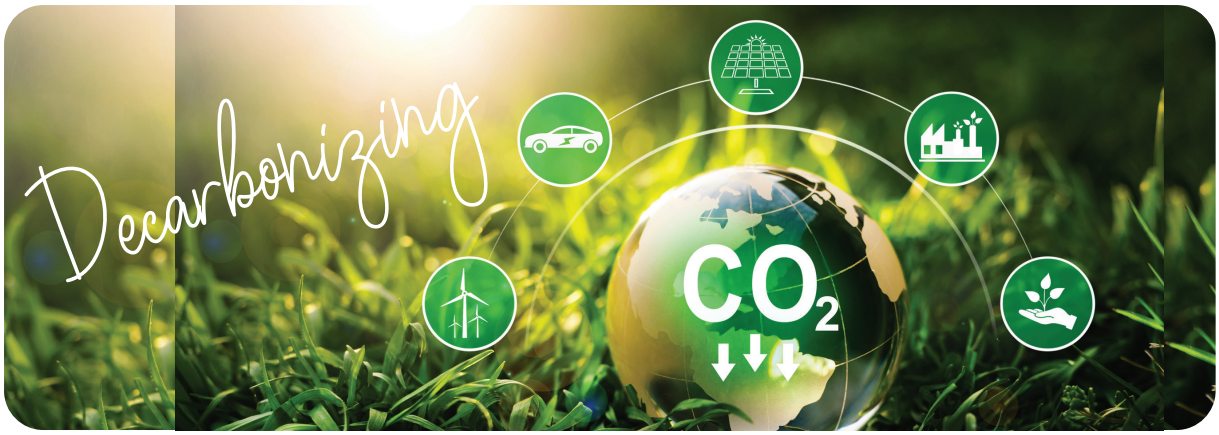
i) A careful assessment on continuous reliance on fossil fuels as against clean energy and the corresponding implications for fiscal stability and revenue spending as the speed of the global energy transition increases.

ii) Reduce emissions from fuel extraction, processing, transportation and refining to the fullest extent possible, by deploying the best available technologies and practices.

iii) Create an enabling environment that discourages methane emissions and gas flaring, and encourages upstream electrification, and carbon capture (utilization) and storage.

iv) Engage with importing countries to seek technical and financial support for curbing gas flaring and venting.

v) Create an enabling environment to facilitate low carbon technology transfer, through reducing trade tariffs and leveraging partnerships between national and international oil and gas companies to foster sustainable technology transfer.






[10] The International Energy Agency (IEA)'s Net Zero Roadmap finds that by 2050, fossil fuels would still represent a 20% share of the global energy supply.

# b)Sustainable fossil fuel exit strategies and just transition plans

Global climate commitments are changing the market outlook for high carbon commodities viz. the carbon footprint of fossil fuel extraction, processing, transportation and refining will de facto affect prospects for future market access and there is a likelihood of imposing carbon constraints in importer countries. Oil rich poor countries might face difficulty in securing capital, developing regulation, and building technical expertise to enable emissions reduction in the sector, compared with higher-income exporters. The measures suggested to enable financing, planning of the transition include:

i) Centralize and consolidate identification, assessment and management of transition risks, and improve cross-government capacity to adopt innovative techniques, including stress-testing and scenario modelling.

ii) Structure inclusive and effective just transition management processes. These include leveraging tripartite social dialogue mechanisms between government, employers and workers, as well as inclusive consultations to build a shared understanding of the costs and opportunities of the low carbon transition and ways to realize benefits for all.

iii) Assess who will be affected by fossil fuel phase down/out, accounting for labor market informality, impacts on jobs and households and how these will vary by region, to provide a nuanced picture of the distributional impacts of the low-carbon transition.

iv) Put in place measures, such as targeted cash transfers, fuel vouchers and other targeted support, to mitigate impacts on those who will be adversely affected, particularly fossil fuel workers and poorer households.

v) Given the skills overlap, active labor market measures can support the transfer of workers from fossil fuel industries to low carbon jobs. Such measures must be complemented by robust social protection coverage and effective public services to support workers through retraining and reskilling.

vi) Where feasible, transition proof the new fossil fuel infrastructure, enabling future repurposing for low carbon re-use to mitigate risks of stranded assets and high carbon lock in. Repurposing existing fossil fuel infrastructure can avoid enormous decommissioning costs, extend the life of infrastructure for low carbon re-use, help to decarbonize industrial production, create jobs, and accelerate the pace of the low carbon transition.

vii) To attract private capital, enhance project planning and preparation capacity to develop robust channels of investible low carbon projects to which investors can readily commit their time, efforts and resources.

# c)Systemic change and economy-wide decarbonization

This stresses the need for broader transition planning, including integration of NDCs, decarbonization and sustainable development planning. It is noted that the process of diversifying the economy will be a multidecade endeavour with no single industry or sector being capable of replacing revenue from fossil fuels. To achieve this, the following will be needed:

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i) Pursue long term integrated development planning, incorporating interconnected energy, climate, environmental, macroeconomic, fiscal, labor, skills, industrial, infrastructure and transport policies. This can be achieved through strengthening fossil fuel producers' capacities to mainstream low carbon development strategies into national development planning. To avoid contradictory outcomes, it is essential to coordinate and harmonize actions being taken horizontally within government and vertically across levels of governance (national, regional, local with meaningful stakeholder engagement), all pulling in the same direction, as opposed to an array of isolated policy measures.

ii) Define credible transition plans, including milestones and targets and reporting mechanisms to mobilize transition finance.

iii) Forge new "win-win" partnerships. In the short to medium term, this can involve meeting energy demand in return for investments in abatement technology transfer, resource efficient infrastructure, scaling up renewables' generation, expanding access to energy services, while increasing the revenue predictability for producer economies. This will require a clear commitment from advanced economies to invest in long-term transition pathways that enable developing countries to manage the phase down/out of fossil fuel dependence.

iv) Capitalize on the increasing global demand for the resources of the future, including critical minerals through sustainable mining development, underpinned by circular economy principles, and alternative low carbon fuels, to diversify revenue away from oil, gas and coal.

v) Place greater emphasis on valuing natural assets and biodiversity, introducing natural capital into national accounting systems, creating incentives to preserve existing ecosystems and establishing mechanisms which enable developing economies to get paid for the provision of global ecosystem services, such as the function forests in capturing and storing carbon emissions.

vi) Optimize the blend of power generation technologies, storage, demand side measures and investments in transmission and distribution infrastructure.

vii) Given the scale of buildings and urban infrastructure yet to be built, progressively improve buildings' efficiency standards and incentivize onsite renewables solutions. Encourage systems planning which takes a holistic approach to mobility. This should reduce overall demand for vehicles, bringing services closer to demand and prioritizing effective and accessible public transport.


# 3.0Mixed fortunes and realities of energy transition

In this section, the benefits, challenges, and realities of transitioning to clean energy are explored. The potential employment opportunities in the solar sector, more than double that of fossil fuels, highlight a positive aspect of the transition. However, the section also confronts the complexities of whether energy transition alone can effectively address the climate crisis and uplift the livelihoods of mineral-rich communities.

It acknowledges the dual nature of critical minerals, presenting both opportunities for resource-led industrialization and potential environmental and social disruptions. The discourse emphasizes the importance of addressing these challenges to ensure that the supply of critical minerals supports, rather than hinders, the broader energy transition.

The funding gap for clean energy transition in developing countries, particularly in Africa, is underscored, necessitating private sector involvement and innovative financing approaches. The importance of grid connections for effective energy transition is highlighted, emphasizing the need for sustainable mini-grids and the role of interconnected economic activities in promoting a green economy. The section concludes by addressing the high risks and costs associated with investments in less developed countries, calling for changes in the development finance model to accelerate the energy transition effectively.

## • Upholding Environmental and Social Standards is key a pillar to community Justice

Whereas wealth generated from critical minerals has the potential to promote resource led industrialization, there is also the likelihood that a substantial increase in demand for these minerals will accelerate climate change and unleash a wave of new social and environmental challenges especially in the resource rich but poor countries.

Many of the minerals crucial to the energy transition are concentrated in countries that have struggled historically with fragility, weak governance and rent-seeking behavior in the mining industry.

A recent report by S&P Global on the nexus of critical minerals and biodiversity shows that a significant portion of mining for critical minerals is taking place within key biodiversity areas. A failure to properly address these emerging environmental and social disruptions could foster a justified attitude of hostility towards the mining of these minerals, thereby undermining the broader energy transition.[11]

How policymakers, environmental monitors respond to these social and environmental challenges will ultimately determine whether the supply of critical minerals serves as a catalyst or a brake in the energy transition.

## • Close the funding gap and identify new sources of funding

Most developing countries especially in Africa are struggling with inadequate education, failing health, poor transport systems and networks, food insecurity and political instability and rising debt burden to the extent that prioritizing energy/green transition may look/sound luxurious. Nevertheless, some countries have done reforms to attract private sector investment (for an inclusive green economy) that is equitable, inclusive while at the same time being non-polluting.

Developing countries need renewable energy investments of about $1.7 trillion annually but only attracted foreign direct investment in clean energy worth $544 billion in 2022. They face an investment gap of $2 trillion annually for the transition. This means that currently, there aren't sufficient funds to realize clean energy transition: for example, Africa shares on green bond market is almost zero, and out of all globally issued bonds in 2021, only 5.8% were green bonds, and Africa accounted for only 0.077% of issuances[12]. Not to mention that the 100 billion United States Dollars per year, effective 2020-2025 for climate action in developing countries has not yet materialized. Closing this funding gap requires concerted efforts to involve the private sector and tap monies hanging in philanthropies, grants and private capital.

***Furthermore,*** it is important to master how to intermediate the money to skilled implementors on the ground. For example, Beyond the Grid Fund for Africa programme is a Sweden's innovative flagship programme by the Swedish International Development Agency (SIDA) a financing approach to help increase energy access to 4.8 million people in rural areas of Uganda, Democratic republic of Congo, Burkina Faso, Liberia and Zambia. The programme has committed EUR 25 million in results-based financing to 13 companies which have been contracted to establish 953,000 new energy service subscriptions, the companies are in turn supposed to mobilize 80-100 million Euros in additional funding over the lifetime of the agreements, scheduled to end in 2027.[13]



[11] Africa is a Key Source of Critical Minerals for the Global Energy Transition — But There are Hidden Dangers. SIIA. October 2023

[12] Nordic Development Fund approves a grant to boost green bonds in Africa accessed on 3rd October 2023, at https://www.ndf.int/newsroom/ndf-approves-a-grant-to-boost-green-bonds-in-africa.html

[13] BGFA in 2022: Signed projects to provide energy access to almost five million people in Sub-Saharan Africa. Accessed at

## •Grid the energy to the consumers

Grid connection through major or mini grids is the pathway of accessing electricity. In the publication "the Mini Grids for Half a Billion People: Market Outlook and Handbook for Decision Makers", identifies the following market drivers that would help the mini grid sector achieve its full market and development potential:

Reduce the cost of electricity from solar hybrid mini grids to $0.20/kWh by 2030 would enable half a billion people access to energy for just $10 per month; Increasing the pace of deployment to 2,000 mini grids per country per year, by building portfolios of modern mini grids instead of one-off projects. Grids are essential to decarbonize electricity supply and effectively integrate renewables, otherwise, electricity grids could be the weak link in clean energy transitions.

They form the backbone of electricity systems for delivering power to homes, factories, offices and hospitals. However, there are worrying signs that grids are not keeping pace with the rapid growth of key clean energy technologies such as solar, wind, electric cars and heat pumps[14].

## •Adopt green economy approach:

Most developing countries especially in Africa are struggling with inadequate education, failing health, poor transport systems and networks, food inInterconnected economic activities that promote global scale sustainable development, poverty eradication, environmental protection, and eco-efficiency and low-carbon development.

To meet the growing energy demand and food security in a sustainable manner; industrialization, transportation systems in a sustainable manner. Green options include:security and political instability and rising debt burden to the extent that prioritizing energy/green transition may

- *Making use of sustainable mobility - like electric scooters and electric cars, instead of fossil-fuel powered alternatives.*
- *Electrify cooking, by replacing gas stoves with electric ranges:*
- *Avoiding taking cars and scooters whenever possible and using public transport in their stead:*
- *Recycling lithium batteries, whose production requires environment-damaging extraction of cobalt and lithium.*
- *Investing in and using low-carbon, renewable energy sources to power factories and machinery etc.*

*Electric Scooter*



[14] Grids risk becoming the weak link of clean energy transitions; Electricity Grids and Secure Energy Transitions. International energy Agency (IEA) 2023

## •Cushion risk and cost of investment

Attracting much higher levels of financing for energy transition in the developing world hinges on addressing a few key factors such as the cost of capital, currency risks and political risks. The cost of investing in less developed countries is so high and normally hindered by currency exchange risk, which can drive up the cost of capital. For example, lack of a grid connection may hinder establishing a plant in rural areas. The high cost of capital inputs coupled with the absence of fair pricing polices also discourages investment and investors and entrepreneurs pay 35% more to import materials into poor countries. There is need to aggregate procurements and set standards.

Development financers (government development finance institutions (DFIs), multilateral development banks (MDBs) and government aid agencies) can help address the cost of investment.

They are the most powerful tool available for leveraging the billions and trillions of dollars necessary.

However, they can make it affordable once they change their financing model, from price deals to impact and not returns for profit just as the private sector. In this context, the World Economic Forum has suggested the following:

### i)Lend money in local currency

Most renewable energy projects in developing countries are 20 year-plus projects, financed in dollars or euros, but earning in local currency. As is more often than not the case, over time the local currency is likely to depreciate against the dollar or euro.

When that happens, the price of electricity has to be adjusted upwards to service the loans which in turn makes electricity more expensive for the populace. It's a recipe for sustainable poverty, not sustainable development.[15]

### ii)Adjust return expectations to leverage loss

Whereas most DFIs and MDBs need to earn a positive return on their investments, the argument is that it's the same donor countries and tax payers that contribute funds to DFIs and MDBs, and it's easy to channel the money directly to needy countries in the form of grants.

The suggestion is to use blended financing and provide concessional financing and not view the financial model as a loss, but rather as leverage of public money for private investment[16]

## •Policies and investments decisions are not aligned

At the backdrop of energy transition is the reality that Global Investments across all energy transition technologies reached a record high of USD 1.3 trillion in 2022, yet fossil fuel capital investments were almost twice those of renewable energy investments.[17]



[15] https://www.weforum.org/agenda/2023/09/development-finance-to-combat-climate-change-energy-transition/
[16] ibid
[17] World Energy Transitions Outlook 2023. VOLUME 1

# 4.0 Energy Transition in Uganda

The focus in this section shifts to Uganda's energy transition efforts, highlighting its abundant critical minerals crucial for the transition. The country has initiated exploration projects, secured licenses and confirmed commercially viable quantities of rare earth elements and graphite. The policy on energy transition, implemented in December 2023, demonstrates Uganda's commitment amid climate change challenges. The country's current energy consumption mix heavily relies on biomass, contributing to deforestation and thus greenhouse gas emissions.

With a goal of universal energy access, Uganda plans to transition to solar and wind energy, build mini-grids, and promote renewable solutions, aligning with its NDP III and Vision 2040.

The section addresses climate change adaptation, emphasizing a multisectoral approach and emission reduction targets. Financing strategies involve local finance solutions for climate-responsive technologies, carbon projects, and a financial mechanism for the mining sector.

The challenges faced by Uganda, including underfunding, lack of equipment, and rising public debt, underscore the need for external support. The funding sources identified include partnerships with the European Union and Germany, public-private partnerships for solar mini-grids, and the commissioning of mini-grids with international backing.

The section concludes by emphasizing the importance of leveraging development partner funding and government investment to bridge the funding gap for successful energy transition in Uganda.
Uganda is among African countries with vast critical minerals and some of them include iron ore in the Western region, copper and cobalt at Kilembe, nickel and natural graphite in Northern Uganda, tin, tungsten and tantalum in Western Uganda and Rare Earth Elements in the Eastern part of the country. Others are nickel, rutile, tantalum and zircon, cobalt, lithium, copper, antimony, niobium and vanadium.

The aforementioned are key materials needed for: electric motors, permanent magnets, catalytic convertors, phosphors in optical displays, mirror and glass polishing, diesel and petrol fuel refining, mobile phones, televisions, computers, car batteries and other green technologies. In terms of actual exploration, Rwenzori Rare Metals Ltd has secured a license to conduct exploration of 298 $km^2$ across the three districts in Bugiri, Mayuge and Bugwere districts and has confirmed the presence of large commercially viable quantities of rare earths elements. Substantial deposits of graphite have also been confirmed under the licensee held by UK based mineral exploration and development company Blencowe Resources in Orom district.

In December 2023, Uganda triggered the transition button by putting in place an Energy Transition Plan (ETP). Faced with vagaries of climate change but rich in renewal energy sources and an abundance of critical minerals pivotal to supporting the energy transition, Uganda continues to grapple with questions of raising funds and expertise to support energy transition and adaption and mitigation of climate change. Concurrent with this challenge is generating enough electricity to fuel the economy and support her bourgeoning mining sector. In addition, the country must ensure that mining of critical minerals is done sustainably with regard respects for human rights, transparency and sustainable development of local communities.

Uganda's energy consumption mix comprises fossil fuels (diesel and petrol), bio mass and hydroelectricity. Biomass contributes 87% in the form of firewood, charcoal and crop residues and on an annual basis loses 120,000 hectares of forest cover of which 60% is due to charcoal and firewood. Compared to the United Kingdom for example, Ugandan household emits 30 tons of carbon per year compared to 5 tons in UK. Biomass consumption is followed by oil products accounting for 11% and electricity at 2%[18]. From 2001 to 2022, Uganda lost 1.03 Mha of tree cover, equivalent to a 13% decrease in tree cover since 2000, and 463 Mt of $CO_2e$ emissions. The rate of forest loss cover has a negative bearing on the country's ability to mitigate climate change.

Universal access to energy in Uganda is still very low, therefore transitioning to Solar and wind and renewable forms of energy will help achieve this goal. For example, in 2018, one in four Ugandans had access to electricity and in rural areas, the numbers are bleaker still, with just one in 10 having access.

There are plans and opportunities to build mini-grids capable of providing power to 62,000 households across 10 service territories by 2029 (Uganda Off Grid Market Accelerator, 2019). Potential sites were selected based on the criteria of having more than 50 households clustered in one particular area and having expected grid extension costs not exceed USD 2,000 per customer. But in spite of the opportunity for further mini-grid development in Uganda, the market has been slow to take off, largely due to a fragmented regulatory environment.[19]



[18] THIRD NATIONAL DEVELOPMENT PLAN (NDPIII) 2020/21 – 2024/25
[19] State of the Global Mini - Grids Market Report 2020- Case study – Uganda

In terms of greening the economy, the NDP III and Vision 2040 set out to inter alia: construct 200 off-grid min-grids based on renewable energies. This sets to promote use of new renewable energy solutions solar water heating, solar drying, solar cookers, wind water pumping solutions and adopting the use of electric transport solutions e.g. solar powered motor cycles, bicycles and tricycles and develop a framework for net metering and build local technical capacity in renewable energy solutions. Other strategies are to have increased grid capacity and increased renewable energy generation by 2030: with 27 hydroelectric power points HPP, 25 MW of Bagasse power (SCOUL Bagasse Plant), 20 MW of Solar power (Xsabo Nkoge Solar), and 20 MW of Wind power (Rupa Wind Power.[20])

In terms of climate change adaptation, Uganda's answer is in prioritizing response to climate change adaptation in the context of addressing key vulnerabilities in various sectors, including; building adaptive capacity at all levels, addressing loss and damage, and increasing the resilience of communities, infrastructure, and ecosystems with a multisectoral approach broadened from agriculture, forestry, water, infrastructure, energy, risk management, and health to also include ecosystems (wetlands, biodiversity, and mountains), water and sanitation, fisheries, transport, manufacturing, industry, and mining, cities and built environment, disaster risk reduction, tourism, and education.

The aim is to promote renewable energy resources targeting emission reductions of approximately 0.0003 MtCO2e by 2030 and to implement policies and measures that will result in a 24.7% reduction of national GHG emissions below the business as usual trajectory in 2030

In terms of financing, the Energy transition plan; the strategy is to develop local finance solutions tailored for micro, small and medium enterprises engaged in sustainable production and generation of climate change responsive technologies: enhance outcomes from negotiation of carbon projects and develop bankable projects (NDP III). The second measure is to evaluate the feasibility of establishing and operating a financial mechanism for the mining sector to fund the contribution of the fight against climate change.

Mining of critical minerals will most likely have adverse social and environmental and climate change impacts. The NDP III predicts that future power demand for the mining sector alone could absorb more than 30% of the hydroelectric potential identified to date. In a bid to curb emissions related to mining industry, Uganda has suggested to strengthen enforcement of the Mining Act, 2022, and the National Environment Act, 2019, and all the relevant regulations.

However, the National Environment Management Authority, the government institution mandated to enforce these regulations, faces challenges ranging from; chronic underfunding and lack of equipment (mobility, air quality monitoring) to ensure audit, restoration and monitoring efforts for a clean environment and clean mining standards.[21]

For broader transitional planning, funds must be sourced to construct grids, build local expertise, put in place the mini grids, powerlines setting up climate change adaptation measures, decarbonize all sectors, monitoring and enforcement of mining standards and set up smart electric car plants, solar and wind power plants. Furthermore, funding is required to finance fossil fuel exit strategies.



[20] Updated Nationally Determined Contribution (NDC) September 2022 (ibid)

[21] Press Statement December 8, 2021 NEMA registers progress in first 100 days of Dr. Barirega Akankwasah. Accessed at https://nema.go.ug/sites/default/files/ED%20%40%20100%20day_final%20version.pdf

According to the Energy Transition Plan (ETP) "Annual energy investment alone, needs to increase to USD 8 billion by the end of this decade, with USD 850 million required annually by 2030 to cover only electricity and clean cooking (e-cooking and infrastructure for LPG, including refilling and storage units and cylinders, biogas and bioethanol from agricultural waste and outputs from the sugar industry).

Generally, an approximate total of USD 325 billion of sustainable investment over the next three decades is required, with a target of increasing annual clean energy investments to around USD 7.2 billion by 2030, spread across electricity access, power generation, grid enhancements and end-use measures like access to clean cooking.

Realizing this sharp increase in investment requires concerted efforts of private, public national and multinational players. However, the reality is that there no reliable domestic potential of generating the necessary finances, over the last decade, development finance institutions financed about 80% of Uganda's power investments, much of this through concessional funding, compared to a mere 10% from the private sector.[22]

There aren't any readily available financial resources to make the transition happen, Uganda's public debt keeps rising and had risen to unprecedented levels, reaching shillings 96.1 trillion ($25.286 billion) as of June 2023[23]. Compared to the funds required to decarbonize, the meager funding allocated to climate change agencies; in the 2020/21 national budget strategy; for example, the Climate Change Department (CCD) an agency mandated to coordinate and monitor implementation of Uganda's climate change policy and the respective international agreements was allocated UGX 660 million or $171,875 United states Dollars.

In the 2023/24 Budget allocation, Climate Change, Natural Resource, Environment & Water Management, the three key sectors were allocated a total UGX 426.6 billion, 0.8% representation the budget allocation. It should be noted that the national budget did not contain a specific allocation on energy transition aspects discussed in this paper.

The known funding in energy transition is through development partners and multinational corporations to wit: The Uganda Government is in a co funding agreement with the European Union and Government of Germany to construct, operate and maintain 120+ solar powered mini-grids.

The Federal Ministry for Economic Cooperation (BMZ) of Germany will contribute 15 million Euro while the European Union shall contribute 10 million Euro. With the total project costing 35 Million Euros both the Government of Uganda and the private investors will contribute the remaining 10 Million Euro[24]. In a Public Private Partnerships (PPP) front there is a plan to put up at least two solar mini grids in the greater Kampala city area with a view to generate at least 100 KW and connect at least 300 households by the close of the year 2024[25].

The Uganda government has commissioned of 25 mini-grids, with the backing of Germany's state development agency and the EU. The developer, Winch Energy, is to install the mini-grids as part of the European Union and UN-backed Development Initiative for Northern Uganda (DINU). The mini-grids will also supply solar-powered street lighting and improved water services through pumping and purification.

By: Frank Tumusiime

[22] See page 75

[23] Will Uganda's public debt continue to rise in 2024? January 17, 2024. The Observer

[24] Germany, EU provide Uganda UGX 136 billion for solar mini grids, 14.12.2022; at https://www.eeas.europa.eu/delegations/uganda/germany-eu-provide-uganda-ugx-136-billion-solar-mini-grids_en?s=127

[25] https://www.uncdf.org/article/8222/rfa-installation-of-2-solar-mini-grids-to-facilitate-local-economic-development. UN Capital Development Fund

This will see the cost of the electricity generated subsidized so that 15,000 people and 100 businesses will benefit by paying only $0.29/kWh, a tariff said to be the lowest for mini-grids in Africa or anywhere else in the world[26].

It is therefore in black and white that energy transition will in most part be possible once the Government of Uganda and other players leverage development partner funding and government deliberate investment to cover the funding deficit. It is commendable that the Energy transition Plan underscores the importance of concessional support alongside strengthened partnerships with donors, role for domestic institutional investors, domestic financial institutions and pan-African commercial banks and international efforts to review the multilateral development bank approach, through Bridgetown Initiative[27].

It is hoped this will increase climate finance flows from developed to developing nations such as Uganda. The second important approach is creating space for Equity providers who can take on more risk than debt lenders, to assist newer firms or markets that are still in their early stages of development. Equity and debt when available on affordable terms will spur the much-needed investment.

# 5.0Conclusions and Recommendations

Government should control her raising debt vulnerabilities, even before the Russian-Ukraine war, as we can note that before COVID19, the debt burden was high. There is a need to fix the governance, public finance management issues structural weaknesses in Government. In addition, Government of Uganda should pursue Debt relief to get the fiscal space to make the necessary investments for a clean energy transition and to attract international private investment by lowering country risk ratings.

There is also a need for a change mindset (think big and think bolder) of all players including: academic/educational institutions artisanal miners, civil society, government planners and industry players and civil society to take and begin action and policy dialogue for change.

The ETP for capacity building sand support for specialized training of staff of government bodies, regulatory agencies and utility companies in energy policy design, regulatory practices, and project management, as well as for the financial structuring of renewable energy projects is a step in the right direction.



[26] Uganda turns to solar mini-grids to level-up its northern region, December 2021, at https://www.pv-magazine.com/2021/12/09/uganda-turns-to-solar-mini-grids-to-level-up-its-northern-region/

[27] It highlights six key actions for a development finance architecture, one of these actions is to mobilize more than $1.5 trillion per year of private sector investment in green transformation

Government should promote sustainable extraction of critical minerals to position mineral host communities and host governments for transition into clean energy path and ensure they are not disadvantaged in the transition dispensation.

It should be emphasized that mining companies deploy the sustainable mining technologies and strengthening enforcement and appointment of adequate inspectors to monitor mineral sites to mitigate negative ecological impacts, to foster a harmonious coexistence between resource extraction and nature.

The Government must insist on enhancement of mineral beneficiation and value addition and avoid reduce export of raw materials this will help build local content through skills and technology transfer and guarantee foreign investors good returns on their investments. After all, it is cheaper to set up mineral processing centers and refineries in Africa. For example, Considerations are underway to establish a cathode precursor plant in the DRC- the cost being three times cheaper than putting up a similar plant in the U.S, China and Poland. This competitiveness is driven by sustainable access to raw materials, access to affordable land, low costs of engineering, procurement and construction that should attract mineral refiners and processors in the global north to consider shifting their operations to the Great Lakes region.[28]

The use of fossil fuel use will continue in the short-medium term, and remain an important part of the energy mix even after the world has transitioned toward a low-carbon and green economy. Measures to decarbonize the extractives sector should therefore be implemented at the same time as structural reforms to transition.

Strengthen transparency and seal corruption related fiscal leakages, to ensure energy, tax proceeds, loans and grants are used for real development impacts and delivery of critical social services rather than ending in pockets of small political elite.

There is need to develop skills and capacity of local players to enhance inclusive development, enhance value addition, skills development and job creation within local borders. Uganda has a young and fast-growing population, with more than three-quarters under 25. In terms of formal energy employment, the National Labor Force Survey 2021 found that around 0.1% of the working population is employed in electricity generation.[29]

Mainstream gender in particular, increasing women's participation in both the workforce and energy sector. Women are at the center of collecting and use of wood fuel for daily use in domestic home steads, and deliberate integration into the energy mix can help mitigate deforestation and hence mitigate climate change and reduce on the heavy work burden.

Government should create an enabling environment to attract massive investments, the investment gap in renewable projects in Africa is so wide is and donor partners are struggling to honor climate financing pledges.

The need to leverage the private sector, build a strong pipeline of bankable green projects set your priorities, develop projects and work with partners to and raise money and build bankable projects is more urgent. Once this is done, then fast track projects where decision makers take swift action and let projects move to get quick outcomes.

Getting deals across the finish line depends on investors' trust in government, Government must offer the guarantees, exhibit political will with a clear direction on what to do and be predictable.



[28] Bloomberg news. The Cost of Producing Battery Precursors in the DRC November, 2021

[28] Energy Transition Plan. Uganda, page 88

Regarding the leveraging of technology, this has the advantage of creating new sources of value by placing digital information at the core of the business and reshaping the business to harvest value, for example deployment of digital technologies such as blockchain, smart grids and digital platforms into the energy sector can leverage unique models of production, distribution, and consumption of energy.

Alliance for Green Infrastructure in Africa started this and is seeking to unlock up to $10 billion in private capital for green infrastructure projects and expedite Africa's just and equitable transition to net-zero emissions. Contributions from the various nations and institutions are expected to propel AGIA toward its initial target of $500 million for early-stage project preparation and development blended capital. Similar initiatives can be set up to boost technology and mobilize finance to help propel Uganda's transition path

Every Ugandan deserves to access clean energy, and solar and wind can help penetrate where there are no grid connections and can reach populations today that would otherwise wait years to be reached by the grid. To realize the full potential of solar mini grids, governments and industry must work together to systematically identify mini grid opportunities, drive costs down, and overcome barriers to financing.

Translate the ETP into action, the Energy Transition Plan sets good targets but it does not indicate an implementation path. The ETP must be integrated into Government broader transition planning, including integration of National Determined Contributions (NDCs), decarbonization and sustainable development planning. Climate change is worsening and the most affected are the poor and vulnerable, there should be not even be a tiniest gap between planning and implementation path to clean energy.