Received 14 April 2022
Revised 28 July 2022
Accepted 31 July 2022

The economic-administrative role of geographic information systems in rural tourism and exhaustive local community development in African marginalized communities

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Abstract

Purpose – The purpose of this study was to examine the latent part of geographic information systems in inclusive sustainable rural tourism, community-based natural resource management (CBNRM) and community development and empowerment in Southern Africa, Africa generally and many rural areas elsewhere worldwide.

Design/methodology/approach – The viewpoint utilizes literature and document reviews to assess African and worldwide agricultural, environmental and tourism resources management scenarios. It thus liaises with CBNRM and geographic information systems in sustainable tourism and local community development applications.

Findings – This review viewpoint uncovers a better potential synergetic relationship between tourism and rural (agricultural) activities that geographic information systems along a concept of CBNRM can amplify. Hence, it has poised a need for a decent and integrated tourism strategy to develop and empower the pertinent communities in many rural and marginalized areas within the continent.

Originality/value – Many rural communities in Southern Africa and Africa broadly dwell in low-income areas. Such milieus are rich in natural biodiversity, including tourism destination areas. Geographic information systems, sustainable tourism and CBNRM can form a gestalt of local community development projects within their environs.

Keywords Geographic information systems, Tourism, Agriculture, Agritourism, Ecotourism, Community empowerment, Climate change, Sustainability, Rural areas

Paper type Viewpoint

1. Introduction

Impact evaluation and simulation are increasingly becoming an integral part of tourism development (Ramaano, 2021a). The earlier inferred is consonant with Singh (2015), who maintains that geographic information systems (GISs) got implemented in various fields such as forestry, urban development and planning, geography and environmental considerations.

The author acknowledges the invaluable part of the editors and anonymous reviewers, as well as the acquaintances of GIS, ecotourism, agroforestry and environmental change credentials from the University of Pretoria and the University of Venda rural development geography within the former Department of Geography and Geo-Information Sciences and conservation biology from the Biological Sciences Department; hence, the funding from SANSA EARTH-OBSERVATION is recognized.

Arab Gulf Journal of Scientific Research
Vol. 40 No. 2, 2022
pp. 180-195
Emerald Publishing Limited
e-ISSN: 2536-0051
p-ISSN: 1985-9899
DOI 10.1108/AGJSR-04-2022-0020

Admittedly was limitedly explored in tourism; therefore, factor implying its current turnaround imminence. Tourism success revolves around effective outlining and development, which can be more magnified by applying a GIS. That being the case, Jovanović (2016) further emphasized the fundamentals of planning, advancing research and retailing within any tourism enterprise, and posited that GIS has an indispensable role in such prerequisite obligations. African impoverished countries can redeem themselves within such inferred horizons (Ramaano, 2021g, 2022b). It is thus more consistent with Fagerholm, Oteros-Rozas, and Raymond (2016). They appraise the linkages within ecosystem services, land use and well-being in an agroforestry scene utilizing public participation GIS (PPGIS) as the latent features of beneficial agro products. Accordant with the African rural environs conundrum, PPGIS vouch for the empowerment and incorporation of marginalized populations, who have limited voice in the public platform, with geographic technology teaching and cooperation as its central theme. It applies and provides digital maps, satellite imagery, sketch maps and numerous other spatial and visual instruments to improve geographic engagement and knowledge on a social level. Similarly, African rural communities can also lean on the ideals of the open sourcing of Quantum GIS (QGIS) utilities to combat impoverishment and improve diverse entrepreneurship productions and their socio-economic conditions. With that, Albuquerquea, Costa, and Martins (2018) assert that GIS are instruments that permit a more dependable decision-making process. Indeed in reaching legislators and directors in tourism expansion and implementing blended touristic knowledge. They are compelling means for the improvement of destination retailing procedures. GIS such as QGIS, participatory GIS (PGIS) and remote sensing got viewed as having a potentially significant role in checking environmental conditions, assessing the locations for envisaged and planned developments, defining contradictory values and modeling relationships. Henceforth their potential significance in tourism management (Martin, Curtis, Fraser, & Sharp, 2002; Briedenhann & Wickens, 2004; Mearns, 2012), agricultural administration and land use suitability conditioning (Wilson, 1999; Malone *et al.*, 1998; Musakwa, 2018) in African rural areas.

Systematic assessment of the ecology effect is often affected by a lack of information (Manel, Williams, & Ormerod, 2001; Kettenring & Adams, 2011). Thus, Huddleston *et al.* (2003) assert that even though most rural mountain communities partake in agricultural activities, their livelihood systems are mixed. Hence they endorsed the GIS-based analysis of mountain climates and residents. GISs are instruments and techniques for data manipulation, integration, image and analysis. GISs have since proved an essential solution in these regards and obligations (Bahaire, 1999; Fagerholm *et al.*, 2016). To this end, Orimoloye *et al.* (2019) urged the application of remote sensing and GIS in Wetland modification surveying and geography dynamics and its imports on ISimangaliso Wetland Park, South Africa. Therefore, suffice to realize that both agriculture and wetlands are significant facets of the provisioning utility for ecosystem services and are essential livelihood items in rural areas and vital subsistence hubs for deprivation in marginalized rural communities. They are indeed crucial cores for agritourism and ecotourism developments. Agritourism involves any farming-based operation that brings guests to farms. It affords secondary revenue for agriculturists (Phillip, Hunter, & Blackstock, 2010). Thus, enabling an additional source of income to afford adaptation technologies amid the climate change era. Meanwhile, ecotourism entails responsible travel to the natural environment, protecting nature and empowering the local communities (Keyser, 2002). Hence, GIS has been used in culinary mapping and tourism development in South Africa's Karoo region (Du Rand, Booysen, & Atkison, 2016).

CBNRM attaches local people packs to guard their land, water, animals and plants to use these natural reserves to amplify their current and future livelihood opportunities. Therefore it facilitates every participating member of the society to have a duty in their subsistence culturally, economically and spiritually. Community-Based Natural Resource Management

(CBNRM) is thus a scheme to work synchronically to defend their natural resources and simultaneously produce long-lasting value to the community (DEAT, 2003). GISs such as PGIS mimic the foremost essence of CBNRM in participatory rationales and can jointly synergize livelihood efforts within African rural communities. Quan, Oudwater, Pender, and Martin (2001) and McCall and Minang (2005) highlighted the position of participatory mapping and PGIS relevance within participatory spatial planning for CBNRM and sustainability in emerging economies.

1.1 The potential for sustainable rural tourism and community-based natural resource management (CBNRM) activities within African marginalized communities

CBNRM is a path that allows for land and natural resources management. It holds the potential to contribute resolutions to some of the complications encountered within the communal lands. It labels communities' rights to resources, successful farming, food supply, job production and small businesses. It thus promotes broad equality, diversity, and inclusion in its core themes. In Southern Africa, and Africa generally, many people live with and depend on natural resources. Ecotourism and agricultural enterprises are much-desired targets for land reform capitalizations in rural African locales. Weiner and Harris (2003) highlighted the imperativeness of community-integrated GIS for land reform in South Africa for natural resources and land use administration. Therefore, a point of this narration is that tourism (Agro-tourism) could assist horticulture, forestry, and agriculture. Henceforth community-based tourism (CBT) and CBNRM endeavors (Ramaano, 2021g) provide a secondary and spare source of revenue in many rural areas across the Continent. So, for the procurement of farm implements and improve the socio-economic status of the local people. With that, agritourism and sustainable tourism can make synergism with each other. To that end, more exits for diverse local entrepreneurship can emerge. The aforesaid is consonant with Rogerson (2006) on tourism pathways in small towns and rural areas of South Africa.

A triumphant CBNRM can induce diverse incomes and promote sustainability in African rural communities within community-based tourism, spurring and improving wildlife tourism dynamics (Mbaiwa & Mogende, 2022). Indeed, for the support of agritourism, ecotourism and agroforestry (Ramaano, 2022b). Likewise, PGIS implementations furnish instruments that certify deprived classes to create a case for honor, collaboration and political route (Linebaugh & Rediker, 2000; Kwaku Kyem, 2001). Hence, CBNRM has become a vital component of PGIS; therefore, promoting community development while combatting climate change dilemmas. Thus for capacitating rural, poverty-stricken and marginalized African communities, especially women empowerment tourism and hospitality-linked projects like selling traditional baskets, brooms, artwork and pottery among others from the indigenous wealth and biodiversity; henceforth, for benchmarking with other rural communities worldwide.

1.2 Climate change implications on agriculture and tourism in African rural communities

Climate change is caused by the high greenhouse gas (GHG) emissions into the environment. It contributes to global warming (UNEp and IEA, 1995) and makes human ecosystems vulnerable (Haines, Kovats, Campbell-Lendrum, & Corvalán, 2006). Suryabhagavan (2017) posited that climate change is the alarming crisis in agricultural and livestock activities in Ethiopia; hence, they endorse the critical role of GIS-based climate variance and depletion depiction in Ethiopia over three decades. Likewise, in response to climate change dilemmas, Onyancha and Onyango (2020) appraised web-based science for information and communication technologies for agriculture in sub-Saharan Africa for about 27 years to model climate change matters, disparities and their critical mitigation measures. That being the case, Sifolo and Henama (2017) remind us that in Africa, tourism is a trigger for other corporations such as agriculture and is confronted by the menacing climate change

variability. Therefore, Hoogendoorn and Fitchett (2017) hold that where migration is not viable, heightened concerns of advancing temperatures in the Western Cape Province of South Africa will negatively affect wine farming and tourism transactions. Such citations emphasized the need for improved monitoring and mitigation techniques associated with a blend of GISs to enhance productivity and engendering sustainability.

Charles, Reneth, Shakespear, and Virginia (2014), with a case study of the marginalized rural communities of Zimbabwe, posit that the ongoing climate change threat to tourism and agriculture has necessitated coping and mitigation strategies for the locals. Henceforth adaptation strategies mostly dwelled on timing, diversifying, and managing crops against predicted harsh seasons. It thus mandates the availability of empowering technology, as early inferred with the application of GIS precisions within the disadvantaged African rural communities. Similarly, in the case of Eastern Africa, Orindi and Murray (2005) opined that prolonged droughts, floods and rapid climate changes have dismal effects on economic activities and tourism ambition alike with mining, subsistence agribusiness and fisheries; hence a call for mitigation measures to negate dire consequences. Akin to the aforesaid, Radhouane (2013) postulates on climate change impacts on North African countries and some Tunisian financial sectors, asserting that rising temperatures linked with climate transformation will reduce the land sites appropriate for agriculture and negatively affect tourism.

Ozor, Umunakwe, Ani, and Nnadi (2015) evaluated the consequences of Climate change among rural agriculturists in Imo State, Nigeria. Therefore, rural people reportedly widen their subsistence strategies and adapt to climate change. Furthermore, Denton (2002) and Milne (2005) professed for rural women's respect and management in climate transformation policies and approaches amid altering climate and doubtful destiny. Thus, along with the integrity of political ecology, ecofeminism, equality and climate change threats. It is crucial to conceive that rural women face the effects of climate change within their everyday exercises, such as formal agricultural actions, fuel wood collection and water assemblage, among other routines globally. The participatory guidance and empowering policies of PGIS and CBNRM can assist in alleviating women's burden in this regards. Nicholls and Amelung (2015) evinced that many rural localities, previously counting on immediate activities such as forestry, fishing, agribusiness and mining, and in the Nordic regions, have been replaced by concentration on tourism ambitions. It thus appears to be a global issue, and climate change is attached to such adaptation due to its sudden influence on the expected yield. Likewise, worldwide climate change imports demand political economy transformation strategies for poverty and subsistence, as exemplified by pastoral mountain neighborhoods in Nepal (Gentle & Maraseni, 2012).

2. The use of GIS and PGIS in sustainable tourism strategy and activities

A GIS is a computer-based instrument for mapping and analyzing characteristic effects on land. A GIS is a computerized database management system for snap, memory, recovery, handling, use, analysis and display of spatial (i.e. locational defined) data (Knippers, Stoter, & Kraak, 2006). There are examples:

(1) *Conservation biologists and preservationists* might be worried about the effects of slash-and-burn exercises on the populations of certain spiders. Imperatively conservation biologists and agro foresters share common sentiments, both custodians of two integral forms of sustainable tourism within the rural settings in eco-tourism and agro-tourism (Ramaano, 2008, 2021g, 2022b). A significant GIS data about conservation areas and eco-tourism, agricultural areas and agro-tourism is fundamental for tourism strategy and local community development in African rural milieus and elsewhere relevant;

(2) *Natural hazard analysts and specialists* might need to probe the high-risk places of annual monsoon-linked swamping by considering rainfall forms and terrain features. Safety is a priority for any tourist associated with various types of tourism. GIS information about the safeness of some areas can form a crucial part of the tourism strategy for the local community development in marginalized African rural environs;

(3) *Forest managers and administrators* might be interested in optimizing timber yield by employing soil data and actual tree viewpoint dispersions, despite many challenges, such as the need to maintain tree diversity. Quite significantly, forests are the central element of a variety of tourism. Decent expertise in forest management enables tourism stakeholders and planners to establish tourism ventures and initiatives (Donohoe & Needham, 2006; Ramaano, 2021g, h); thus, supporting the discovery and management of tourism areas such as heritage, agro-tourism and adventure tourism within rural and remote areas. The latter can broadly help to strengthen sustainable tourism strategy and rural community development activities; hence, influencing the development and management of natural and water-based tourism initiatives and resources toward pro-poor tourism and sustainability (Knippers *et al.*, 2006; Ramaano, 2021g, 2022c; Rogerson, 2006).

2.1 The prospective role of quantum GIS (QGIS) in agriculture, agronomy and tourism for community empowerment in the African continent's rural and marginalized areas

Sherman, Sutton, Blazek, and Luthman (2004) indicated that QGIS is an open-source GIS, yielded in May 2002 as a scheme on Source Forge. Therefore, Jaya and Fajar (2019) remind us that it can operate as a combined data bank, managing spatial and non-spatial data in a blended database. To that end, QGIS functions as cross-platform desktop software on GIS. Akin to the African scenarios, it designates a free alternative to more costly GIS Programs (Flenniken, Stuglik, & Iannone, 2020; Ramaano, 2021g). Thus many impoverished and marginalized African communities can capitalize on this platform to enhance their agricultural production. To that account, Thorp, Hunsaker, French, Bautista, and Bronson (2015) expressed that the advancement of sensors contributing to geospatial information on crop and soil circumstances has been a prime advance for accurate agriculture. Thus, The Geospatial Simulation (GeoSim) plug-in for QGIS was significant in enhancing the crop management of cottonseed and maize productions, as revealed by their study (Raj *et al.*, 2021; Ramaano, 2022b). Hence the same could be fundamental for many African countries' agriculture and agronomy endeavors while boosting the socioeconomic statuses of the respective communities (Nawar, Corstanje, Halcro, Mulla, & Mouazen, 2017). As already early predicated, the specified could work hand in hand with CBNRM and farm tourism initiatives for the maximum benefits of the locals.

2.2 Participatory geographical information systems (PGISs) value in sustainable rural tourism

PGIS is a participatory approach to spatial planning and spatial data and communication directions. PGIS integrates participatory learning and action (PLA) techniques with GIS. Universally, people bring social change by collaborating to formulate notions and results (Rambaldi, 2005). Kwaku Kyem (2001) specified that PGIS is a vital facet of CBNRM in Africa, while Quan *et al.* (2001) urge its imperative role in developing countries. Similarly, PGIS was utilized as an empowerment approach to natural resources management and tourism in Indonesia (Corbett & Keller, 2004). Spatial information technologies, entailing GIS, global positioning systems (GPS), remote sensing software and open access to spatial data and

imagery, empower those who apply them. Generally, assorted access can benefit the advantaged people and less help the impoverished communities and local people; hence, perpetuating the marginalization of those already marginalized. However, PGIS is a concept for approaches that seek to alter the latter by endorsing participatory rural appraisal (PRA) and spatial data technologies; minority cadres can be capacitated along within the traditionally omitted from spatial decision-making actions. Rambaldi (2005) detailed how local people can get empowerment. Hence, significant to utilize the technologies to build their maps and employ them for their research. These maps and models can vary from the ground and paper maps of PRA in their greater spatial precisions, permanence, assurances and credibility with government personnel. Rambaldi purported that such maps got utilized as interactive routes for spatial discovery, data exchange and affirming decision making. Thus, for resource usage planning and advocacy activities, it can be very beneficial for the development and maintenance of different local tourism routes. Equality is one of the critical norms of sustainable rural tourism development (Xiang, Isbister, & Okumus, 2015); in conjunction with the diverse roles of GISs, this paper also backs the influential part of women in tourism agendas as livelihood alternatives for local communities.

Villagers all around the world can use various PGIS models, including defending indigenous lands and resource rights; management and resolution of disputes over natural resources; collaborative resource utilization planning and management; intangible cultural heritage conservation and identity constructions among indigenous rural communities; equity advancements with regards to ethnicity, culture, gender and environmental justice; hazard minimization, for instances through community safety monitoring and audits; and peri-urban planning and research and climate alterations adaptation (Omara-Ojungu, 1992; Rogerson, 2002, 2006; Ramaano, 2021a, g). The mentioned could prove essential in tourism as a livelihood strategy for marginalized remote communities (Rambaldi, 2005; Rambaldi, Kyem, McCall, & Weiner, 2006; Ramaano, 2021g, 2022b). Various models of PGIS got authenticated for countries as broad as Australia, Brazil, Bhutan, Cambodia, Cameroon and Canada amongst others.

There are hundreds of non-documented cases where technology intermediaries (most NGOs) affirm community-based organizations or indigenous peoples in employing geographic information technology and systems (GITS) to account for their spatial planning requirements. Politics forms part of the constraints toward the flourishing of tourism businesses in rural areas. Therefore land ownership and demarcation of land use are central to healthy tourism initiatives (Rogerson, 2002; Ryan, 2002); thus, affecting the interest in private sector investment (Rogerson & Rogerson, 2020). That being so, GISs has a potentially substantial role for local communities and private sectors when dealing with the discovery, mapping and management of the indigenous land to enhance sustainable tourism endeavors within African marginalized rural populations and rural areas elsewhere. As to Hasse and Milne (2005), tourism researchers and administrators proceed to engage with how to deliver sustainable practices consonant with tourism development. Henceforward community cooperation and stakeholder interplay are increasingly recognized as fundamental to accomplishing aspired ends.

2.3 Remote sensing in holistic agriculture, tourism and rural livelihoods activities

Pervez and Brown (2010) designate that authentic geospatial information on the area of irrigated land enhances acquaintance of agricultural water use, local land cover operations, preservation or shortage of water resources, and constituents of the hydrologic appropriation. Therefore, the essence of remote sensing and GIS-based soil erosion estimation from a farming watershed (Patil, Sharma, & Tignath, 2015). Thus, through empowerment strategies and available technological grounds, such can be beneficial to the

impoverished African rural farmers. Analogously, agritourism offers a secondary revenue opportunity for agriculturalists to afford farm implements. There exist platforms for affording technologies to increase productivity and battling dry conditions, drought, and climate change shocks. To this account, Ozdogan, Yang, Allez and Cervantes (2010) urged us on the prospects and remote sensing usages in agrarian productivities. Thus remote sensing can reinforce farming determinations in homelands at threat of food insecurity, including remote rural African communities (Becker-Reshef *et al.*, 2020). Therefore, refined sensing instruments are vital for sketching soil management zones for variable-rate fertilization (Nawar *et al.*, 2017); hence, ensuring accuracy preservation for environmental sustainability and agriculture, also in conjunction with GIS and GPS (Berry, Detgado, Khosla, & Pierce, 2003; Delavarpour, Koparan, Nowatzki, Bajwa, & Sun, 2021); hence consequential for the Big GIS analytics model for agribusiness supply chains (Sharma, Kamble, Gunasekaran, Kumar, & Kumar, 2020).

Satellite remote sensing imagery and GIS in Maasai Mara Game Reserve and Nairobi National Park and the ecosystem's assortments, representatives and influential connections have been recognized; and using the Masai Mara ecosystem wildlife sanctuary in East Africa (Ndegwa, Mundia, & Murayama, 2009; Magige, Jepkosgei, & Onywere, 2020). Similarly, Gcaba and Dlodlo (2016) recommend internet of thing usage and remote sensing South African tourism developments. Accordingly, Remote Sensing is essential in the tourism policy strategy for local community development in African rural societies (Newsome, Moore, & Dowling, 2012); and in ecotourism initiatives worldwide (Salam, Lindsay, & Beveridge, 2000). Therefore, this paper sustains a *raison d'etre* of the implied significance of integrative GIS in sustainable tourism and comprehensive community development in Musina Municipality South Africa, and a fulcrum of GIS in sustainable rural tourism and local community empowerment. Henceforth, for a natural resources management appraisal for marginalized African communities.

3. Conclusion and recommendations

3.1 Policy implications

While it was evinced that CBNRM can offer the best means of managing communities' native resources and that various forms of GIS can complement such enterprises. Nonetheless, there is an invincible need for a holistic approach within African rural and marginalized populations to allow comprehensive socio-economic development. Analogously, Shoval and Ahas (2016) appraise GPS and utilize pursuit technologies in tourism analysis. Thus GPS generally affords significant information for GIS recordings, and GPS data were rated at the top of big data in tourism studies (Li, Xu, Tang, Wang, & Li, 2018). Henceforth, in line with precision agriculture, GPS and GIS are crucial in monitoring diverse parameters in farming systems (Koch & Khosla, 2003; Satyanarayana & Mazaruddin, 2013; Yousefi & Razdari, 2015).

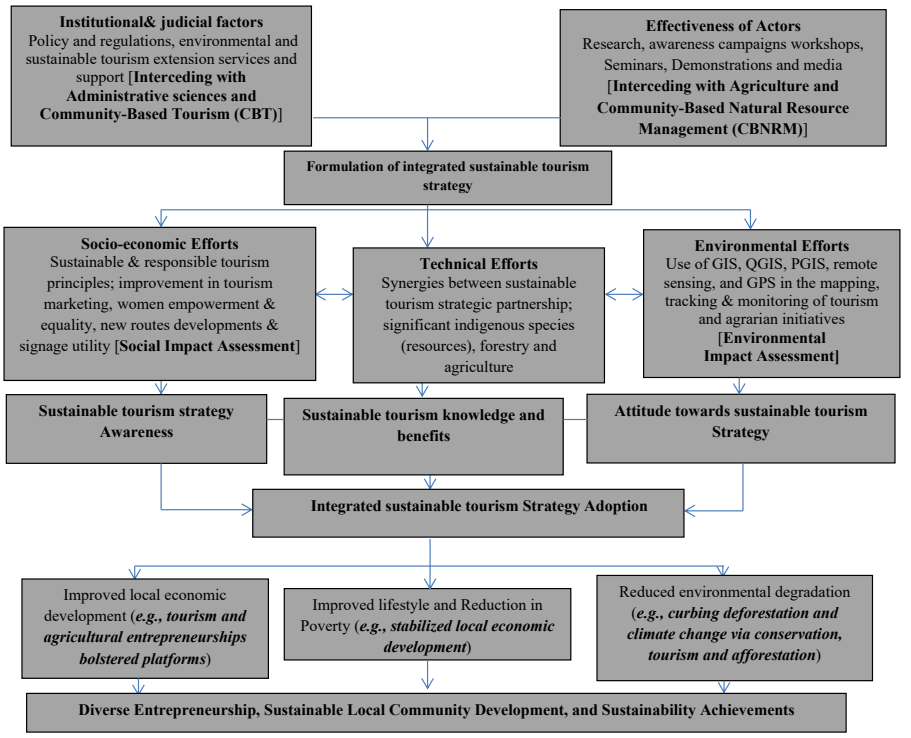
Suffice to note that unsustainable agriculture contributes to both climate change and underground water vulnerability (UNEP, 2010), thus reducing productivity and agritourism potential. Consistent with development policy rationales, sustainable agriculture delivers a probable resolution to foster farming systems to provide for a growing population amid changing environmental circumstances (Wittman, 2009). Analogously, sustainable tourism concerns the whole tourism adventure and considers social, economic and environmental issues. Therefore enhancing tourists' occasions and managing host communities' needs (Eagles, McCool, & Haynes, 2002; Ryan, 2002). There exists an obligation within national, regional and local government entities to unite in one common goal of sustainable agriculture, natural resource management, sustainable tourism and community development through the amplification of technology and diverse initiative platforms (Mkwizu, 2020; Ramaano, 2021a,

b, c, d, e, f, g and h). To that end, attention to participatory tourism planning would heighten tourism expansion and population advancement in rural expanses. It will be essential to support an inclusive tourism policy that endeavors to operationalize local resources and rectify past management accounts; also, to maintain equity, equality and empowerment of every member of the respective communities within their domiciles. Ultimately, a booming interspersed tourism development policy could prove paramount for African marginalized, impoverished and remote communities.

3.2 Theoretical and practical implications

Therefore (Figure 1), is based on broad recommendations of this viewpoint and its core theme of sustainable tourism fundamentals (Ritchie & Crouch, 2003; Landorf, 2009; Ramaano, 2021a, b, c and d). It exhibits that factors like policy and regulations concerning the effectiveness of role players such as researchers and media can reinforce tourism prospects and community development in rural areas. Hence, along with the integrity of CBNRM and community-based tourism enterprises (DEAT, 2003). A formulation of a tourism strategy ought to implement significant socio-economic, technical and environmental efforts. Thus, significant for tourism marketing and new routes establishment.

Holistic tourism marketing tactics that support diverse marketing outlets, such as social marketing, can stimulate creative tourism economies. The cited could work favorably with eco-marketing, green marketing, and green tourism within ecotourism standards. Therefore, green marketing concerns the technique of creating and publicizing creations based on their



Source(s): Author's elaborations; adapted from Ramaano (2021a–h)

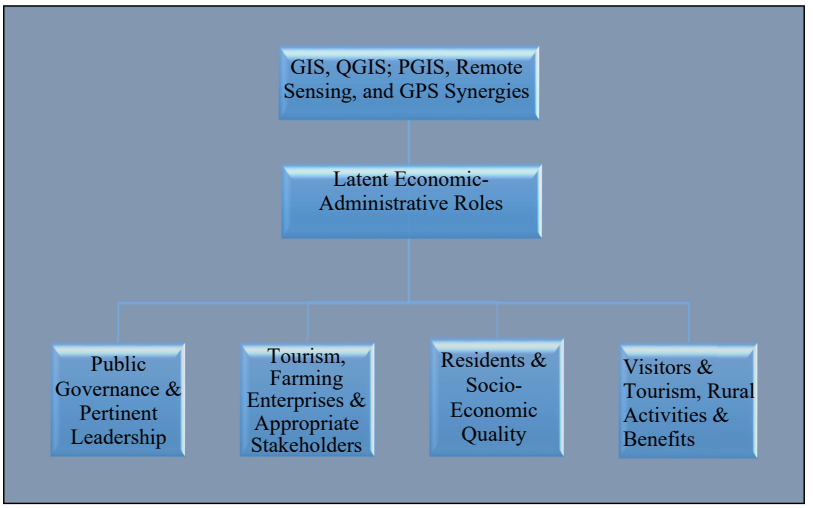
Figure 1.
The envisaged sustainable tourism and community development model strategy for rural and marginalized communities

perceived environmental sustainability (Peattie, 2001; Cherian & Jacob, 2012; Dangelico & Vocalelli, 2017). Furthermore, green tourism entails environmentally friendly exercises with mixed priorities and purposes critical for more natural income and sustainable products (Williams & Ponsford, 2009; Higgins-Desbiolles, Carnicelli, Krolikowski, Wijesinghe, & Boluk, 2019). Likewise, Albuquerque, Costa, and Martins (2018) recommended geographical information systems for tourism marketing purposes with a case study of the Aveiro region, Portugal tourism; thus, various tourism marketing strategies can benefit from GISs. Furthermore, synergies between sustainable tourism strategic partnership, and prioritization of GISs (Geographic Information Systems); QGIS (Quantum GIS), PGIS (Participatory GIS), and remote sensing in the discoveries and monitoring of tourism and CBNRM and community development initiatives could be essential. Ultimately, the adoption of a sustainable tourism strategy is on awareness, benefits and attitudes (Butler, 1999). So, how the locals view sustainable tourism, an adopted strategy could boost local economic development, reduce poverty and alleviate environmental degradation. Admittedly, tourism-based initiatives could encourage sustainable community development and sustainability. Broadly allowing rural areas' development within the African Continent; and also serving as a benchmark globally (Debarbieux *et al.*, 2014). Indeed within the portrayals of gastronomy and agro-tourism, it is known that farmers involve themselves in tourism activities as a secondary means of income generation (Azimi *et al.*, 2012; Ramaano, 2021a, b, c, d, e, f, g and h).

3.3 Limitations and further study implications

Any decent tourism strategy within the rural communities should not distance itself from the evident relationship between agricultural, farming, and tourism activities. It is suffice to say that African rural areas are generally attached to agriculture and tourism in their usual nature (Okech, Haghiri, & George, 2015). Hence, this is crucial to rural communities elsewhere (Holland, Burian, & Dixey, 2003; Ramaano, 2021g, 2022b). Thus, for preparation, designing and adopting a possible inclusive tourism strategy to advance livelihoods. As such, in most cases, agricultural development has got a slight edge compared to tourism development. Therefore, in this regard, strategic tourism management that encompasses the value of agriculture, with rather a notion of a synergetic relationship than a juxtaposition and competitive analysis, can be a prime goal for the communities in remote and marginalized domiciles. Hence, synergy amid CBNRM, GISs, sustainable tourism, community development and empowerment is imminent within marginalized and rural areas (Ramaano, 2022b). The limited approach and methodology of literature and document analysis can further be appended. Thus, there is more room for active incorporation of remote sensing and other earth observation methodologies for studies on tourism, agriculture and sustainability of rural community livelihoods. Henceforth monitor the performances of current and potential inclusive tourism strategies in rural milieus for tangible economic developments (Navalgund, Jayaraman, & Roy, 2007). Hence, Figure 2 displays the model for synergetic conceivable economic-administrative roles of incorporated GIS exercises in rural-tourism spin-offs and livelihoods advances in marginalized rural communities. It demonstrates that constituents like public governance and pertinent leadership, tourism and agricultural business and relevant stakeholders jointly with residents' socioeconomic quality are complementary.

Indeed, there is evidence of planned GIS utilization worldwide, including in some African neighborhoods. Nonetheless, this analysis dwelled on the premise that GIS has not been utilized to its full potential in African rural communities, theoretically and virtually reflecting its further latent significance in hoisting livelihoods in places of marginality (Kashaigili, 2010; Mahajan, 2014; von Braun & Gatzweiler, 2014). Hereafter, significantly in biodiversity and tourism-agriculture orientated societies. Henceforward, tourists, tourism exercises and welfare are



Source(s): Author's own compilation; adapted from Ramaano (2021d)

Figure 2.
Model for synergetic potential economic-administrative positions of integrated GIS exercises in tourism-orientated and integrated livelihoods advancements

potential receptive bases for latent economic-management roles of diverse GIS activities in the deprived and marginalized rural African communities. Thus, an inclusive tourism-orientated rural community's development strategy has to implement significant socioeconomic, technological and environmental efforts in such vicinities (Ramaano, 2022a; Florido-Benítez, 2021). The next part presents references.

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