

Challenges and Opportunities Facing Ecotourism in Sub-Saharan Africa from Climate Change Desertification

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Abstract: This study explores one aspect of the macro-atmospheric phenomenon of amplified climate change that is causing significant micro manifestation challenges in one of the most fragile ecosystems on earth, sub-Saharan Africa. The micro manifestation of desertification impacts humans, flora, and fauna all of whom already struggle to survive in these areas. Desertification in turn effects ecotourism. Desertification is a type of land degradation in which biological productivity is reduced and where fertile areas become arid. Desertification causes the loss of vegetation and food for livestock and humans and a decrease in drinking water reserves.

Our examination researches the extents of desertification in the area and the effect it is having on ecotourism. We explore the strategies for proper ecotourism management and planning that are being utilized to offset these effects and explore how these strategies can and are being utilized to offset these effects and even supply numerous economic resources for government, private sector, and local groups to help improve living conditions and quality of life.

Ecotourism in these unique ecosystems that are impacted by climatic changes provide a meaningful opportunity to enhance the lives of host communities and protect the environment. During a recent visit to Namibia, I found residents who are utilizing innovative strategies such as solar energy, rainwater collection and other innovations to protect the ecosystem, wildlife and environment and allow them to continue to host ecotourists and provide services.

Resources for ecotourism in deserts are made of the mutual effect of topography, climate, water, wildlife, plant type and density. Previous studies have shown that if ecotourism is properly managed and planned, it has the potential for numerous economic resources for the local community. We examine the extent of desertification in these semi-arid deserts, the planning and management of ecotourism activities, and the role that education of these ecosystems could provide for additional economic resources and ecological protection.

Key Words: Sustainability, Ecotourism, Climate Change, Desertification

1. Desertification – Causes and Impacts of This Manifestation of Climate Change

There have been multiple definitions of desertification over the decades, each mentioning the reduction of biological productivity and the resulting transformation of the land and impact on human activities in the area. The widely agreed-upon definition used by the United Nations Convention to combat desertification provides that this phenomenon involves: “land degradation in arid, semiarid, and subarid areas, resulting from various factors including climatic variations and human activities” (Becerril-Piña and Mastachi-Loza, 2021, p. 1). Desertification is a type of land degradation, examined by the “persistent or irreversible reduction in the capacity of ecosystems to supply ecosystem services for several decades (soil, vegetation, and water) in drylands...due to a variety of factors, particularly climatic variations, and human activities” (Becerril-Piña and Mastachi-Loza, 2021, p. 1).

The United Nations reviewed the economic and environmental impacts of desertification and land degradation concluding a resulting loss of 12 million hectares of arable land every year creating international interest over these changed ecosystems as they have a meaningful role in both food production and the social aspect in communities (Rivera-Marin et al., 2022, p.1). A study conducted by Rivera-Marin et al. (2022) found that desertification is composed of a multitude of factors, including land use, land cover, changes to vegetation distribution (both climate and human induced), socioeconomic structures, and changes in public policies on the area’s agriculture including irrigation system decisions.

The drylands of Africa, found in northern and southwestern Africa, are suffering from high levels of degradation. The multiple-decades-long process of desertification is driven by both human activities and climate changes. Reductions in fresh water, harvests in wood and other natural materials, and fertile soils have been recorded, as well as the decrease in the region’s scenic attractions and cultural values (Becerril-Piña and Mastachi-Loza, 2021, pp. 1-2). A nexus has been identified between the socioeconomic status of an area and desertification, linking poverty to decreasing environmental resources. The residents of the drylands are impoverished, leaving them more vulnerable to natural disasters than others. While people inhabiting the drylands have been able to adapt to decreasing resources, the reality of climate change has posed a problem of increasing stresses, with the potential of outpacing their adaptation (Becerril-Piña and Mastachi-Loza, 2021, p.2).

Drylands are typically defined by their “ratio of annual precipitation...to annual potential evapotranspiration...” (Becerril-Piña and Mastachi-Loza, 2021, p 3). They are also one of the largest biomes and have a great percentage of global livestock producing nearly half of the global crops. The very name “drylands” makes clear the scarcity of water in the areas. The soils have a large range of functions, including growing crops in the fertile soils, being natural land for carbon storage, and being the origin of “sources of genetic material for the development of drought-resistant varieties” of major food crops (Becerril-Piña and Mastachi-Loza, 2021, p. 3).

Virtually all studies of desertification recognize climate change and human activity as separate causes in desertification intertwined with factors of varying speeds. Climate variability increases land surface temperatures and decreases precipitation. Human activities include the expansion of croplands and growth of population. Combined, the results are decreased vegetation productivity, increased dust storms, increased salinization, increased soil erosion, and a decline in carbon storage in the soil (Mirzabaev et al., 2019, p.251).

As the climate changes, so do the interactions within the region such as land use, water use, land management, grazing patterns, and urbanization. Planning policies should be considered based on the population, available resources, level of poverty, and utilization and development of adjacent lands. Poor policy planning to countermeasure desertification can lead to overpopulation and trigger urbanization, which leads to more poverty, flooding, land use changes, overexploitation of the land, and even greater climate changes (Becerril-Piña and Mastachi-Loza, 2021, pp. 8-11).

Factors such as vegetation overgrazing have major consequences. A loss of vegetation results in increased erosion and soil run-off. Without vegetation, there is an increased rate of water evaporation increasing aridity which increases the occurrences of forest fires and economic losses for farmers. The loss of the biodiversity allows for secondary vegetation to be established, changing vegetation and soil composition. The consequences of crop irrigation and the over-usage of water include increased erosion by water, increased potential for salinization, reduction of water sources, poorer water quality, over-exploitation of groundwater, and greater threat of migration due to the scarcity of water resources (Rivera-Marin et al., 2022, pp. 1-2).

Sub-Saharan Africa is comprised of forty-seven countries, all of which depend heavily on soil resources. Desertification occurrence in sub-Saharan Africa poses a great threat to agriculture productivity, economic development, and soil protection. Crop productions have decreased over the years while poverty has increased (Usman et al., 2017). The drylands in sub-Saharan Africa have very low vegetation coverage, leading to many soil problems, including erosion, landslide, diminished nutrients and surface soils, and water contamination. These issues are exacerbated by a lack of environmental policies, inadequate soil management, and socio-cultural events.

Desertification in sub-Saharan Africa has been a long-standing concern. In the 1970s and 1980s, the United Nations discussed desertification in Kenya’s capital, Nairobi, to consider: “soil, vegetation, forest, water, animal, wildlife, agriculture, and human’s cultural and social lifestyles” (Usman et al., 2017, p. 4). The 50% reduction of the sub-Saharan agricultural land productivity’s attributes desertification and land/soil degradation as its cause (Usman et al., 2017, p .5).

Changes in the climate resulting in higher temperatures exacerbate the challenges in the sub-Saharan region. Heatwaves, dust storms, low crop, and grain yields, decreased livestock populations and productivity, and declining population health are patterns seen (Mirzabaev et al., 2019, p.274). The climate and environment were large factors in the urbanization in the region. One study performed by Barrios, Bertinelli, and Strobl (2006, pp. 17-18) reporting “each 1% reduction in rainfall was associated with a 0.45% increase in urbanization. This migration favored more industrially diverse urban areas in Sub-Saharan Africa...because they offer more diverse employment opportunities and higher wages” (Mirzabaev et al., 2019, p. 285).

As a policy response, a transition to more renewable energy sources in the area is recognized as a countermeasure to desertification. Sub-Saharan Africa was reported as having the highest dependence on traditional biomass for their energy sources, such as fuelwood, crop straws, and manure from livestock. By lowering the reliance on biomass sources, benefits include better socioeconomic trends and increased health trends (Mirzabaev et al., 2019, p. 288).

Another policy response to combat desertification is an investment into irrigation systems. The sub-Saharan region in Africa was recorded as having irrigation covering only six percent of the cultivated areas. When combating droughts, tackling the entire region of sub-Saharan Africa rather than by individual countries was found to be more cost-effective. Increased communication and effective use of drought relief funding helped at

the time of the drought and strengthened the development of further policies (Mirzabaev et al., 2019, pp. 289-290).

Migrations of citizens due to desertification as well as herder-farmer conflicts (Lenshie, N.E., et al., 2021) are occurring in the area. As pastures and natural water sources dry up, herders are forced to find areas that can provide for the basic needs of their livestock. The encroachment of herders onto the lands of others have fueled many violent interactions. Herder-farmer conflicts have amounted to nearly 4000 deaths as of 2018, further stating “desertification is a major but often neglected driver of cyclical attacks between the two groups” (Lenshie, N.E., et al., 2021, p. 2).

Climate change fuels desertification with variability in temperature, rainfall, wind, and the strength of solar radiation (Gonzalez, 2001, p.217). Ecosystems are changing, vegetation coverage is declining, soil erosion has increased, carbon sequestration is threatened, and human lives are endangered.

2. Impacts of Ecotourism on Sub-Saharan Africa

All throughout sub-Saharan Africa, there are a plethora of activities and beautiful sights to see. Ecotourism is a significant revenue source throughout Africa because of the “Big Five” – the African elephant, rhinoceros, lion, leopard, and African buffalo (Scholte, Kamgang and Sabuhoro, 2023, p.443). Protected areas and parks and diversity in landscapes and ecosystems contribute greatly to the wide spectrum of attractions in sub-Saharan Africa (Eyster, Naidoo and Chan, 2022, p.428).

Ecotourism is centered on conservation, education, sustainable business practices, and travel to natural areas. The four most popular destinations in Tanzania for example include the Serengeti, Lake Manyara, Kilimanjaro, and the Ngorongoro Crater. The Ngorongoro Conservation Area in Tanzania offers attractions of several day safaris, archaeological sites, visitations to the Maasai villages to view the huts built with cow dung and sticks, and opportunities to see the Maasai warriors in their cultural clothes perform traditional dances (Obour, Ankomah and Larson, 2017, p.266).

Visitors show preferences of species and landscapes, providing case studies and research ample data to best determine methods for conservation. By seeing which species of mammals or preference of birds for birdwatching, protected parks can use that higher income to their advantage and use one method of conservation and economic development, as opposed to another protected park that might require an alternative method due to a significant difference of incoming funds (Eyster, Naidoo and Chan, 2022, pp.428-433). Research done by Eyster, Naidoo and Chan (2022) about ecotourists and preferences found that species and landscapes were primarily how ecotourists planned visits. These analyses aid in current and future conservation methods.

Many factors contribute to ecotourism success. Ecotourism governance is a vital element. The United Nations Development Program states “governance relates to the modus operandi by which societies manage socio-economic, political, and environmental affairs, drawing from systems of values, policies and institutions” (Forje, Awazi and Kimengsi, 2021, p. 2). When there is poor governance in ecotourism, stakeholders and donors stop funding projects and efforts, resulting the failure of these projects. Rural communities host these projects, but with poor governance, there is often a presence of ineffective management, little or no participation from the local communities, and the “imposition of formal...institutions on communities with functional traditional institutions” (Forje, Awazi and Kimengsi, 2021, p. 2). The International Union for the Conservation of Nature (IUCN) established principles and criteria that can be adopted to set governance standards in relation to a system of protected areas: legitimacy and voice, direction, performance, accountability, and fairness/rights (Borrini-Feyerabend et al. 2013, p.90). For their research, Forje, Awazi and Kimengsi (2021) have researched seven principles: efficiency, equity, accountability, transparency, effectiveness, conflict management, and participation. Many of these principles overlap, emphasizing the importance of accountability, participation, equity, and transparency. Furthermore, the principles overlap in some ways, such as strong transparency among stakeholders leading to more effective conflict management and increased participation (Forje, Awazi and Kimengsi, 2021). Forje, Awazi and Kimengsi’s (2021) seven principles researched in the sub-Saharan African region show a significant concentration on local community participation. Throughout the studies in the Southern Africa region where there is an absence of local community participation, the result was a generalized lack of trust in the government “for the development of proper (eco)tourism in South Africa and Zimbabwe” (Forje, Awazi and Kimengsi, 2021, p. 7). Throughout East Africa, lack of participation from the local population was claimed to be from a “lack of empowerment and limited capacity, lack of marketing and promotion skills, low community organization initiatives, poor networking and communication skills and above all absence of

effective collaboration with other ecotourism stakeholders” (Wondirad, 2017, p. 11-12). West Africa’s lack of participation was cited for different reasons, being low educational levels and limited resources for entrepreneurship. Central Africa named factors of inequity of management and exclusivity of local population stakeholders, misleading ecotourism development policies, and limited benefit sharing (Forje, Awazi and Kimengsi, 2021). Being aware of the causes that result in the lack of such a vital principle, plans can be made to counteract the effects, leading to a strong economy and increased conservation.

Learning and experiencing the local culture is also a large part of ecotourism. Education about the local populations in an area include how some products are made, preserve local culture, and how each gender contributes to the community through various roles. With access to multiple and diverse employment opportunities, women in the sub-Saharan African region have had opportunities to break into new roles and empowerment (Umuziranenge, 2019, pp. 77-78). Ecotourism cannot be successful without environmental justice, which “seeks for better conservation outcomes by involving all people and treating them fairly in all activities regarding the environment” (Umuziranenge, 2019, p. 78). A study conducted by Umuziranenge (2019) focused on women in Rwanda and how improvements in conservation policies and practices affects them. Rwanda’s ecotourism and tourism is a large contributor to the country’s gross domestic product. The Kitabi Women Handcraft Cooperative began in 2011 with 28 females and 2 males. The cooperative is mostly composed of women whose husbands had used resources in the Nyungwe area to create different products before it was established as a national park. The cooperative’s objective is to raise awareness for environmental protection in the surrounding areas of the national park, in the Kitabi sector, and the Nyamagabe District (Umuziranenge, 2019, p.77).

The Rwanda Development Board uses donor support and income from tourism to assist the cooperative in numerous community programs. In addition to employment opportunities and other financial and cultural programs, children from the surrounding areas create clubs to teach tourists traditional dancing (Umuziranenge, 2019, p.82).

The Republic of Cameroon is located within sub-Saharan Africa. Forest, woodlands, and tropical moist forests comprise over half of the 47.5 million hectares of land making up the country. Of all the African countries, Cameroon hosts one of the highest amounts of forest-dwelling primates and is ranked as one of the top five countries with the largest diversity of plant species (Sama and Molua, 2019, p.207). Many of the large mammals inhabiting the country are listed as rare, endangered, or threatened with extinction under the International Union for Conservation of Nature and Natural Resources (Sama and Molua, 2019, p.208). The Republic of Cameroon’s fastest developing section in its gross domestic product is the services trade. Tourism and travel-related services contribute greatly to this sector (Sama and Molua, 2019, p.203).

Despite reports from the World Travel and Tourism Council demonstrating the increased overall employment, both directly and indirectly related to the tourism industry, the potential of the industry is still not being met (Sama and Molua, 2019, p. 205). Cameroon boasts natural attractions like mountains, forests, rivers, and diverse climates. The cultural attractions are amazing and unique, with various folklore, festivals, multiple kingdoms, and nearly 250 ethnic groups. Difficulties with governance, poor travel accommodation management, inadequate training, antiquated equipment, high costs of some methods of transport, lack of promotion and information on available activities, and deficient infrastructure make the full potential of ecotourism in Cameroon difficult to be reached (Sama and Molua, 2019, p.205).

The rich diversity of flora and fauna, the culture, and the climates attract many people to places throughout the sub-Saharan African region. However, there are more factors beyond just these that create a solid foundation for ecotourist. Sama and Molua (2019) extended their research of ecotourism in Cameroon beyond the number of ecotourist arrivals, considering other influences on the industry such as political stability, and social conflict.

By knowing the determinants of ecotourism, policy makers could create more efficient and strategic approaches to the industry, with allocations of funds potentially being altered to boost the socio-economic statuses of locations throughout sub-Saharan Africa.

3. Impact of Desertification on Ecotourism

Ecotourism is a huge industry in Africa, particularly in sub-Saharan Africa, alongside the attraction of the region’s beautiful beaches. Tourists visiting the area have high expectations to see a wide variety of wildlife and partake in a variety of activities including animal watching, wildlife tours, hunting, fishing, and habitat-specific tours (Chardonnet and Le Bel, 2012).

Protected areas throughout sub-Saharan Africa are the 'backbone of the industry' (Chardonnet and Le Bel, 2012, p.43). While ecotourism would not be possible without the protected areas, the protected areas rely on ecotourism just as heavily. The money generated by the ecotourism is used for national parks, hunting areas, communal conservancies, and game ranches. Due to how intertwined they are, any threat to one in turn endangers the other (Chardonnet and Le Bel, 2012, p. 43). Conservation of the ecosystems and protection of the biodiversity are fundamental to ecotourism which boosts the economy with additional tangential benefits.

The threats faced by the protected areas, in turn impacting ecotourism, are both direct and indirect. The indirect threats of habitat degradation and habitat conversion are responsible for the destruction of the habitats, making the area uninhabitable for the wildlife (Chardonnet and Le Bel, 2012, p.43). One form of habitat degradation is pastoral encroachment. Pastoral encroachment, the broadening of pastures used by livestock into natural ecosystems, is responsible for a tremendous amount of ecological degradation. Habitat conversion, such as agricultural encroachment, "transforms wild landscapes into domesticated landscapes" (Chardonnet and Le Bel, 2012, p. 30). This degradation in conjunction with desertification threaten protected areas, ecosystems, wildlife, and ultimately ecotourism.

The research done by Chardonnet and Le Bel (2012) stresses the importance of attracting tourists to fund their management costs associated with conservation goals. There is great emphasis on the range of benefits of the areas, stemming from the very basis of the habitat. Wildlife-viewing, one of the most profitable forms of ecotourism, require "a high level of security, easy access, an efficient infrastructure, professional services and at least one outstanding feature, such as a spectacular landscape and/or species" (Chardonnet and Le Bel, 2012, p. 23).

A case study conducted by Seely, Klintonberg and Shikongo (2006) in Namibia focused on a policy to combat desertification. One of the elements of the policy required the government to "create a favorable macro-economic policy environment" and correct any inherent structural imbalances by "redirecting and strengthening essential services and facilities to the communal areas, where their socio-economic impact is likely to be greatest" (Seely, Klintonberg and Shikongo, 2006, p. 107). This resulted in the planning and management to respond to droughts and agricultural production failure, reducing the effects caused by climate variability. The creation of plans such as these recognized the water scarcity and land degradation.

During a recent 2023 expedition in Namibia, I discovered that the impacts of desertification were evident. Desertification had exacerbated land degradation and caused a loss of vegetation and food for livestock and humans and a decrease in drinking water reserves due to the loss of aquifers. I visited Portsmut Farm in the Namib desert where desertification is palpable. The family farm owners I met have learned to coexist with the changing climate. They increased their grazing patterns from 1 cow to 12 hectares to 1 cow to 20 hectares. Additionally, they incorporated solar energy, rainwater collection and other innovative strategies to protect the beautiful African wildlife and allow them to continue their ecotourism programs and host some of the most wonderful farm to table meals.

Intertwined in the desertification policies include the National Resettlement Policy, the National Water Policy, and the National Land Policy. Furthermore, the Wildlife Management, Utilization and Tourism in Communal Areas Policy which assists with conservancies with the objective of conservation and wildlife sustainability allow for landowners to participate in roles and responsibilities, such as harvesting, trophy hunting, and other tourism attractions. By combining resources together for conservation, landowners have gained financial opportunities boosting the economy. With a financial stake in the land, residents are more willing to strive to reduce the effects of climate change and desertification. The effect of this increase in participation is an effective long-term tactic for the policy's objective of combating desertification (Seely, Klintonberg and Shikongo, 2006, pp. 107-114).

Human activities attribute to desertification. Expanding croplands is a major cause of desertification, the land not able to handle the excess pressure put on it. Unsustainable land use and management practices accelerate the land becoming usable and limit the land from adapting with the changing climate. By diminishing the land, the population is diminishing their available resources to invest in for better economic gains (Mirzabaev et al., 2019, p.251). Ecotourism is an active section of tourism that assists in sustainable developments, diminishing these harmful that include multiple causes of desertification.

A study conducted by Uduji and Okolo-Obasi (2023) on the relationship between the role of corporate social responsibility of oil companies in Nigeria and youth participation in the ecotourism development in the same area. The research found that 85% of young people live in developing countries, where the main source of income

is from ecotourism, making it “vital that young people are connected with ecotourism development” (Uduji and Okolo-Obasi, 2023, p. 3).

The Niger Delta region in Nigeria is considered the world’s third largest wetland (Uduji and Okolo-Obasi, 2023, p.3). The conservation and protection of the Niger Delta “is closely linked to the protection of the economic wellbeing” of its residents (Uduji and Okolo-Obasi, 2023, p. 6). By having confirmed oil reserves and hosting several wildlife reserves and diverse ecosystems, Nigeria makes certain to create and foster a relationship between environmental protection and the multinational oil companies. Under this concept, everyone involved can work together to protect the communities, ecosystems, and natural resources.

Uduji and Okolo-Obasi’s (2023) research sampled nearly 800 households in the region, concluding in multiple findings, one of which is an interest of youths that are interested in participating in the ecotourism sector, where roles of employment are available, regardless of a lack of education or skills. An example would be cleaners or housekeepers at nature reserve housing accommodations (Uduji and Okolo-Obasi, 2023, pp. 21-22).

Ecotourism thriving is a gain for the oil companies, making community participation vital. By investing in multiple sustainable development methods, the oil companies include youth participation in infrastructure, entrepreneurship training in ecotourism, the building of tourism centers, advocacy to the government, organization, and promotion of tourism, and more (Uduji and Okolo-Obasi, 2023, pp. 30-31).

The impacts of planning and management for ecotourism requires review and renovations. Different management programs have been successful in initial periods of time, with subsequent years showing diminished results. There were several successful ecotourism stories all throughout Zimbabwe, but due to the political climate and economic collapse that was occurring simultaneously, wildlife conservation was given a negative perception, leading to loss of donors and policy makers withdrawing their support (Mudzengi et al., 2020, p.3029).

Programs under the Community Based Natural Resources Management (CBNRM) are trying to change these negative perceptions by adapting to the changing world and offering new solutions (Mudzengi et al., 2020, p. 3029). By using a previous ecotourism venture that took place in Mahenye, Zimbabwe, from 1982 to 2020, Mudzengi et al. (2020) were able to conduct a new study centered around a management framework that intervenes in the changing environment. The changing environment of the area includes population increase, international hunting bans, climate change, exclusion of women and children, and decreasing numbers of international visitors. The research done by Mudzengi et al., (2020) included the pressures of the ecotourism industry developing from the epidemic coronavirus disease (COVID-19). The negative effects on the ecotourism industry were directly analyzed, comprising of “wildlife resources, amenities, attraction, accessibility, management system, marketing, beneficiaries, and linkages” (Mudzengi et al., 2020, p. 3028).

The resulting interventions for these issues reiterate much of previous suggested solutions, such as the promotion of a strong united community, encouragement of multiple sources of income, development of and carrying out self-funding programs, creating targeted educational programs, planning ahead for larger capacities, upgraded marketing for domestic and international ecotourism visits, securing stakeholders’ trust, lobbying for the lifting of hunting bans, and endorsing of ‘climate smart’ ecotourism (Mudzengi et al., 2020, p. 3028).

CBNRM is changing the typical script of a top-down approach, presenting a management framework with a bottom-up approach. This approach requires a greater support from local communities, boosting their involvement. Strong community cohesion is necessary for the regulation of local natural resources which can hold up to periods of low amounts of visitors, and concentrates socioeconomic benefits in the area, including the poorer areas (Mudzengi et al., 2020, p. pp. 3029-3030).

4. Conclusion

Desertification, a micro-manifestation of climate change, continues to present challenges to the environment and ecotourism, and subsequently, the economic health of sub-Saharan Africa. Interrelated factors including political instability, overpopulation, withdrawal of support, and pandemic diseases, compound these challenges. By recognizing that one threatened factor causes more vulnerability to the others, it is imperative that the planning and development of any viable solutions are set into action. We examined several planning and management programs including revamping land management frameworks and instilling new environmental policies, as well as self-funding programs, educational programs and enhancing stakeholder engagement to address the ongoing challenges. The sub-Saharan African region has undergone multiple changes; however,

further action is required to adapt to the negative consequences of desertification and other micro-manifestations of the macro-atmospheric phenomenon of amplified global climate change.

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