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## Finding balance between nature conservation and economic development in Africa.


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# 1. Introduction

Increasing the standard of living humans frequently has negative consequences on the natural conditions of ecosystems. The two objectives which is nature conservation and economic development seem to be at odds and thus present a challenge. We will look at trophy hunting as a practice, the regulations that allow it to be sustainable, and how it can be used to serve the purpose of nature conservation and while contributing to the betterment of communities in economic terms and overall safety. We will look how the lack of electricity access has led to biomass use which has led to the degradation of land. We will also look at how nature conservation can be achieved in spite of the urbanization of Africa that is expected to occur in the coming decades.

As Africa looks forward to fast development in the near future, and a high rate of urbanization is prognostized. Africa is expected to have the highest urban growth rate in the world. According to the Organisation for Economic Co-operation and Development OECD/SWAC (2018) it is expected that by 2050, African cities will be home to an additional 950 million people. The cause of this mass migration is the better living opportunities found in cities that can not be found in the rural areas. These benefits are mainly social and economic, such as better education, better health care, sanitation, housing, business opportunities and transportation. We will investigate whether urbanization has a connection to the overall prosperity and what effect does it have on nature conservation.

According to the World Wide Fund for nature (WWF) over 900 million people live without electricity in the world, 72% of those people live in Sub-Saharan Africa. Almost 80% of energy used in Sub-Saharan Africa is generated through the inefficient combustion of solid biomass. The main purpose of energy generation is for cooking, using mainly wood or charcoal. This is increasing deforestation, greenhouse gas emissions, habitat destruction and the loss of nature.

One way to abate this over dependence on the combustion of biomass for energy is to extensively increase access to electricity for the continent. Africa has a wealth of resources from which a wide variety of ways of generating electricity can be possible. It ranges from renewable energy sources such as wind and solar (Musango et al. 2021), to fossil fuels such as coal, natural gas and petroleum and even nuclear energy.

Fossil fuel use is the primary source of $CO_2$ which makes up more than three quarters of all emission into the atmosphere. This would suggest that more fossil fuel use should be terminated in order to avoid exacerbating climate change. However, Africa is in desperate need for industrialization on a wider scale. Fossil fuel use is the most readily available way of generating electricity which would serve to avert the aforementioned threat of deforestation through biomass on the continent. Furthermore, it is worth recognizing that Africa's carbon emissions are nowhere near the level of developed nations and it is fossil fuel use that has enabled progress in developed nations. Perhaps net-zero emissions targets should provide some flexibility for developing regions of the world such as Africa.

Africa has a wide range of animal species and is particularly rich in the largest and most famous fauna in the world. This includes animals such as lions, leopards, giraffes, cheetahs, hippos and rhinos. These are distinct features of Africa's biodiversity, therefore there is a duty to conserve these magnificent beasts. For instance, South Africa is the most reliable destination for spotting the big five, the lion, leopard, rhino, elephant and the buffalo. So rich is Africa's megafauna that these animals can be found in other African countries such as, Botswana, Tanzania, Kenya, Namibia, the DRC, Rwanda, Zambia, Uganda and Zimbabwe.

There are several challenges with the management of wildlife and game reserves in Africa, particularly in relation to local populations. Sabuhoro et al. (2023) found that due to poor management of game reserves it is common that animals escape the demarcated areas and make their way to local populations. Dunham et al. (2010) found that in Mozambique it is quite often the

unwelcome and hostile interaction between local population and the escaped animals resulting in the killing of animals by local populations and vice versa. It is also common for local populations to start poaching in order to sell meat or for food. It is worth considering that the local populations are almost invariably poor and are growing exponentially in numbers. This poses a question, what is the solution to conserving the animals, create mutually beneficial relationship between the game reserves and the local population?

In this paper we will look into trophy hunting as a practice. It is important that we first distinguish between poaching and trophy hunting. Poaching is hunting without permission from whoever owns that land, while trophy hunting requires a license that contains regulations that hunters must abide by. Opponents of trophy hunting argue that it is unethical to kill animals for sport, especially when many of the targeted species are threatened or endangered. They also dispute the conservation benefits, suggesting that the money generated by trophy hunting often fails to reach local communities or conservation projects, (Detalle, 2021). Moreover, concerns about the biological and ecological implications of removing individuals, often large, healthy males from the population, are also raised, as it can have negative effects on the genetic diversity and social structure of the species.

We will look at how trophy hunting contributes to the economy of some nations in Africa through the high participation fees, providing employment for people in rural areas. We will look at how trophy hunting can benefit local communities. When communities benefit financially from hunting activities, they may become more invested in preserving their local wildlife and habitats. This can lead to increased support for conservation efforts and reduced human-wildlife conflicts.

Historically, economic prosperity was often seen as being in conflict with environmental protection. As countries industrialized, they frequently exploited natural resources without much regard for the environment. This led to the perception that to achieve prosperity, environmental degradation was a necessary evil. In this paper we will investigate this idea. Thereafter, we will formulate recommendations in regards to the situation in Africa as it seeks to develop to increase the living standard in the continent while protecting nature.

# 2. Literature review

## 2.1 Trophy hunting

Ecotourism is a major contributor to revenues for many countries in southern and eastern Africa. Consumptive wildlife utilization such as trophy hunting can provide additional revenue from wildlife. While it is often criticized for its ethical and moral implications, some proponents argue that it can have positive effects on nature conservation under certain conditions. The effectiveness of trophy hunting in conservation varies depending on factors like regulation, enforcement, and local context.

Trophy hunting has considerable economic incentives for the southern and eastern African region. Trophy hunting can generate significant revenue for conservation efforts and local communities. Hunters pay substantial fees for permits and licenses, which can fund habitat preservation, anti-poaching efforts, and community development projects. This financial incentive can provide an economic alternative to other land uses that may harm wildlife and habitats.

In the paper by Lindsey et al. (2006) findings indicated that the preferences of hunting clients are aligned with values that could positively impact both conservation and the advancement of local communities. It appears that, in contrast to the assumptions held by many in the hunting industry, a significant number of clients are reluctant to engage in hunting practices that could undermine conservation goals, for example, by exceeding set quotas or participating in put-and-take hunting. Hunting service providers seem to overvalue the importance to clients of certain trophy acquisition and undervalue the clients' interest in seeing local communities benefit from hunting activities. These insights imply that hunting clients, if given the proper tools to discern and choose operators based on conservation and community-related concerns, could incentivize a shift towards more ethical practices within the industry. Implementing an independent accreditation system for hunting operators, focused on their dedication to conservation and community benefits, could be an effective way to enable this market-driven transformation.

The authors interviewed hunting operators and prospective clients at the Dallas Safari Club(DSC) and the Houston Safari Club(HSC) conventions in January 2005. The results of the interviews showed that hunters were generally unwilling to hunt in conditions which disturb nature conservation. This is a key finding which serves to redeem the public perception of trophy hunters as glory hunters with no concern for wildlife and nature. Results also showed that more experienced hunters were more inclined to hunt which are not popular tourism destinations, as opposed to younger inexperienced hunters who prefered more popular hunting grounds in South Africa. The study showed that hunters are generally more willing to hunt in areas with low tourism potential.

The economic impact of trophy hunting in the wildlife industry in South Africa was reported by Saymaan et al.(2018). Through their vigorous research the authors revealed residual impact on other industries in South Africa because of the trophy hunting industry. As with the previous literature the method of research used was a questionnaire that was distributed by the Professional Hunters Association of South Africa(PHASA). It was distributed on the PHASA website and the SCI (Safari Club International) which is one of the prestigious hunting organizations worldwide.

The paper showed that 7600 trophy hunters came to South Africa for the hunting season of 2015/16. The hunters spent a total of a whooping USD214.851 million($274,845,496.70 in today’s value) for their trip to South Africa. Trophy hunting had a significant direct and indirect impact across many sectors of the South African economy during the same period. This goes for industries such as agriculture, transport, mining, manufacturing, construction, etc,. with the most benefiting sector being the agriculture industry with a 36% piece of the pie. The total impact on the South African economy amounted to USD341 million($436,220,051.92 in today's value). Murray (2017) estimated that only 6-9% of this income is allocated towards conservation..

Trophy hunting programs often involve local communities in conservation efforts. When communities benefit financially from hunting activities, they may become more invested in preserving their local wildlife and habitats. This can lead to increased support for conservation efforts and reduced human-wildlife conflicts.
The debate of trophy hunting as rural development mechanism has been investigated in China by Zhou et al. (2018). The study was conducted in three different locations in the republic of China. Two actions were in the Qinghai province, in the Dulai International hunting are and Xining the capital of the province. The third location was Beijing. The variance in locations and social class was especially important in finding any connection in attitudes toward trophy hunting in regard to background and social class. The research was threefold. Through the use of a general questionnaire across various demographics. Secondly through an attitudinal assessment, and lastly through choice experiments. The research found that trophy hunting can be used as a valuable component in sustainable wildlife management strategy if it puts emphasis on rural livelihoods and benefit sharing. The research also found that it is imperative that evidence can be used when making policies, especially human considerations and particularly those living alongside wildlife on a daily basis and bear the cost. This is a key point because the study found that trophy hunting in China is supported by the majority of the rural residents

Trophy hunting operations often require the preservation of large areas of natural habitat to maintain healthy populations of game animals. This can indirectly protect a wide range of species and their ecosystems. A research by Musika et al. (2018) at the Moyowosi-Kigosi Game Reserves in Tanzania assessed whether hunting activities in the reserves serves to deter illegal grazing thereby leading to higher vegetation quality in the fields. The research was done by comparing samples of above-ground biomass and soil cover between control, moderately and intensively grazed hunting blocks. They also assessed soil infiltration, soil penetration, organic carbon in the soil and the N-P-K across the three blocks. The study concluded that trophy hunting has a direct contribution to the preservation of wildlife habitats. The direct contribution is due to the finding that trophy hunting brings with it various anti-poaching measures such as constant surveillance which prevents also illegal grazing. This is crucial because the study found that illegal grazing decimated vegetation at the Moyowosi-Kigosi Game Reserves . The authors further proposed maintaining trophy hunting as an essential ecological tool in managing wildlife conservation.

Whitman et al. (2004) found that well-regulated trophy hunting can encourage selective harvesting, where older males with reduced reproductive value are targeted. This can have minimal impact on overall population dynamics while providing an economic benefit.The rationale behind selective harvesting in trophy hunting is that by targeting older or genetically less desirable individuals, hunters can help maintain the health and genetic diversity of the population. This is based on the idea that removing certain individuals can potentially improve the overall fitness of the population by allowing younger and more genetically superior individuals to reproduce and pass on their genes.

Legislation changes in Southern Africa in the 1960s and 1970s allowed private landowners to have user rights over wildlife (Nelson et al. 2013). This has enabled private landowners to generate income through trophy hunting. However what is interesting from an environmental perspective is that because of privatization the last 20-30 years have seen significant increases in wildlife populations and ranges. It should be noted that racial inequality in land distribution has been a significant issue in Southern Africa, particularly in countries like South Africa, Zimbabwe, Namibia, and others. This issue is deeply rooted in the colonial history of the region, where European powers colonized these areas and implemented policies that dispossessed indigenous African communities of their land. European colonial powers, such as Britain and the Netherlands, implemented land policies that favored white settlers at the expense of indigenous African populations.

Bond et al. (2004) found that these policies often included land seizures and forced removals of indigenous people from their ancestral lands. It's important to note that the specific situations and approaches to addressing racial inequality in land distribution vary by country in Southern Africa. The issue remains complex and deeply rooted in historical and political contexts, and progress toward more equitable land distribution continues to be a topic of debate and policy development in the region.

The interaction between people and wildlife in villages can vary greatly depending on the location, culture, and the specific types of wildlife present. In many villages, people rely on agriculture for their livelihoods. This can lead to interactions with wildlife, both positive and negative. Some wildlife, such as certain birds and insects, can be beneficial for crop pollination and pest control. However, other wildlife, like deer, rodents, or wild boars, can damage crops, leading to conflicts between villagers and wildlife. In areas where human settlements overlap with wildlife habitats as Sabuhoro et al. (2023) found conflicts can arise. For instance, crop damage by herbivores, attacks on livestock by predators, or threats to human safety from large carnivores can lead to tensions between villagers and wildlife.

Improving human quality of life can have a positive impact on wildlife conservation. Improved quality of life often correlates with increased education and awareness about environmental issues, including wildlife conservation. Educated and economically stable communities are more likely to support and engage in conservation efforts, advocate for wildlife protection, and contribute to organizations involved in conservation. Poverty and resource scarcity can lead to conflicts between local communities and wildlife, such as retaliatory killings of predators that threaten livestock. Improved quality of life can reduce such conflicts and promote coexistence with wildlife.

Villagers and rural communities may hunt wildlife for various reasons, and it's important to recognize that these reasons can vary widely depending on cultural, economic, and environmental factors. In many rural areas, especially in developing countries, hunting wildlife is a means of obtaining food for the family. Muchaal and Ngandjui (1999) found that people in Cameroon rely on hunting as a source of protein to supplement their diets, especially in regions where alternative sources of protein are scarce or expensive.

Cooney, R., et al. (2017) found that in impoverished regions, hunting and selling wildlife products can be a way for villagers to earn income. Wildlife can be a source of valuable products like fur, skins, ivory, and medicinal plants that can be sold in local or international markets. It's important to note that while some of these reasons may be driven by necessity and cultural traditions, unsustainable hunting practices can have detrimental effects on wildlife populations and ecosystems.

In some cases, the funds generated from trophy hunting can be used to finance anti-poaching initiatives, which are crucial for protecting wildlife from poachers. These efforts can include the hiring of rangers, the purchase of equipment, and the establishment of surveillance systems to hinder and combat illegal hunting. On certain occasions through fee and even donations from the hunters themselves dwindling wildlife populations can be resuscitated. This was seen with the case of the Bighorn sheep in North America which has seen its population tripled (Cooney et al. 2017). It should be remembered that trophy hunters have an incentive to preserve wildlife.

## 2.2 Regulations of Trophy Hunting: South Africa, Namibia, Tanzania

In South Africa, the Department of Forestry, Fisheries and the Environment issued the Norms and Standards for the Trophy Hunting of Leopard (Panthera Pardus Pardus) in South Africa. These norms and standards are isssued under section 9(1)(a) of the National Environmental Management: Biodiversity Act, 2004 (Act no.10 of 2004). The purpose of these Norms and Standards is to manage the trophy hunting of leopard in order to reduce the impact thereof on the stability of the leopard population and to ensure that trophy hunting is carried out in an ecologically sustainable manner. The Scientific Authority establishes Leopard Hunting Zones (LHZ) for the purpose of setting the annual leopard hunting quota. Only one leopard may be hunted per Leopard Hunting Zone. To safeguard the ecological balance and stability of leopard numbers, the established Norms and Standards stipulate that only male leopards that are at least seven years of age are eligible for hunting. This age requirement is set to guarantee that the leopards have had ample time to reproduce and thus bolster the genetic diversity of the species.

The Scientific Authority is tasked with providing guidance on whether the assigned hunting quotas may adversely affect the overall survival and health of the leopard population. The guidelines also mandate that any prospective hunter aiming to target a leopard must clear a sanctioned leopard hunting test, conducted only once under the supervision of an official from the issuing authority. This examination is designed to assess the hunter's proficiency in determining the age of a male leopard and to ascertain their knowledge of the relevant biodiversity laws.

Ms. Barbara Creecy, the Minister of Forestry, Fisheries, and the Environment, validated the 2022 quotas for trophy hunting of black rhino, leopard, and elephant in South Africa. This quota were a carryover from 2021, allowing stakeholders to utilize the previous year's allocation in 2022, with consultations for 2023's quota to occur within the year. A cap of 10 leopards has been determined, based on comprehensive data from a national monitoring program, with hunts permitted only in regions where leopard populations are stable or growing. The strict requirement that only male leopards aged seven years or older may be hunted is in place to minimize the risk of overhunting. The black rhino quota allows for the hunting of 10 individuals, with elephant hunting capped at 150, ensuring that these figures are in alignment with species conservation and sustainability.

The quotas, in compliance with CITES and National Environmental Management: Biodiversity Act, 2004 (Act no.10 of 2004) regulations, are part of South Africa's commitment to sustainable hunting practices, which are fundamental for incentivizing wildlife conservation and supporting rural economies. In 2019, the hunting sector significantly contributed to the economy, with R1.4 billion in revenue, and the biodiversity sector employed a workforce comparable to that of mining. These practices, deeply rooted in South African heritage, not only sustain biodiversity but also aid in rural economic development, poverty alleviation, and employment growth. The quotas are meticulously set and communicated to ensure ecological sustainability and economic benefit, with the norms and standards for leopard hunting being in the final stages of implementation.

There is massive room for improvement however, the Humane Society International estimates that a mere quarter of trophies from native species that are exported as hunting trophies are managed under a national conservation plan in South Africa. This indicates that the majority of hunted native species whose trophies are exported do not benefit from the structured oversight of a dedicated conservation strategy.

In Namibia, Trophy hunting is allowed to occur within the specific timeframe of half an hour before the sun rises until half an hour after it sets. It's authorized solely on properties where landowners have given explicit consent. If bow hunting is to be conducted, the property needs to be additionally registered with the Ministry of Environment, Forestry, and Tourism (MEFT) for this purpose. Before any hunting begins, permits are required; each hunter must have an individual permit, and for hunting large cat species such as leopards, cheetahs, and lions, a special permit with further conditions is necessary. These permits, which must be fully filled out by both the hunter and

the professional guide (including any instances of wounded or lost animals), are exclusively issued by the MEFT. A hunter is limited to taking no more than two trophies of each species per permit. Additionally, all operators offering trophy hunting services must have valid registration with the Namibia Tourism Board (NTB).

Tanzania stands out as the leading destination for hunting safaris in Africa, boasting an impressive array of big game and a wildlife diversity surpassing many other nations globally. Visitors are drawn to its vast migrations of wildebeest and zebras, as well as the presence of major predators such as lions, leopards, and hyenas. It is renowned for having the highest lion numbers and is ranked third globally for its elephant population. The country also offers a rich bird population with more than a thousand species and is a haven for anglers with its abundant lakes, rivers, and coastal game fishing spots. Under the Wildlife Conservation (Tourist Hunting) Regulations 2015, the nation integrates regulated hunting as a core component of its wildlife preservation efforts, essential for the enduring protection of its natural heritage. Licensed hunting companies conduct these safaris within designated hunting zones, which include reserves and various wildlife management areas. The Tanzania Wildlife Authority (TAWA) oversees and manages all hunting-related activities to ensure sustainable practices.

Hunting safaris within Tanzania are meticulously governed by tourist hunting regulations, which play a pivotal role in TAWA's broader conservation initiatives. The hunting quotas are carefully determined each year by a specialized advisory committee that considers ecological data, including animal counts and the sustainability of species, to decide on the allowable catch. The minister in charge of natural resources and tourism is tasked with the transparent distribution of hunting areas within reserves and controlled regions, utilizing methods such as auctions or tenders that adhere to the principles of accountability and good governance. In Wildlife Management Areas, hunting territories are assigned by an authorized association.

The allocation of hunting blocks is structured to last for 10 years for the first two categories and extends to 15 years for the third category of blocks. When hunting areas become available, TAWA announces the vacancies and invites applications, which are then evaluated based on a set of established criteria. Hunting companies act on behalf of clients to request permits from TAWA's designated offices, and these permits are granted once it is confirmed that all conditions for a responsible and regulated hunt are fulfilled. The updated 2007 Wildlife Policy, initially established in 1998, along with the Wildlife Act of 2009 and the Resident Hunting Regulation of 2010, have been instrumental in reducing illegal hunting activities by promoting the sustainable use of natural resources, including game meat, which supports local livelihoods through resident hunting. There are currently eight specific regions in Tanzania designated for this purpose. These areas have been set aside specifically for resident hunting, aligning with the country's goal to ensure hunting practices contribute positively to the community and the environment.

The examples of South Africa, Namibia and Tanzania are in accordance with the International Union for Conservation of Nature (IUCN) guiding principles on Trophy Hunting. According to the IUCN SCC (2012), on planning, monitoring and and reporting on Trophy Hunting, the practice can serve as a tool for conservation when it is based on thorough assessments of wildlife resources and the careful tracking of hunting metrics, leading to the creation of informed quotas and management plans. This process ideally incorporates the participation of local communities and their indigenous knowledge, ensuring that data collection methods such as wildlife counts and tracking signs are as accurate and scientifically sound as possible. Secondly, it should employ a flexible approach to managing quotas and plans, adjusting them according to the findings from ongoing resource assessments and hunting indices. This adaptability is crucial to respond to ecological shifts, climate variations, or the impact of human activities. Thirdly, the practice should be governed by clear and transparent laws and regulations that are regularly reviewed and revised. Local input in establishing these rules is preferred to ensure that the regulations resonate with those who are most affected by them.

## 2.2 Urbanization

Urbanization in Africa has been a significant demographic trend, and it is projected to continue in the coming decades. Africa has been experiencing rapid urbanization, with its urban population growing at a faster rate compared to other regions. This trend is expected to continue as rural-to-urban migration and natural population growth in cities persist. Africa has one of the fastest-growing populations in the world. The United Nations projected that by 2050, Africa's population could double, with a significant portion of this growth occurring in urban areas.

Güneralp et al. (2017) found that urbanization in Africa presents both challenges and opportunities. While it can lead to increased economic development, improved access to services, and enhanced quality of life for some, it also brings challenges like inadequate infrastructure, housing shortages, and informal settlements. Some African cities, like Lagos (Nigeria), Cairo (Egypt), Kinshasa (Democratic Republic of Congo), and Johannesburg (South Africa), are already large and continue to grow. These mega-cities face unique challenges related to congestion, infrastructure, and service provision.

However, Africa is seeking to rapidly transform itself as outlined by the Agenda 2063, Union African (2015). Agenda 2063 is a strategic framework for the socio-economic transformation of the African continent, developed by the African Union (AU). It was adopted by AU member states in 2013 as a long-term vision and action plan to guide Africa's development over the next 50 years, with the goal of achieving a prosperous, peaceful, and integrated continent by the year 2063. Agenda 2063 represents a collective vision for Africa's future and aims to overcome the challenges that the continent faces while harnessing its vast potential. It serves as a blueprint for African countries to work together and prioritize their development efforts to achieve a prosperous and united Africa by the year 2063. Progress toward these goals is monitored and evaluated regularly by the African Union and its member states.

Rosenthal and Strange (2004) found that cities play a crucial role in economic development for several reasons. They found that it’s the agglomeration of resources. Cities concentrate a diverse range of resources such as skilled labor, capital, technology, and infrastructure in a relatively small geographic area. This concentration of resources facilitates innovation, productivity, and efficiency. Cities offer a large and diverse labor market, making it easier for businesses to find the right talent for their needs. The density of workers in cities also leads to competition, which can drive up wages and productivity.

Cities are often centers of education, research, and innovation. They host universities, research institutions, and a vibrant entrepreneurial ecosystem, which foster the development of new technologies, products, and industries. Cities tend to have better infrastructure, including transportation networks, communication systems, and utilities. This connectivity reduces transaction costs, facilitates trade, and allows businesses to operate more efficiently. Cities are large consumer markets themselves, and they are often well-connected to other markets, both domestically and internationally. This accessibility increases the customer base for businesses and encourages trade.

All of these points help us understand the trend towards urbanization in Africa as it is still a developing region of the world. While cities offer significant advantages for economic development, it's important to note that challenges like congestion, inequality, and environmental issues can also arise in urban areas. Therefore, effective urban planning and governance are crucial to harnessing the potential benefits of cities while addressing their associated challenges. The UN 2030 agenda gives guidance in reconciling the urbanization trend in Africa with its associated challenges. The United Nations 2030 Agenda for Sustainable Development, adopted in September 2015, includes a specific goal related to urbanization. Goal no. 11 is titled "Sustainable Cities and Communities," and it addresses the challenges and opportunities associated with urbanization.

Overall, the UN 2030 Agenda recognizes that urbanization is a global trend with significant implications for sustainability, equity, and development. Goal 11 underscores the need for cities to become more inclusive, resilient, and environmentally sustainable while acknowledging the importance of local and international cooperation to achieve these objectives. Achieving sustainable urbanization is seen as crucial for the overall success of the 2030 Agenda and the well-being of future generations.

Inclusive urban development and governance are critical aspects of creating sustainable and equitable cities and communities. These concepts focus on ensuring that urban areas are designed, managed, and governed in ways that promote social, economic, and environmental inclusion for all residents, regardless of their background, income level, or abilities. Inclusive urban governance refers to the way cities and local governments are managed and operated to ensure the participation and representation of diverse voices and interests.

Involving residents, community organizations, and stakeholders in the decision-making processes related to urban planning, budgeting, and policy formulation. This was found by Kundu (2020) while overviewing urbanisation processes in Africa and Asia. Ensuring that government actions are transparent, accountable, and responsive to the needs and concerns of the public. Distributing resources and services fairly across neighborhoods and populations, particularly focusing on under-served areas.

Implementing policies and initiatives that actively address discrimination, segregation, and exclusion based on race, gender, age, or other factors. Building the capacity of local governments, community organizations, and individuals to engage effectively in urban governance.Effective inclusive urban development and governance require collaboration among various stakeholders, including government bodies, civil society organizations, businesses, and residents. Additionally, data-driven approaches and a focus on sustainability and resilience are often integrated into these strategies to ensure long-term success and prosperity for cities and their inhabitants. Promoting inclusivity in urban development and governance not only enhances the quality of life for all residents but also contributes to the overall economic and social well-being of cities and regions.

Lall (2020) found that land use planning is critically important in urbanization. Effective land use planning helps ensure that urban areas grow in a sustainable and balanced manner. It promotes the efficient use of land, resources, and infrastructure, reducing negative environmental impacts and enhancing the overall quality of life for residents. Land use planning can protect natural resources, open spaces, and green areas within and around urban centers. This will be crucial in Africa for preserving biodiversity, managing storm water, and mitigating the urban heat island effect.

Effective land use planning involves setting long-term goals and visions for urban areas, taking into account population growth and changing demographics. This helps cities adapt to evolving needs and challenges. Land use planning is essential for guiding the growth and development of urban areas in a way that maximizes benefits while minimizing negative impacts. It plays a pivotal role in creating sustainable, livable, and resilient cities that can thrive in an era of rapid urbanization.
African urbanization and environmental change are two interconnected phenomena.

Lwasa (2014) found this interconnectedness has significant implications for the continent's future development and sustainability. Africa is currently experiencing rapid urbanization, which refers to the increasing migration of people from rural areas to urban centers, leading to the growth and expansion of cities and towns. While urbanization poses significant challenges, it also presents opportunities for sustainable development. Well-planned urbanization can lead to increased access to education, healthcare, and economic opportunities, potentially improving the quality of life for urban residents and reducing pressure on rural areas.

African urbanization is a complex process with both positive and negative environmental implications. To address the challenges associated with urbanization and environmental change, it

is essential for African governments, regional organizations, and international partners to collaborate on sustainable urban planning, infrastructure development, and environmental conservation efforts. Balancing urban growth with environmental protection is crucial for the long-term well-being and sustainability of the continent.

McGranahan et al. (2009) found that regional collaboration plays a crucial role in the process of urbanization. Urbanization is a global phenomenon, and it often occurs unevenly across regions and countries. Effective regional collaboration can help manage and harness the benefits of urbanization while addressing its challenges. Regional collaboration can facilitate the planning and development of essential infrastructure such as transportation networks, water supply, sewage systems, and energy distribution. Coordinated efforts between neighboring cities or municipalities can lead to more efficient and cost-effective infrastructure solutions, reducing the burden on individual urban centers.

Urbanization often places a strain on resources like water, energy, and land. Collaboration among neighboring regions can lead to the sharing of resources, which can be critical in ensuring the sustainable growth of urban areas. Urbanization can have significant environmental impacts, including pollution, deforestation, and habitat loss. Regional collaboration can help develop strategies for sustainable urban growth, such as green infrastructure, conservation initiatives, and the establishment of protected areas.

Cities in close proximity often face similar natural disaster risks. Collaboration can lead to joint disaster preparedness and response plans, ensuring that urban areas are better equipped to handle emergencies like floods, earthquakes, or hurricanes.
Regional collaboration can facilitate comprehensive spatial planning that considers the broader regional context. This can help prevent issues like urban sprawl, congestion, and inefficient land use by coordinating land-use policies across municipalities.

Effective urban governance often requires coordination between different levels of government, including municipal, regional, and national authorities. Collaborative efforts can lead to better policy alignment and coordination in areas like zoning regulations, taxation, and public services. Collaboration can help address social inequality by ensuring that marginalized communities within and across urban regions across Africa have access to essential services, education, and job opportunities.

### 2.2.1 Synurbization

Synurbization is a concept related to urban ecology and the adaptation of wildlife to urban environments. It refers to the process by which certain species of animals or plants adapt and thrive in urban or suburban areas. This adaptation involves making use of human-created habitats, such as buildings, parks, gardens, and even waste spaces, to meet their needs for shelter, food, and reproduction.

Synurbization typically occurs when animals and plants are able to exploit the resources and opportunities provided by urbanization. This can include things like foraging for food in trash bins, nesting in buildings, or utilizing artificial light sources for navigation. Some species are better suited to synurbization than others, and their success in urban environments can depend on factors such as their ability to tolerate pollution, noise, and other urban stressors.

Andrzejewski et al. (1978) comparing rodent species in an urban environment in Warsaw, Poland found that pigeons, raccoons, rats, and certain types of plants that thrive in sidewalk cracks or disturbed urban soil. The concept of synurbization highlights the ability of some species to adapt to and coexist with human-dominated landscapes, even as urban areas continue to expand and change. It also underscores the importance of urban ecology in understanding how wildlife interacts with and responds to urban environments.

While urbanization can pose significant challenges to many species, some birds have found ways to benefit from these human-altered landscapes as found by Maciej (2004). Urban areas often provide a consistent and readily available food source for birds. Bird feeders, trash cans, and even insects attracted to artificial lighting can be sources of food. Some bird species have adapted to exploit these resources. Birds have adapted to nesting in urban structures like buildings, bridges, and signs. These structures can offer shelter from predators and the elements, which can lead to increased breeding success for certain species.

Urban environments tend to have higher temperatures than surrounding rural areas due to the urban heat island effect. This can be beneficial for some bird species, particularly during cold winters, as it can provide a more hospitable climate. In some cases, urban environments may have fewer natural predators for certain bird species. For example, the absence of large predators like foxes or coyotes can make it safer for ground-nesting birds.

Eisenbeis and Hánel (2009) found that artificial lighting in cities attracts insects, which can serve as a food source for nocturnal and crepuscular birds. Additionally, some bird species are known to sing or forage at night under the influence of artificial lighting. Urban structures can provide shelter and protection from natural disasters like wildfires and floods. Birds that have adapted to urban environments may have a better chance of surviving such events.

Some birds have learned to tolerate human presence and even benefit from it. They may scavenge from outdoor dining areas, glean food from sidewalks, or nest in close proximity to people without disturbance. The presence of birds in urban areas offers opportunities for researchers to study their behavior, ecology, and adaptations to urban environments. This can lead to valuable insights into avian biology and conservation.

However, it's important to note that synurbization is not beneficial for all bird species, Partecke et al. (2006) found that european blacbirds suffer stress in the city. Many bird species face challenges in urban areas, including habitat loss, pollution, collisions with buildings, and exposure to non-native predators. Additionally, while some birds thrive in urban environments, their populations may become isolated from their natural habitats, potentially leading to genetic diversity issues.

Efforts to mitigate the negative impacts of urbanization on bird populations include creating bird-friendly building designs, establishing urban green spaces and parks, and implementing wildlife corridors to connect urban habitats with natural ones. These measures can help ensure the coexistence of birds and humans in urban areas while promoting bird conservation. Ives et al. (2016) found that urban areas can potentially harbor threatened species, although the extent to which they can do so depends on various factors, including the specific characteristics of the urban environment and the conservation efforts in place. As observed in Australia, some urban areas may still contain pockets of suitable habitat for certain species. Urban parks, green spaces, and even vacant lots can serve as refuge for wildlife.

Urban conservation initiatives, such as habitat restoration, green infrastructure, and wildlife corridors, can help to support threatened species within urban areas. These efforts may involve creating artificial habitats, planting native vegetation, or providing nesting sites for species like bats or birds. To assess the presence and health of threatened species in urban areas, ongoing monitoring and research are crucial. Scientists and conservationists may use techniques such as camera traps, tracking, and population surveys to gather data and inform conservation efforts.

Public awareness and education can play a significant role in conserving threatened species in urban environments. Educating the public about the importance of coexisting with wildlife and providing guidance on responsible behavior can help reduce conflicts and support conservation efforts. Shwartz et al. (2014) mentions that biodiversity can have a significant positive impact on the quality of life for people in cities. Biodiverse urban areas often have more trees, plants, and green spaces. These green areas act as natural filters, absorbing pollutants and producing oxygen, which can lead to cleaner and fresher air for city dwellers to breathe. Access to green spaces with diverse plant and animal life can reduce stress, anxiety, and depression. Spending time in natural environments within cities provides opportunities for relaxation and recreation, improving overall mental well-being.

A diverse urban ecosystem with a variety of plants can help in temperature regulation, Ziter (2016). Cooler temperatures make cities more comfortable to live in, especially during hot summer months. Biodiversity can make urban areas more visually appealing. Green spaces, parks, and gardens provide beauty and natural aesthetics that can improve the overall quality of life and make cities more enjoyable places to live.

Urban biodiversity can support local food production through community gardens, urban farming, and the cultivation of native edible plants. This contributes to food security and access to fresh, healthy products for urban residents. Urban biodiversity can serve as a valuable educational resource. Parks, nature reserves, and urban wildlife can inspire an appreciation for the environment and the importance of conserving biodiversity, particularly in younger generations.

Biodiversity can boost the economy by attracting tourists and creating jobs related to conservation, gardening, and eco-tourism. Green infrastructure and sustainable practices can also reduce long-term infrastructure costs. Biodiverse urban areas are often more resilient to climate change impacts such as flooding and extreme heat. Natural green buffers, like wetlands and forests, can mitigate the effects of extreme weather events.
Promoting biodiversity in urban areas can lead to the protection and conservation of native species, which in turn can have long-term benefits for regional and global biodiversity.

According to Hedblom et al. (2018) birds can significantly improve the quality of life for people in cities. Birds add beauty and aesthetic value to urban environments. Their vibrant colors, graceful movements, and melodious songs can enhance the overall visual and auditory experience of city dwellers. Interacting with nature, including birds, has been shown to reduce stress and anxiety, improve mood, and enhance mental well-being. Watching birds in urban parks or from home can provide a calming and therapeutic effect.

Birds are a crucial part of urban ecosystems. They help in the control of insect populations, pollinate plants, and disperse seeds, contributing to the health of urban green spaces and supporting a more sustainable urban environment. Birds can serve as a valuable educational resource for city residents, especially for children. Observing and learning about local bird species can foster a sense of connection with the natural world and promote environmental awareness and conservation efforts.

Birdwatching can be a shared activity that brings people together. Birdwatching clubs and community events centered around birds provide opportunities for social interaction and community building. Some birds, such as certain species of sparrows and swallows, help control insect populations, which can be beneficial for reducing the prevalence of disease-carrying insects in urban areas. Birds are part of complex urban food webs. Their presence helps maintain ecological balance by controlling populations of insects, rodents, and other species. Bird-related tourism and birdwatching can bring economic benefits to cities. People often travel to urban areas to observe unique bird species, contributing to local businesses and tourism revenue.

To attract birds, cities often invest in creating and maintaining green spaces, parks, and wildlife corridors. These green spaces provide residents with recreational opportunities and help mitigate the urban heat island effect. Trees and vegetation used by birds can provide shade and reduce ambient temperatures in urban areas, making them more comfortable during hot summer months. Goddard et al. (2010) found that gardens can enhance urban biodiversity in several ways, making cities more ecologically vibrant and resilient. Gardens provide new habitats for various species of plants, insects, birds, and small animals. The diverse range of plants in gardens can support different life stages of insects, from caterpillars to adult butterflies and bees. Bird species can find food and shelter in gardens as well.

Using data from the South African Bird Atlas Project and a review of existing literature, (McPherson, S.C., et al 2021) identified 66 species of diurnal and nocturnal raptors in South African cities. Of these, 30 species were reported frequently enough to suggest a significant presence in at least one of the eleven cities studied, showcasing a notable diversity of raptors within these urban settings. Notably, five species were both abundant and widespread across multiple cities, and three of these were scavengers: the Black-winged Kite, African Fish Eagle, and Yellow-billed Kite, along with the Common Buzzard and Black Sparrowhawk. Despite this variety, the study points out that only a handful of these raptors have been thoroughly researched in urban contexts. The Black Sparrowhawk, African Crowned Eagle, Lanner Falcon, and Peregrine Falcon are among those few. Their urban populations are denser than their rural counterparts, suggesting that cities might offer important conservation opportunities. This potential is especially critical given the drastic decline in raptor numbers and diversity across Africa in recent decades. The study highlights the need for more research on urban raptors and points to urban conservation as a promising avenue, particularly when it includes public engagement.

Patterson (2017) investigated the urban ecology of vervet monkeys in KwaZulu-Natal, South Africa, and the factors leading to human-monkey conflicts. Due to urban and rural development, natural foraging areas for vervet monkeys have become reduced and fragmented. The research included three components. An urban wildlife survey assessing residents' attitudes towards vervet monkeys and their conflicts with them. An examination of vervet monkeys' impact on urban nesting birds using 75 artificial nests, which found that monkeys were the primary predators, suggesting further study is needed using natural nests for comparison. Observational data on 20 vervet monkey troops living in urban environments showed that factors such as the absence of dogs, supplementary food, fruiting trees, and tree coverage influenced the monkeys' behaviors, with different activities being more prevalent in certain garden features. The findings suggest that vervet monkeys have adapted to urban environments by utilizing available food resources, which has facilitated their persistence despite habitat changes. The study emphasizes the need for conflict management through the conservation of natural habitats to reduce vervet monkeys' reliance on human resources and mitigate conflicts. The research underscores the importance of citizen science

and spatial ecology in guiding conservation and management strategies at the complex human-wildlife interface.

Cilliers (2019) concluded that despite progress over the past decade, South Africa, like much of Africa, lacks a consistent definition of green infrastructure, leading to a gap in understanding its value among stakeholders and communities. Consequently, green infrastructure often isn't given due consideration in land use planning. The paper calls for a contextualized definition of green infrastructure in Africa, one that is not simply a copy of international models. It suggests that the benefits of green infrastructure, such as health improvements and property value increases, should be quantified and communicated to the relevant beneficiaries to highlight its importance. Moreover, the paper advocates for the adaptation of urban and green economic models to the African context to support evidence-based decision-making. It also notes that local challenges, like safety concerns, affect the economic and social valuation of green infrastructure. Further research is needed to establish and appraise green infrastructure values within a broader African context.

Gardens, when linked together through green corridors or greenbelts, can provide a network of habitats that allow wildlife to move more freely through urban areas. This helps prevent isolation of populations and improves genetic diversity. By attracting natural predators like ladybugs (Coccilenidae), lacewings, and birds, gardens can help control pest populations. This reduces the need for chemical pesticides, which can harm both the environment and beneficial insects. Gardens can have a positive impact on human mental health, which indirectly benefits urban biodiversity. A well-maintained garden can encourage people to spend more time outdoors, fostering a stronger connection to nature and a desire to protect it. Gardens can be designed to manage rainwater runoff, reducing the risk of flooding and preventing pollution of urban water bodies. This can improve water quality and create additional aquatic habitats. Urbanization can have significant impacts on protected areas, which are designated regions set aside to conserve biodiversity and natural resources. Mcdonald et al. (2008) found that these impacts can be both direct and indirect and can vary depending on the scale and rate of urbanization, as well as the effectiveness of management and conservation efforts.

Urban areas can serve as hubs for the introduction and spread of invasive species. Invasive species can out compete native flora and fauna within protected areas, leading to shifts in species composition and potentially disrupting ecological relationships. As urban areas expand, they can bring increased human activity to the fringes of protected areas. This can include recreational activities, such as hiking, camping, and off-road vehicle use, which can disturb wildlife and habitats. Poaching, illegal logging, and other illicit activities may also increase in proximity to urban areas.

Proper urban planning and zoning can help minimize encroachment on protected areas and ensure that urban development is located away from ecologically sensitive regions. Establishing buffer zones around protected areas can help reduce the direct impacts of urbanization on these areas. Conservation organizations and governments can implement strategies to restore degraded habitats within and around protected areas.Public awareness campaigns can educate urban residents about the importance of protected areas and the need for responsible behavior near these areas. Strict enforcement of laws and regulations within protected areas can deter illegal activities and protect wildlife and habitats.

Anderson and Minor (2017) found that using vacant lots for ecological and social benefits in cities is a great way to revitalize unused urban spaces and create positive impacts on the environment and the community. Implement ecological improvements that can benefit the local environment. Such as, planting native trees, shrubs, and wildflowers to enhance biodiversity. Create rain gardens or bioswales to manage stormwater runoff and reduce flooding. Install birdhouses, bat boxes, or bee-friendly plants to support wildlife.Develop pollinator gardens to help protect and boost pollinator populations. Use sustainable landscaping practices that reduce water consumption and maintenance costs, such as xeriscaping or native landscaping.

Frantzeskaki (2019) suggested ways for nature-based planning in cities, one of which is collaboration with local organizations, universities, or environmental groups to leverage resources and expertise. Transforming vacant lots into ecological and social assets can significantly enhance the quality of life in urban areas while contributing to sustainability and community resilience. It requires careful planning, community involvement, and ongoing commitment to maintenance and improvement.

Pavao-Zuckerman (2008) found that urban soils play a crucial role in ecological restoration efforts within cities. They are a vital component of urban ecosystems, providing various functions and services that are essential for sustaining urban biodiversity and improving overall environmental quality.To maximize the role of urban soils in ecological restoration, cities can implement policies and practices that prioritize soil health, green infrastructure, and sustainable urban planning. This can include promoting green roofs, urban forestry, community gardens, and sustainable landscaping practices, all of which contribute to healthier urban soils and more resilient urban ecosystems.

## 2.3 Electricity as main resource for rising human well-being.

Africa has one of the lowest rates of electricity access in the world. According to the International Energy Agency (IEA) data at that time, approximately 48% of the population in Sub-Saharan Africa had access to electricity. In some countries, particularly in rural areas, access rates were much lower. There was a substantial gap in electricity access between urban and rural areas. Urban areas generally had higher electrification rates compared to rural and remote regions. This disparity was due to factors such as infrastructure investment priorities and the cost of extending the grid to remote areas.

In many African countries, even where electricity was available, power supply was often unreliable and subject to frequent blackouts and brownouts. This affected businesses, industries, and daily life. The energy mix in Africa varied from country to country. Some countries relied heavily on hydroelectric power, while others depended on fossil fuels, such as coal and natural gas. Renewable energy sources, particularly solar and wind, were increasingly explored as alternatives.

Insufficient infrastructure, including aging power plants, inadequate transmission and distribution networks, and a lack of maintenance, hindered the expansion and reliability of electricity supply. Several African governments and international organizations were working to improve electricity access. Initiatives like the Power Africa program, supported by the U.S. government, aimed to increase investment in African power projects and enhance infrastructure.

Given the challenges of extending the grid to remote areas, off-grid solutions such as solar home systems and mini-grids were gaining traction in some regions. These solutions were seen as a way to rapidly increase electricity access, particularly in rural areas. Efforts to improve electricity access in Africa were ongoing, and progress may have been made in some regions while challenges persisted in others. Karekezi and Kithyoma (2002) suggests that a diversified renewable energy strategy in Africa is crucial for several reasons, as it can address multiple challenges and unlock numerous opportunities on the continent. Africa faces a unique set of energy-related challenges, including limited access to electricity, high energy costs, and environmental concerns. A diversified renewable energy strategy can help to address these challenges and provide a pathway to sustainable development.

Africa is blessed with an abundance of renewable energy resources, including solar, wind, hydro, and geothermal energy. Leveraging these resources can provide a reliable and cost-effective source of electricity while reducing the continent's reliance on fossil fuels. A significant portion of the African population lacks access to modern energy services. Diversifying the energy mix with renewables can help in extending access to electricity to remote and underserved areas, improving the quality of life and supporting economic development.

A diversified renewable energy strategy in Africa can provide a multi-faceted solution to a range of pressing challenges, including energy access, environmental sustainability, economic development, and climate resilience. By harnessing the continent's abundant renewable resources and embracing innovative technologies, African countries can build a more sustainable and prosperous energy future. However, it is essential for governments, businesses, and international organizations to work together to overcome barriers and promote the adoption of renewable energy solutions across the continent.

Biomass is an important energy source in many parts of Africa, particularly in rural areas where access to modern energy services is limited. Biomass refers to organic materials such as wood, crop residues, animal dung, and charcoal that can be used for various purposes, including cooking, heating, and electricity production. Biomass in some African countries is often done through the combustion of wood, agricultural residues, or dedicated energy crops. Biomass power plants can provide electricity to both rural and urban areas.

Biomass plays a crucial role in meeting the energy needs of many people in Africa, particularly in rural areas. However, Bailis et al. (2015) found that there are significant challenges associated with its use, including environmental and health concerns. Efforts are being made to promote sustainable biomass management and transition to cleaner energy sources to improve living conditions and protect the environment in Africa. There is a growing emphasis on sustainable biomass management in Africa to mitigate the environmental and social impacts of biomass use. Sustainable practices include reforestation and afforestation efforts, improved cookstove technologies to reduce indoor air pollution, and the promotion of alternative clean energy sources.

Etchie et al. (2020) found that exposure to hazardous components in ash resulting from biomass burning in Africa can pose significant health and environmental risks. These substances can become part of the ash that settles on the ground and can potentially affect human health, ecosystems, and air quality. Biomass burning produces fine particulate matter (PM2.5 and PM10), which can be inhaled deep into the lungs and pose serious health risks, especially for those with respiratory conditions. Burning biomass releases carbon monoxide, that can lead to carbon monoxide poisoning when inhaled in high concentrations. Biomass burning can release VOCs, which can contribute to the formation of ground-level ozone and smog, leading to respiratory problems. These toxic compounds are produced during incomplete combustion of biomass and are known to be carcinogens. Ash from biomass burning can contain heavy metals such as lead, cadmium, and mercury, which can contaminate soil and water and have toxic effects on organisms. Certain organic pollutants, like dioxins and furans, can be formed during biomass burning and persist in the environment, potentially causing harm to humans and wildlife.

The ash itself can be toxic, especially if it comes into contact with water, leading to leaching of harmful substances into water bodies. The risks associated with exposure to these hazardous components depend on various factors, including the type of biomass burned, the combustion conditions, and the proximity of human populations to the burning areas. Vulnerable populations, such as children, the elderly, and individuals with preexisting health conditions, are at a higher risk of health impacts from exposure to ash from biomass burning. Wood ash has several potential applications in agriculture due to its nutrient content and alkaline properties. As found by Demeyer et al. (2001) wood ash is a good source of essential nutrients such as potassium (K), calcium (Ca), and magnesium (Mg). It can help improve soil fertility and structure when mixed into the soil. The calcium in wood ash can also help raise soil pH, making it less acidic. Wood ash is particularly rich in potassium (potash), which is an important macronutrient for plant growth. Potassium is essential for overall plant health, fruit development, and disease resistance. Wood ash has an alkaline nature and can be used to raise the pH of acidic soils, (Bang-Andreason et al. 2017). This is especially useful in areas with naturally acidic soils, as many crops prefer a slightly acidic to neutral pH range. Wood ash can be a valuable resource in agriculture when used judiciously to improve soil fertility, adjust pH, and supplement nutrients. However, careful application and monitoring are essential to reap its benefits without causing harm to the crops and the environment.

Rosnes and Vennemo (2012) found that the investment required to provide electricity to Sub-Saharan Africa would be between 160 to 215 billion US dollars over a 10 year period. Graeber et al. (2005) suggests that there are 6 areas which need reform in order to transform power access in Africa. He recommends firstly that underpricing must be corrected as well as subsidies. Secondly, he calls for smarter more agile electrification systems. Thirdly, the author calls for the reduction of inefficiencies in the state owned current electricity delivery. Fourthly, the author suggests reforms to allow for greater private sector participation within the context of clear regulatory environment, where the private sector can provide private equity and technical expertise. Fifthly, the author calls for hybrid power markets through the encouragement of private generation capacity. Lastly, the author suggests regional integration to reduce costs and enable other economic and political benefits.

The Stockholm Environment Institute has made interventions to provide access to clean and efficient cooking options with positive results in Mali, Ghana, and Ethiopia. The new and improved

stoves introduced in Mali save each household 340kg of charcoal per year, which represents 2.2 tonnes of would be $CO_2$ emissions. The new stoves in Ghana had a financial upside for households, with the new stoves households realized savings of 40GHC (roughly 27USD) which also means reduced coal use. The newly introduced ethanol stoves in Ethiopia significantly reduced CO2 emissions to below WHO recommended threshold. The ethanol used in the stoves was extracted molasses which is a by-product from large local state-owned sugar factories.

Valickova and Elms (2021) advocated for regional trade and integration to reduce the cost of electricity In Southern Africa. They found that trade has the potential to reduce the generation cost by over 8 billion USD in the period 2019-2030. Bowen et al. (1999) further expounded on the need for electricity trade in Africa. They presented a model for electricity trade in the Southern African Power Pool(SAPP). In West Africa, Gnansounou et al. (2007) suggested a stage by stage basis reform of competition for electricity production in the region. Starting with the resuscitation of the generation and transmission infrastructure already existing in the region. The potential benefits and challenges of expanding grid electricity in Africa was reviewed by Bos et al. (2018). They found the challenges faced when connecting to the grid to be the timing of connection and various barriers such as connection fees and the lack of understanding of the billing systems. They also looked at the potential benefits such as an increased energy use, cooking and fuel use replacing biomass fuels, education benefit for children by enabling them to study for longer at evening time, health benefits with the powering of hospitals, increased business and economic well-being.

# 3. Methods

In the frame of this paper we will look at the situation in Kenya. The interesting case about Kenya is that it banned trophy hunting unlike the many East and Southern countries in which trophy hunting is allowed and realized a significant boost in their economy as it is shown in the literature Bohne (2008), Saymaan et al. (2018). Due to overshooting and corruption Kenya banned trophy hunting in 1977 instead of solving the problems and coming up with solutions. As a result Kenya lost out on approximately USD 20-40 million of revenue per year, and with a loss of 70% of its wildlife, Lindsey (2008).

From this approximated lost revenue we will make basic calculations estimating the lost jobs. We will use South Africa as a reference drawing on the economic impact of trophy hunting in the South African wildlife industry (Saayman, M. van der Merwe, P., & Saayman, A et al., 2018). We depict the total impact of income from trophy hunting in South Africa on employment and household income. These are revenues from the 2015-16 hunting season. This study shows that South Africa gained USD 370 million (equivalent to roughly 5 billion ZAR) in the 2015/16 hunting season.

Using the data from the South African example we will do calculations to estimate how the 40 million USD that Kenya would have realized, could have been distributed and contributed to job creation and household income in many different sectors of the economy as shown in the South African context. For the purposes of the calculation we consider the various sectors of industry shown in the South African study to be also applicable in Kenya, which should make the calculations justifiable.

To get the total labour in each sector of the economy we use the labour multipliers. If the Direct impact, Indirect impact and Induced impact are available it would be possible to find the specific labour multipliers for each sector in Kenya using the I-O framework. For the purposes of this calculation as well we will use the labor multipliers from South Africa(Saayman, M. van der Merwe, P., & Saayman, A et al., 2018). The labour multiplier used for the South African case should be applicable to Kenya as Dwyer, L et al.(2015) notes the I-O multiplier is reasonable in economies with high unemployment and small capital constraints.

As in Namibia, (Birch 2017), had a Game Products Trust Fund (GPTF) so might have been formed in Kenya also, and funds could have been similarly invested into wildlife conservation, community conservation and rural development programs. It is estimated by the Namibian Business Express that Namibian wildlife trophy hunting generates 227 million Namibian dollars (12 million USD) annually, of which 10% (22 million Namibian dollars) according to conservation Namibia is given to the GPTF. The 10% to the GPTF in Kenya would equate to 4 million USD from the lost 40 million USD in revenue due to the ban. Looking at the allocation of the funds by the GPTF in Namibia we can calculate how much could have been invested in Kenya.

Through the literature we have already established the correlation between urbanization and increased standard of living. For urbanization we will simply just compare through tables and data the level of urbanization in developed regions of the world and Africa. Then we will compare how those much more urbanized region have fared in biodiversity conservation. We will do this by assessing their EPI score( Environmental Performance Index). The Environmental Performance Index is a data driven summary of the state of sustainability across the world. It ranks 180 countries on climate change performance, environmental health, and ecosystem viability by using 40 performance indicators across 11 issue categories. What the EPI score gives us is an overall indication of which countries are best addressing the environmental challenges that each country is facing.

We will look at the highest performing countries by GDP per capita. The GDP per capita is considered the best indicator for country's standard of living. With the findings of the Environmental Protection Index score and rank with GDP per capita rankings we can look to see if

there is correlation and what that implies. Although correlation does not always mean causation. With the literature some facts have been established in relation to the causal relationship between urbanization and improved standards of living.

# 4. Results

## 4.1 Impact on production

Trophy hunting has been banned in Kenya since 1977. The Kenyan economy could have gained potentially 40 million USD per year dating back from 1977 (Lindsey et al.,2007). It would be difficult to estimate how the additional 40 million (5974 million Kenyan Shillings) could have impacted the economy. Luckily there is a quite comprehensive study of the economic impact by trophy hunting in South Africa in the 2015-16 hunting season.

We found that trophy hunting had an economic impact totaling 5389,516 million ZAR (287 million USD) distributed across various sector of the South African economy. For example the Agricultural industry gained 1961,654 million ZAR (roughly 104 millions USD) from trophy hunting in the hunting season. The percentage distribution for each impacted industry give us direction on how the 40 millions USD could have been distributed across the same industries in the Kenyan economy. Using the percentage distributions in South Africa we use those percentages to calculate how much each industry would have gained in the Kenyan economy.

The total impact the 40 million USD would be across the different sectors of the Kenyan economy is shown (Table 1). The agricultural industry with its 36,4% percentage distribution would stand to gain 14,56 million USD (5974 million KES). The mining, manufacturing, electricity and water industries gaining 920 000 USD (137,4 million KES), 6,240,000 USD( 931,944 million KES) and 680,000 USD (101,558 million KES) respectively. Again, it is worth mentioning that the percentage distribution for each industry is not a precisely calculation as would be in the case of Kenya but an approximation based on the actual distribution in a country quite similar, that is South Africa.

Table 1: How the economic impact would be across the sectors of the economy in Kenya
*( Source: Own calculations)*

| **Total 40 million USD = 5974 million Kenyan Shilling** | | |
|---|---|---|
| Agriculture | 36,4% | **14,560,000 = 2174,536 million Kes** |
| Mining | 2,3% | **920,000 = 137,4 million Kes** |
| Manufacturing | 15,6% | **6,240,000 = 931,944 million Kes** |
| Electricity and Water | 1,7% | **680,000 = 101,558 million Kes** |
| Construction | 1,1% | **440,000 = 65,714 million Kes** |
| Trade, Accomodation, Catering | 8,9% | **3,560,000 = 531,686 million Kes** |
| Transport and Communication | 15,1% | **6,040,000 = 902,074 million Kes** |
| Financial and business services | 9,3% | **3,720,000 = 555,582 million Kes** |
| Government | 4,6% | **1,840,000 = 274,804 million Kes** |
| Personal and Social services | 5,0% | **2,000,000 = 298,7 million Kes** |

## 4.2 Impact on employment

The results of the calculations from Table 1 give the total distribution in each sector of the Kenyan economy. With the total distribution in each sector we can calculate the total jobs created as an increase in production and implies that more people must be hired. The total labour is found from multiplying each million gained in total production with the labour multiplier. This means that in the sector of Agriculture for example each KES million in total production creates 4,16 jobs.

The results show that the agricultural sector would be the biggest provider of new jobs as an additional 9046 jobs would be created due to the 2174,536 million Kenyan shillings(KES) total production. While the mining, manufacturing and electricity and water sectors would provide a combined additional 1,099 jobs, with each of the sectors accounting for 65, 997 and 37 jobs respectively. As a result, the total number of jobs the Kenyan economy lost due to the ban on trophy hunting equals 19,573.

Table 2: Jobs that would be created in Kenya if source were available from trophy hunting
*( Source: Own work)*

| **Sector** | **Total production (Kes million)** | **Multiplier** | **Total labour** | **Percentage** |
|---|---|---|---|---|
| **Agriculture** | 2174,536 | 4,16 | 9046 | 46,2% |
| **Mining** | 137,4 | 0,47 | 65 | 0,3% |
| **Manufacturing** | 931,944 | 1,07 | 997 | 5,1% |
| **Electricity and Water** | 101,558 | 0,63 | 37 | 0,3% |
| **Construction** | 65,714 | 5,54 | 364 | 1,9% |
| **Trade, Accomodation, Catering** | 531,686 | 8,02 | 4264 | 21,7% |
| **Transport and Communication** | 902,074 | 1,96 | 1768 | 9% |
| **Financial and business services** | 555,582 | 2,58 | 1433 | 7,3% |
| **Government** | 274,804 | 2,96 | 813 | 4,1% |
| **Personal and Social services** | 298,7 | 2,63 | 786 | 4,0% |
| **Total** | **5974** | | **19573** | **100%** |

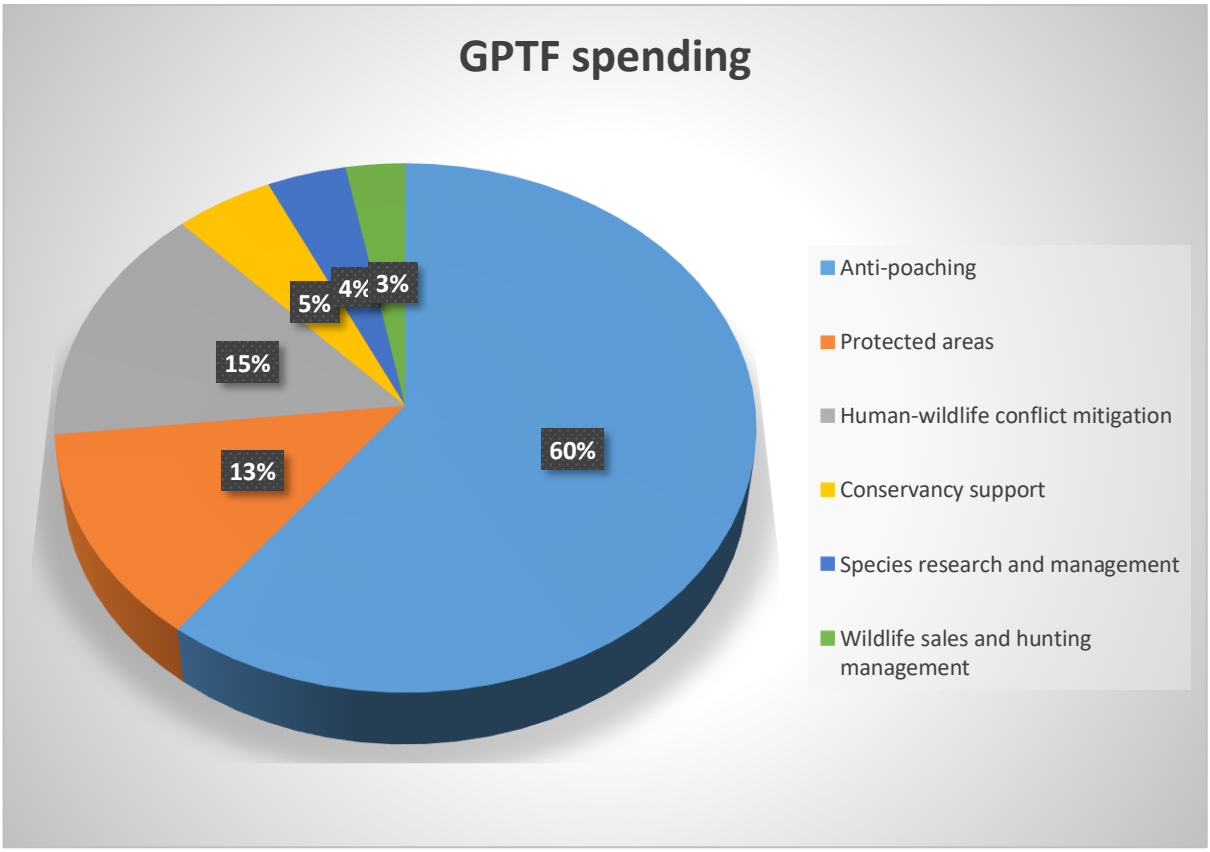
### 4.3 Game Products Trust Fund (GPTF): Kenya

If Kenya had established a Game Products Trust Fund (GPTF) similar to Namibia's, and if trophy hunting revenue was available and similar in structure, we can draw the following hypothetical allocation of funds from trophy hunting in Kenya. The funds could have substantial impacts on various conservation efforts. With 4 million USD estimated to be the 10% contribution to the GPTF from the 40 million USD revenue (which is currently not realized due to the ban), we can anticipate the following allocations based on the Namibian model:

Anti-Poaching Initiatives get the largest portion, 61% of the GPTF or 2.44 million USD, and would be dedicated to combating poaching. This suggests a strong prioritization of protecting wildlife from illegal hunting.Protected Areas Maintenance with 13% of the GPTF or 520,000 USD. This amount would be used for the upkeep of areas designated for wildlife conservation. This is critical for the preservation of habitats and the well-being of the wildlife within them. Human-Wildlife Mitigation Efforts is meant to address the conflicts that arise between human settlements and wildlife, which is often a significant issue in conservation areas, would get 15% of the GPTF or 600,000 USD would be allocated here.

Conservancy Support gets a smaller portion, 5% or 200,000 USD, that would be provided to support conservancies, which are crucial for protecting biodiversity and supporting sustainable use of natural resources. Species Research and Management with 4% of the GPTF funds, which would be important for ongoing research to inform conservation strategies and understand wildlife dynamics. Wildlife Sales and Hunting gets the smallest allocated portion, 3%, and suggests a lesser but still significant investment in sustainable hunting and wildlife trade that can support conservation if it is managed effectively.

Figure 1: How the Game Products Trust Fund could have been allocated annually
*( Source: Own work)*



## 4.4 Urbanization

The level of urbanization is different across the world (Figure 2). Upon careful observation it is discernible that the most urbanized areas are in the western hemisphere and the least urbanized region are mostly in Sub-Saharan Africa and India. In fact, almost all of Sub-Saharan Africa is less than 50% urbanized while almost all of the western world is more than 70% urbanized.

Figure 3, shows us the projected population in Africa leading up to 2050. It also shows us the projected rise in urbanization in Africa leading up to 2050. We find that as the population will rise in Africa so will the urbanization. We see that the population in Africa is expected to reach 2,5 billion by 2050 while urbanization in Africa is expected to go above 50% by 2050.

Figure 2: Share of people living in urban areas across the world. *(Source: Our World in Data)*

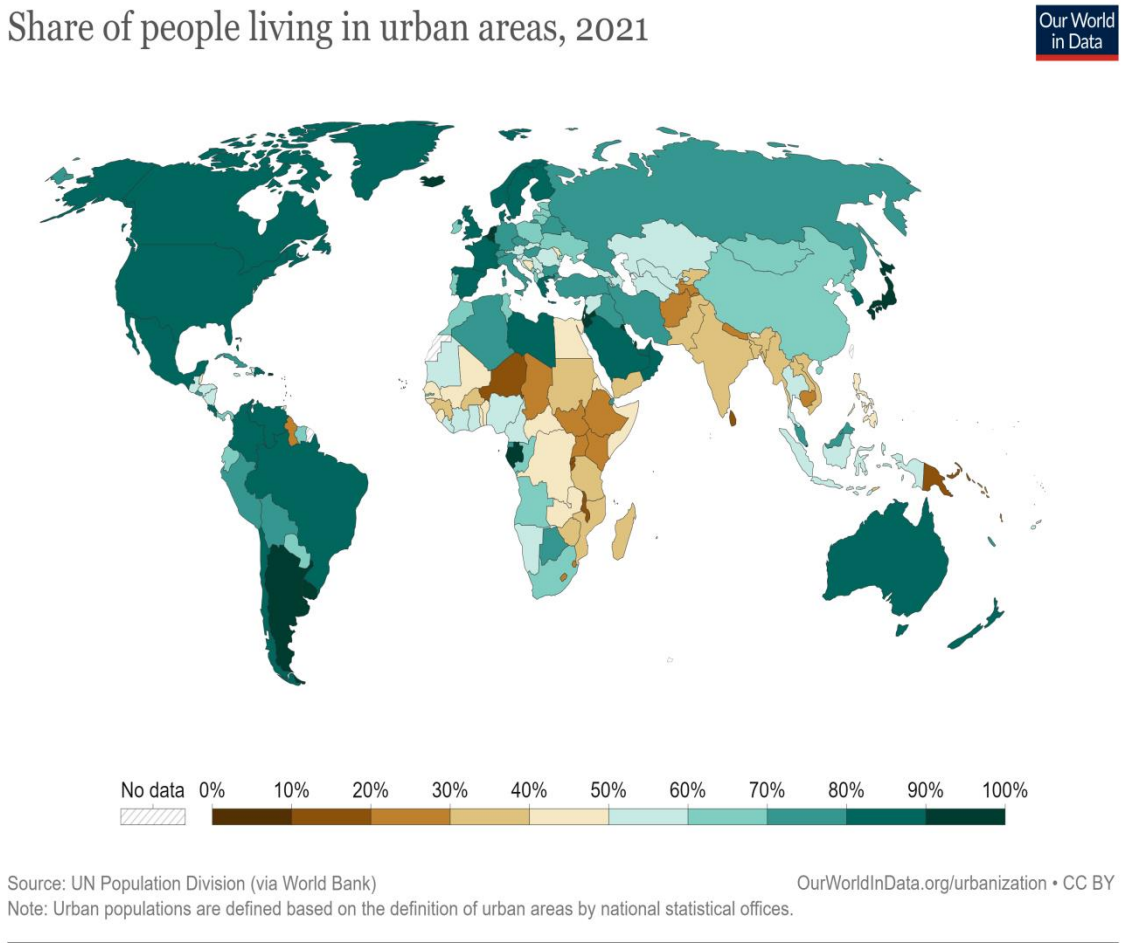
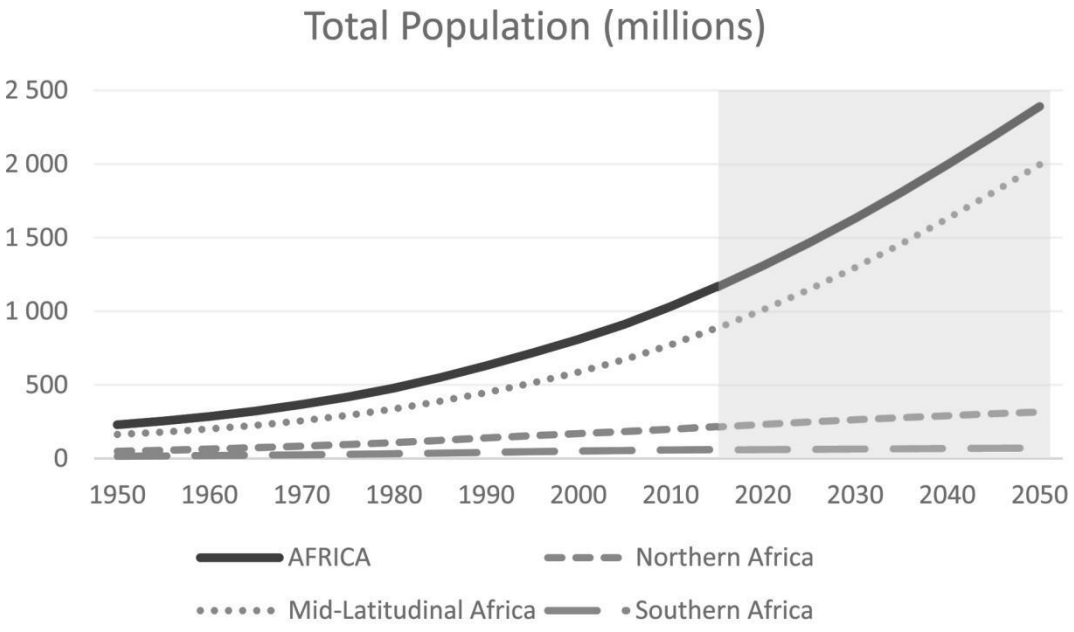
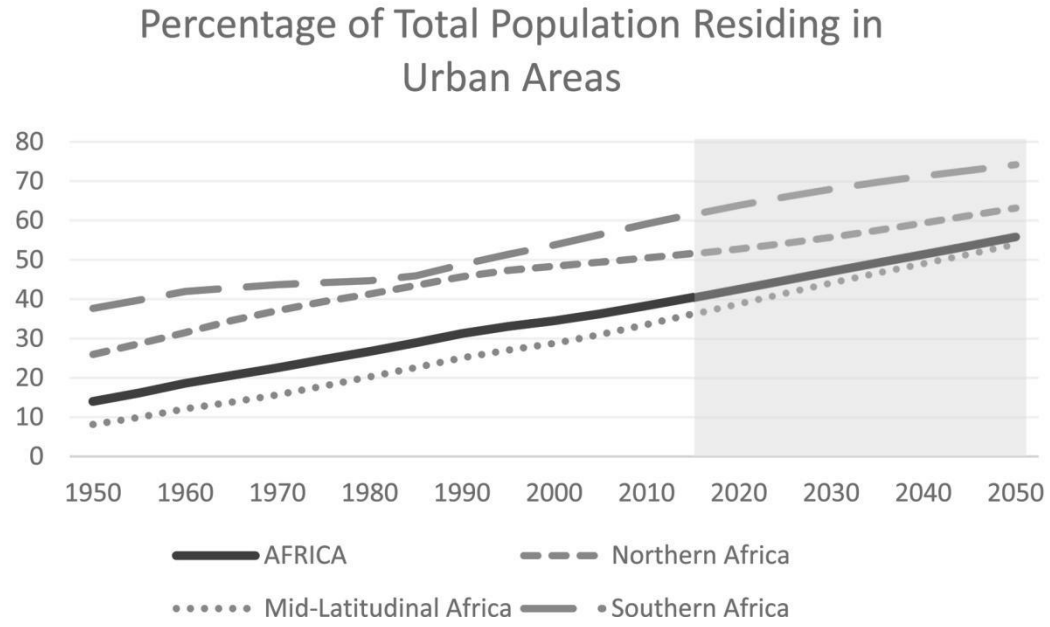


Figure 3: Projected population and urbanization in Africa leading up to 2050.
*(Source: Our World in Data)*




(a)




(b)

It is clear that Sub-Saharan Africa and countries in the western hemisphere are on the different spectrum of urbanization. Table 3 shows us the top 20 countries by GDP per capita. We find that all the top 20 countries are all having a light to dark shade of blue in Figure 2. This means that the top 20 countries by GDP per capita have an urbanization of at least 60%. Through these findings we can deduce that there is direct relationship between prosperity and urbanization. South Africa saw the urban population surpass the rural population in the 1980s, and more urbanization is projected with a shrinking rural population (Figure 4)

Figure 4: Percentage proportion of urban and rural in South Africa, and Urban and rural population. *(Source: Businesstech.co.za)*

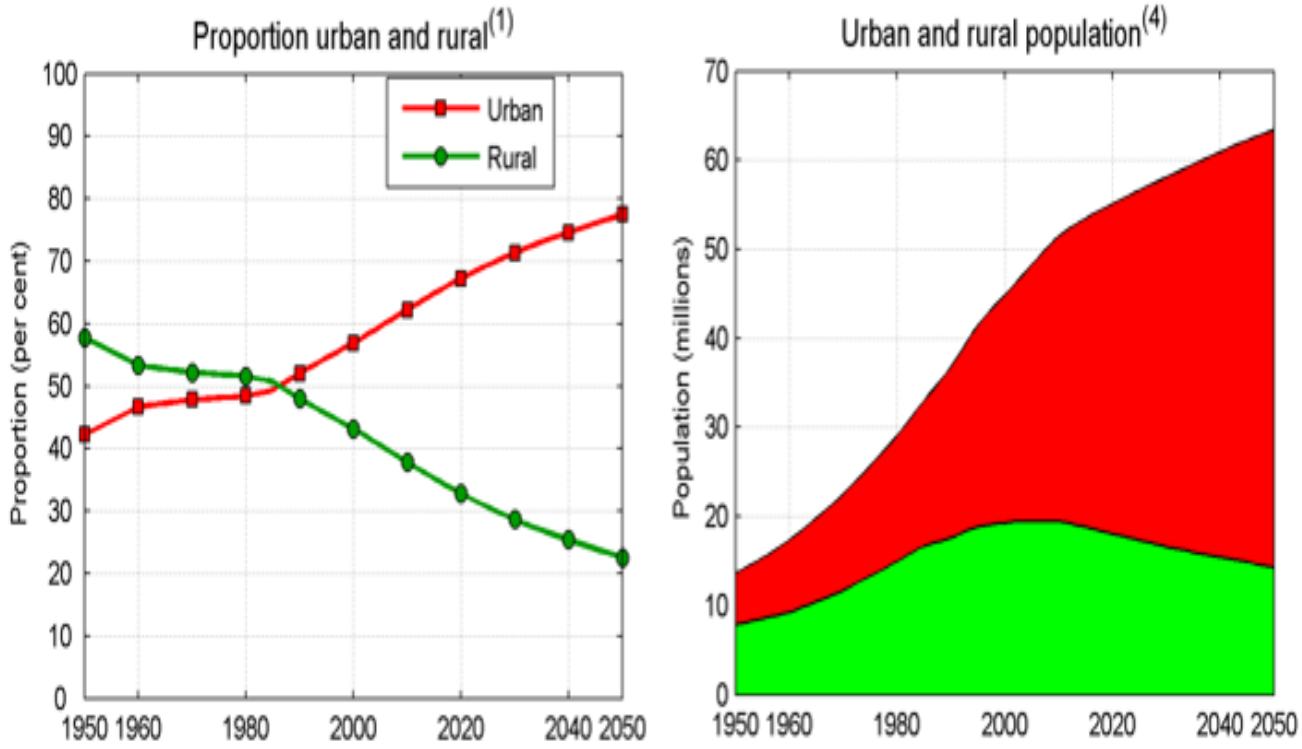


Table 3: Top countries by GDP per capita: the first 20.
*(Source: World Data Atlas)*

| Rank | Country | GDP per capita 2021 (US Dollars) |
|---|---|---|
| 1 | Luxembourg | 136,701 |
| 2 | Ireland | 100,129 |
| 3 | Switzerland | 92,249 |
| 4 | Norway | 89,042 |
| 5 | Singapore | 72,795 |
| 6 | Iceland | 69,422 |
| 7 | United States | 69,227 |
| 8 | Qatar | 68,622 |
| 9 | Denmark | 68,202 |
| 10 | Australia | 63,464 |
| 11 | Sweden | 60,816 |
| 12 | Netherlands | 57,997 |
| 13 | Finland | 53,774 |
| 14 | Austria | 53,332 |
| 15 | Israel | 52,152 |
| 16 | Canada | 52,015 |
| 17 | Belgium | 51,849 |
| 18 | Germany | 51,238 |
| 19 | San Marino | 50,196 |
| 20 | Hong Kong | 49,865 |

Next we seek to find a relationship between level of development of a country with its environmental protection performance. Table 4 shows the EPI rankings of 2022. Denmark tops the ranking followed by the United Kingdom and Finland. In fact, the top 10 spots are occupied by countries from the more urbanized parts of the world. The highest ranked country from Africa outside of the Seychelles archipelago is Botswana at number 33. Interestingly, Botswana is one of the more urbanized countries in Africa as shown in Figure 3 with 70% urbanization.

Table 4: EPI (Environmental Performance Index) Rankings of 2022: Top 15
*(Source: epi.yale.edu)*

| Rank | Country | EPI Score |
|---|---|---|
| 1 | Denmark | 77.90 |
| 2 | United Kingdom | 77.70 |
| 3 | Finland | 76.50 |
| 4 | Malta | 75.20 |
| 5 | Sweden | 72.70 |
| 6 | Luxembourg | 72.30 |
| 7 | Slovenia | 67.30 |
| 8 | Austria | 66.50 |
| 9 | Switzerland | 65.90 |
| 10 | Iceland | 62.80 |
| 11 | Netherlands | 62.60 |
| 12 | France | 62.50 |
| 13 | Germany | 62.40 |
| 14 | Estonia | 61.40 |
| 15 | Latvia | 61.10 |

Connecting the EPI rank with the GDP per capita rank of different countries of the world further magnifies the link between prosperity and environmental protection. In Table 5, we see that the most urbanized region which is the global western hemisphere occupies the first 5 spots of the Environmental Performance Index rank, and all the five countries are also in the top 30 countries in terms of GDP per capita. In contrast, countries in Sub-Saharan Africa are not found in the top 30 of the EPI ranking and in the top 50 countries by GDP per capita rankings. It is important to remember that Sub-Saharan Africa is the least urbanized region of the world.

Table 5: Global West GDP values and EPI (Environmental Performance Index) rankings *(Source: Own work)*

| Country | EPI Rank | GDP per capita |
|---|---|---|
| Denmark | 1 | 9 |
| United Kingdom | 2 | 22 |
| Finland | 3 | 13 |
| Malta | 4 | 30 |
| Sweden | 5 | 11 |

Table 6: Sub-Saharan Africa GDP values and EPI (Environmental Performance Index) rankings *(Source: Own work)*

| Country | EPI Rank | GDP per capita |
|---|---|---|
| Seychelles | 32 | 57 |
| Botswana | 35 | 85 |
| Sao Tome and Principe | 38 | 142 |
| Namibia | 44 | 106 |
| Gabon | 51 | 76 |

Table 7: Worst overall in EPI (Environmental Performance Index) comparing with GDP per capita. *(Source: Own work)*

| Country | EPI Rank | GDP per capita |
|---|---|---|
| India | 180 | 143 |
| Myanmar | 179 | 160 |
| Vietnam | 178 | 125 |
| Bangladesh | 177 | 138 |
| Pakistan | 176 | 156 |

The worst performing countries in the Environmental Protection Index are Pakistan, Bangladesh, Vietnam, Myanmaar with India occupying the last spot. None of these countries are from the African continent but observing the performance in EPI and GDP per capita further elucidates the link between environmental protection and prosperity. These countries are also ranked lowly in GDP per capita. None of them are in the top 100 with the highest ranked in GDP per capita terms being Vietnam ranked at 125 while ranked at 178 in the EPI, which is third from bottom.

# 5. Discussion

Trophy hunting can contribute to the economy in certain circumstances, but its ethical and ecological implications need to be carefully considered. Trophy hunting can provide jobs to local communities, including guides, trackers, cooks, and other support staff. This can contribute to reducing poverty and increasing economic stability in some areas.

As it is quite evident that trophy hunting is an important contributor to the South African economy, so it is vital that its potential is recognized in other African countries. It could be said that a country like Kenya stands so much to benefit from legalizing trophy hunting. The agricultural sector is the major beneficiary from trophy hunting. The results show that the Kenyan agricultural sector would have an additional 14,56 million USD of the 40 million USD the Kenyan economy would benefit from trophy hunting. The agriculture sector's sizable share is not a surprise as various studies show the substantial link between agriculture and tourism. Keeping in mind that trophy hunting is essentially tourism with the added incentive of hunting for sport.

The link between agriculture is particularly observable in developing economies because they usually tend to have large agrarian populations whose livelihoods are highly dependent on farming. The link between agriculture and tourism is multifaceted and plays a crucial role in the development of rural and agrarian regions. This connection is often referred to as "agritourism" or "agricultural tourism." Tourists are increasingly interested in gaining a deeper understanding of the food they consume and the rural way of life. Visiting farms and agricultural regions allows tourists to learn about the cultivation of crops, livestock farming, and traditional practices.

The results show that close to 20 000 jobs could be created in Kenya if trophy hunting as an industry would have not been banned. This is a significant number of jobs to look past. What these results show is that trophy hunting has the potential to provide so many jobs in Kenya.

The calculations were derived from the South African trophy hunting industry which is the most robust and advanced trophy hunting industry in the African continent. This means that other African countries have potential to implement improvements in their trophy hunting industries and realize greater levels of employment.

The results do not show the full potential of employment opportunities in Kenya since they do not take into account the wildlife sector itself. Through the expansion of trophy hunting there are additional jobs created in the wildlife industry such as hunting guides, game reserve workers, taxidermists, etc.

The creation of a GPTF could potentially have a positive impact on wildlife conservation efforts in Kenya by providing significant financial resources. This could improve anti-poaching measures, enhance the maintenance of protected areas, mitigate human-wildlife conflicts, support conservancies, and fund important research and management of species. The revenue from such a trust fund could also contribute to rural development programs, which might be particularly important for communities living in proximity to wildlife areas who may bear the costs of human-wildlife conflict or whose economic opportunities are limited by conservation efforts.

The potential benefits outlined might inform discussions on the current ban on wildlife trophy hunting in Kenya. If policymakers are considering similar funding mechanisms, the Namibian model could serve as a case study for the potential benefits and allocation of such funds. In drawing these conclusions, it is essential to note that they are based on hypothetical scenarios where Kenya would have the same revenue from trophy hunting as Namibia, and similar governance structures and efficiency in allocating and using these funds. The actual results could vary significantly based on a multitude of factors including governance, transparency, community engagement, and the specifics of the wildlife tourism and hunting industries in Kenya.

## Urbanization

The population in Africa is projected to reach 2,5 billion by the year 2050. The rise in population is expected to coincide with a rise in the rate of urbanization in Africa. The African continent is currently the least urbanized continent. The most urbanized countries are in the global west and Australia. GDP per capita is often considered as an indicator of a country's standard of living. The countries with the highest GDP per capita are some of the most urbanized in the world. Cities are the centres of economic development. The agglomeration of resources is the major reason why cities are the drivers of economic development.

The Environmental Performance Index is an important source of finding the countries that are doing best in addressing the environmental challenges that they are facing. The rankings show the similar pattern as GDP per capita in relation to urbanization levels. That is, the countries ranked the highest in the Environmental Protection Index are also the ones with the higher levels of urbanization. African countries in particular do not crack the top 20 of the Environmental Protection Index. African countries also do not crack the top 20 in GDP per capita. This indicates that poor countries are not doing well in environmental protection and the richer countries do a better job of protecting the environment.

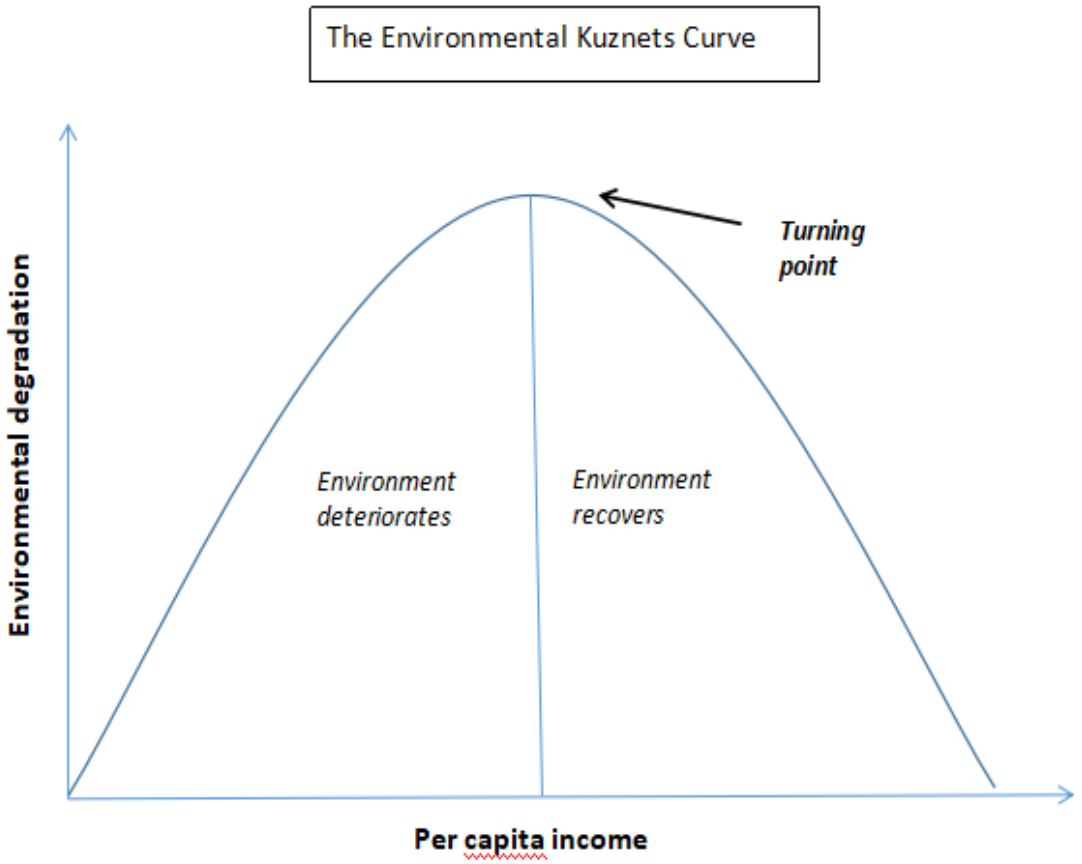
The results could be best represented by the concept behind the Environmental Kuznets Curve(EKC), Dinda (2004). The Environmental Kuznets Curve (EKC) is a hypothesized relationship between environmental degradation and income levels or economic development. Named after the economist Simon Kuznets, the EKC suggests that as an economy develops, environmental degradation and pollution will initially increase, but after reaching a certain level of income (or development), the trend will reverse, leading to a decline in environmental degradation. The EKC can be visualized as an inverted U-shaped curve. At low levels of income, economic growth leads to increased environmental degradation. This is because, in the early stages of development, industries might prioritize growth over environmental protection. There could be lack of awareness, regulations, or technology to mitigate environmental harms. As income continues to grow, there's a point at which the rate of environmental degradation starts to slow and eventually declines.

At higher levels of income, the level of environmental degradation begins to decrease. Wealthier societies might demand better environmental quality and hence enforce stricter environmental regulations. Developed economies often have access to cleaner technologies. As economies grow, there might be a shift from manufacturing-based economies (which might be more polluting) to service-based economies. Higher income might lead to better education and increased awareness about environmental issues.

The existence, shape, and turning points of the EKC can vary depending on the specific environmental indicator studied, the region, and the time period. In policy discussions, the EKC is sometimes used to argue that economic growth will eventually lead to environmental improvements. However, relying solely on the EKC can be problematic as it might lead to complacency regarding the need for proactive environmental policies, especially in the early stages of economic development.

Figure 5: Environmental Kuznets Curve.

*(Source: Own Work)*




The Environmental Kuznets Curve is further supported the curve of Carbon intensity of GDP and the curve of Emissions per capita. These curves are measured from 1800 to 2019. What is encouraging from an environmental perspective is that each wave of economic development is emitting less $CO_2$ in their path to economic development than the last (Figure 6). This can be explained by the growth of knowledge in science and technology which allow for more efficiency and less waste in the use of natural resources. For instance we also find that nations like Netherlands, France, Sweden and the United Kingdom who are among the more advanced agriculture industries have a decreasing fertilizer use since the 1980s (Figure 7). Perhaps what should be advocated for is more investment in science and technology and the quick transmission of the latest technology and methods to developing African countries to enable them to produce more to free themselves from poverty while having a reduced impact on the environment.

Figure 6: Emissions per capita and Carbon intensity of GDP for countries in different stages of development..
*(Source: Our World in Data)*

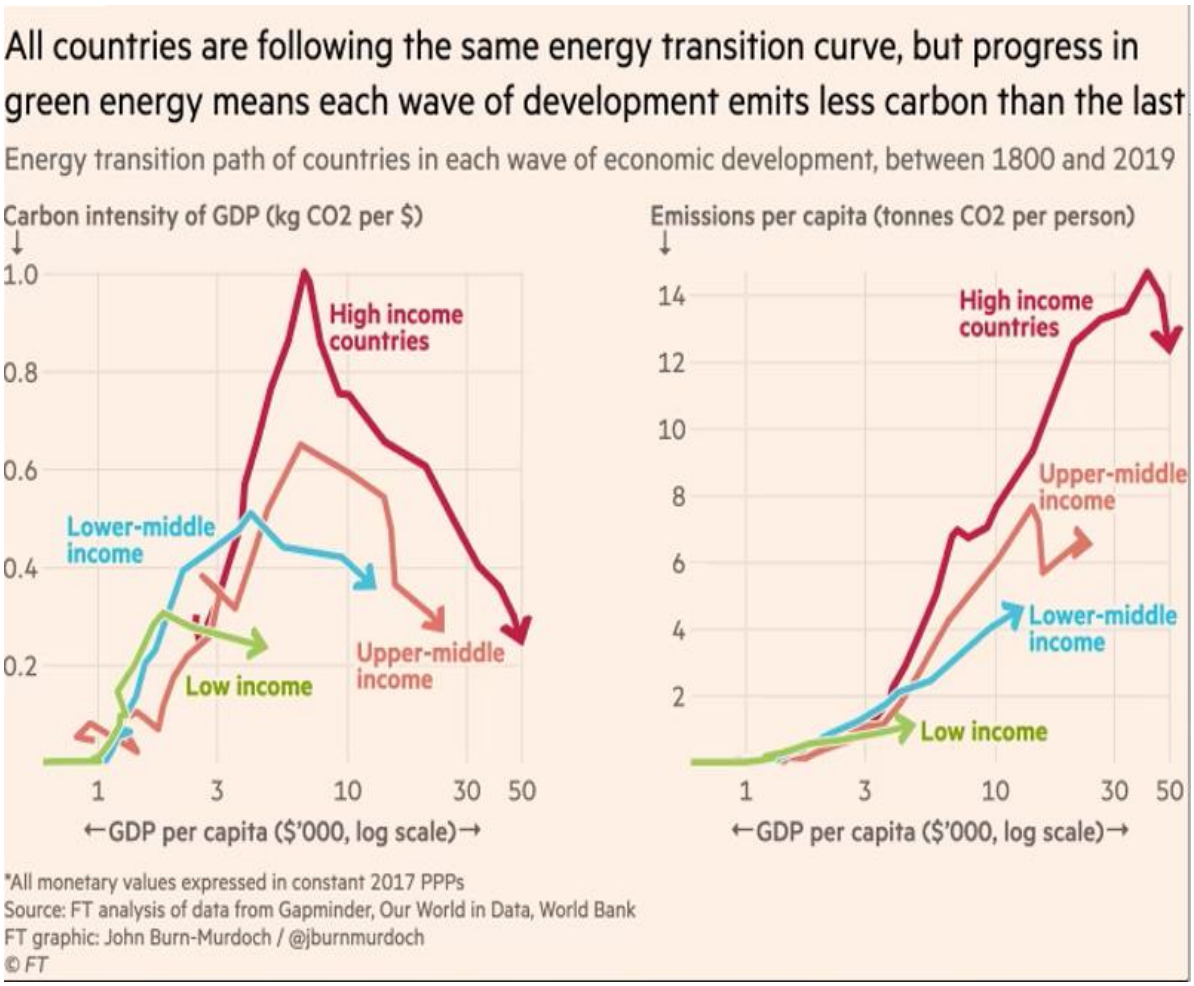
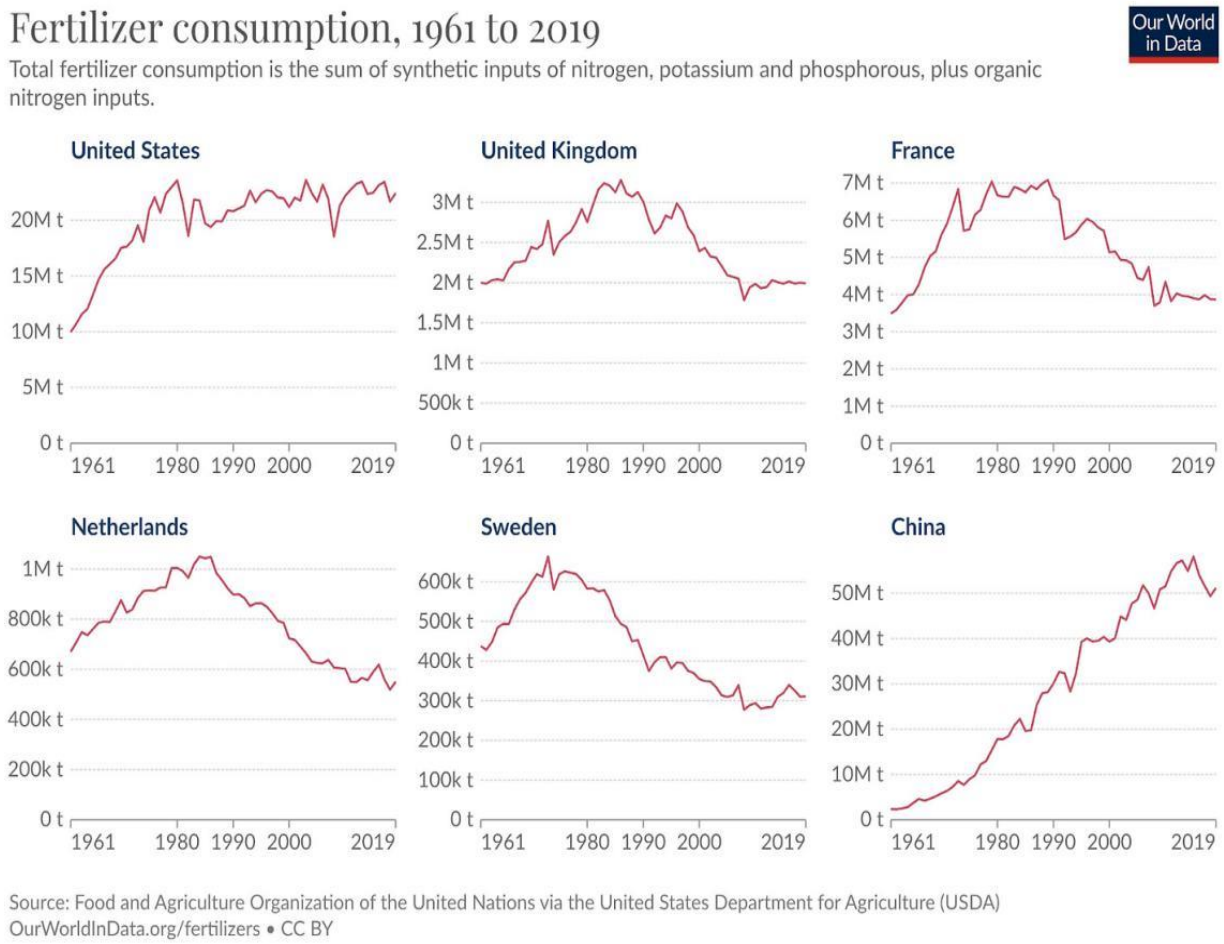


Figure 7: Fertilizer use in selected nations.
*(Source: Our World in Data)*



## 5.1 Further discussion on Trophy Hunting

One of the most important organizations is the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Its only aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species. Along with the Internatinal Union for Conservation of Nature (IUCN) the CITES has become a global authority on conservationand the status of the natural world. In fact the IUCN under the IUCN SSC (2012) acknowledges sustainable trophy hunting as an important conservation tool which provides livelihoods, incentives for habitat conservation and provides profits which can be invested for conservation purposes.

Sustainable trophy hunting is possible through species-specific quotas which are set annually. The perfect example of a country practicing sustainable trophy hunting is Namibia. The ministry of Environment in Namibia "sets qoutas and issues permits for trophy hunting. Old males are usually targeted and when hunting flagship or protected species such as the Black rhino, elephant and lion, the individual animal is selected. These are often 'problem' animals that have been aggressive towards people, or destructive of property, or pose a risk toward other wildlife."

In Namibia, revenues from trophy hunting go to the Game Products Trust Fund (GPTF). The GPTF invest the funds exclusively in wildlife conservation, community conservation and rural development programs. It is important to note that there often isn't enough funding for biodiversity conservation. In 2012-13 trophy hunting raised a total of 57 Namibian dollars (roughly 4 million USD). Of which 39 million of the 57 million was allocated to the GPTF. The GPTF used those funds for various conservation projects such as anti-poaching and wildlife protection, mitigating human-wildlife conflict, and water supply infrastructure.

The total area dedicated to conservancies in Namibia is more than 200 000 $km^2$. This includes state protected areas, tourism concessions and community forests. These conservancies are major beneficiaries of the trophy hunting industry.

Legislative changes in the 1970s in Namibia allowed freehold farmers to have economic rights over wildlife. This allowed them to profit from hunting and sales of live game and meat. These rights were further extended to rural communities under the Community Based Natural Resource Management (CBNRM) programme. During the same period of the 1970s Kenya out-rightly banned trophy hunting as I mentioned. What has been the result? Let us look at elephants for example, the largest land mammal in the world and perhaps the most coveted trophy hunt.

Viljoen (1987) examining the distribution of elephants in the Kaokoveld region in South West Africa/Namibia, and estimated the elephant population in Namibia to be between 700 and 800. Since 1990, Craig et al. (2021) found an increase in elephant population at a rate between 4,2% to 6,5% per annum. The Kenya Wildlife service celebrating World Elephant Day on the 12$^{th}$ of August 2023, estimated the elephant population in Kenya in the 1970s to the early 1980s to have been as high as 170,000. The worldostats made an estimation on elephant population by country in 2023. Namibia is estimated to have an elephant population of 25,000. Kenya is estimated to have an elephant population of 36,000 as of 2023. To put it in perspective Namibia has seen an elephant population increase of between 31 to 35 fold. While Kenya has seen an elephant population decline of 79%.

There are various explanations for Kenya's elephant population decline of which trophy hunting is not one of them since it was banned in 1977. Is trophy hunting the main cause of the elephant population surge in Namibia? Perhaps not. But the funds from the Game Products Trust Fund (GPTF) surely have played a role in fighting the poaching of elephants and mitigating elephant-wildlife conflict which are some of the major causes of deaths for wildlife.

The Namibia nature foundation thus concludes “The triple benefits of community livelihoods, wildlife conservation, and the maintenance of natural ecosystems could be put at risk by international pressure to restrict trophy hunting or the import of trophies, which would discourage hunting and/or reduce the willingness to pay for hunting in Namibia. This would result in loss of income and jobs for some of the poorest communities in Namibia, reduce funding for conservation, have the perverse incentive of encouraging poaching and illegal killing of wildlife, and put at threat millions of hectares of communal and commercial conservancies”.

# 6. Conclusion

The primary aim of this paper was to discuss viable ways on how to improve the living standards in Africa, the role of trophy hunting income, while ensuring nature conservation. To increase their standard of living humans must disturb natural conditions. The two objectives which is nature conservation and economic development seem to be at odds and thus present a challenge. We looked at how trophy hunting contributes to the betterment of communities in economic terms and overall safety. We looked at how the lack of electricity access has led to biomass use which has led to the degradation of lands. We will also discussed how nature conservation can be achieved in spite of the urbanization of Africa that is expected to occur in the coming decades.

In this work we find that trophy hunting is a big component of the economy in many countries in Africa. Trophy hunting has considerable Economic Incentives for the southern and eastern African region. Trophy hunting can generate significant revenue for conservation efforts and local communities. Hunters pay substantial fees for permits and licenses, which can fund habitat preservation, anti-poaching efforts, and community development projects. This financial incentive can provide an economic alternative to other land uses that may harm wildlife and habitats.

However, there is a lack of consensus regarding the possibility of trophy hunting to serve as a tool for conservation in Africa. One thing is certain, many African countries, therefore Africa as a whole enjoy a comparative advantage over the industry. It would therefore be folly to abandon it in a developing continent in need of significant economic stimulation.

Africa has been experiencing rapid urbanization, with its urban population growing at a faster rate compared to other regions. This trend is expected to continue as rural-to-urban migration and natural population growth in cities persist. Africa has one of the fastest-growing populations in the world. The United Nations projected that by 2050, Africa's population could double, with a significant portion of this growth occurring in urban areas.

It is clear that Sub-Saharan Africa and countries in the western hemisphere are on the different spectrum of urbanization. The top 20 countries by GDP per capita have an urbanization of at least 60%. Through the findings we can deduce that there is direct relationship between prosperity and urbanization. Enlisting the help of the Environmental Protection Index rank with the GDP per capita of different regions of the world magnifies the link between prosperity and environmental protection. The most urbanized region which is the global western hemisphere occupies the first 5 spots of the Environmental Protection Index rank and all the five countries are also in the top 30 countries in terms of GDP per capita. In contrast, countries in Sub-Saharan Africa which are the least urbanized, are not to be found in the top 30 of the EPI ranking and in the top 50 countries by GDP per capita rankings.

Overall the conclusion that can be drawn is that economic prosperity precedes a country’s ability to protect and conserve its nature. Therefore Africa must be pro-human in its approach to nature conservation by prioritizing economic development and prosperity and consequently the continent will see better nature conservation.

## Summary

Africa is renowned for its diverse wildlife, including some of the most iconic and largest species in the world, such as lions, leopards, giraffes, cheetahs, hippos, and rhinos. These animals are emblematic of the continent's rich biodiversity and play a crucial role in conservation efforts. South Africa, in particular, is celebrated for being a prime spot to see the 'Big Five': lions, leopards, rhinos, elephants, and buffaloes. However, the continent's megafauna is not limited to one country and can be found across other nations including Botswana, Tanzania, Kenya, Namibia, the Democratic Republic of the Congo, Rwanda, Zambia, Uganda, and Zimbabwe.

Despite this natural wealth, the management of wildlife and game reserves in Africa faces significant hurdles, especially concerning the relationship with local communities. Studies have indicated issues such as animals wandering out of reserves into human settlements. This can lead to dangerous encounters between humans and wildlife, sometimes resulting in the death of either party. Additionally, there is the challenge of poaching, driven by economic necessity or for sustenance, within local communities that often face poverty and are experiencing rapid population growth. These complex issues highlight the need for effective wildlife management strategies that address both conservation and community well-being.

The conservation practices of South Africa, Namibia, and Tanzania align with the International Union for Conservation of Nature (IUCN) principles regarding trophy hunting. The IUCN emphasizes that trophy hunting can be a conservation tool if it involves detailed assessments of wildlife populations and meticulous monitoring of hunting activities. These assessments should lead to the development of well-informed hunting quotas and management strategies, ideally with the inclusion of local community participation and traditional ecological knowledge to ensure the accuracy and scientific integrity of the wildlife data collected.

Furthermore, the IUCN recommends a dynamic management system for hunting quotas, allowing for adjustments based on the latest data from resource assessments and hunting statistics. Such a system is vital for adapting to environmental changes, whether they be natural fluctuations or those caused by human impact.

Lastly, the organization advises that trophy hunting should operate under laws and regulations that are not only explicit and transparent but also periodically updated to reflect new insights and conditions. The establishment of these regulations should ideally involve the local communities, thereby ensuring the laws are attuned to the needs and perspectives of those directly impacted by the hunting practices.

The study's findings indicate that lifting the ban on trophy hunting could potentially yield substantial economic benefits for Kenya, particularly in terms of job creation. The agricultural sector is projected to be the primary beneficiary, with the potential to add 9,046 new jobs stemming from a total production value of 2.17 billion Kenyan shillings (KES). In comparison, the mining, manufacturing, and electricity and water supply sectors combined would see an increase of 1,099 jobs, with mining adding 65 jobs, manufacturing 997 jobs, and the electricity and water sector 37 jobs. Therefore, based on these projections, it is estimated that Kenya's economy may have forfeited the opportunity to create 19,573 jobs due to the prohibition of trophy hunting. In a hypothetical scenario where Kenya implemented a Game Products Trust Fund (GPTF) akin to Namibia's and had trophy hunting revenue, it is estimated that from a 40 million USD revenue, 4 million USD would represent a 10% contribution to the GPTF.

Africa is on the cusp of rapid development, with predictions indicating an unprecedented rate of urbanization. The continent is poised to have the highest urban growth rate globally, with projections by the Organisation for Economic Co-operation and Development (OECD) and the Sahel and West Africa Club (SWAC) suggesting that by 2050, African cities will absorb an additional 950 million people. The driving force behind this mass urban migration is the pursuit of

improved living conditions that cities offer but rural areas often lack. These advantages include enhanced access to education, healthcare, sanitation, housing, business opportunities, and transportation. There is an ongoing examination into how urbanization correlates with overall well-being and the impact it has on environmental conservation efforts.

The relationship between a country's wealth and its environmental protection efforts is highlighted when comparing the Environmental Performance Index (EPI) rankings with GDP per capita across the world. Data shows that the most urbanized region, which encompasses countries from the global western hemisphere, dominates the top five positions in the EPI ranking. Furthermore, these countries also rank within the top 30 for GDP per capita. On the other hand, nations in Sub-Saharan Africa, which is the least urbanized region globally, do not appear in the top 30 of the EPI nor in the top 50 for GDP per capita rankings. This contrast underscores the possible correlation between urbanization, economic prosperity, and the capacity for environmental stewardship.

The Environmental Kuznets Curve (EKC) posits a particular pattern in the relationship between economic development and environmental degradation. As posited by economist Simon Kuznets, the theory suggests an inverted U-shape curve where environmental degradation intensifies as a country's income level or economic development increases, but after surpassing a certain threshold of wealth or development, the trend begins to reverse, resulting in reduced environmental damage. The initial stage of economic growth often sees a rise in environmental harm due to prioritizing industrial and economic expansion over environmental concerns, a possible lack of environmental awareness, and insufficient regulations or technology to address ecological impacts. However, beyond a certain point of economic growth, the damage to the environment tends to decrease as higher income levels can foster better environmental awareness, stricter regulations, and investments in cleaner technologies.

# Tables and Figures

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