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Exploring the role of infrastructural development for tourism growth in East Africa: evidence from Ethiopian Great Renaissance Dam

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ABSTRACT

This study examined the impact of large scale infrastructure projects focusing on GERD (Great Ethiopian Renaissance Dam) in regional tourism development, in East Africa. While dams are designed primarily for water storage and energy generation, its potential role in tourism growth is underexplored. The data collected from 75 tourism and hospitality institution leaders in six cities using qualitative methods. Braun and Clarke's reflexive thematic framework analysis used and themes are infrastructure, economic, tourism diversification, and socio-cultural changes. While improvements in road, bridge, and fuel stations were noted by 72% respondents, gaps in tourism infrastructure including insufficient signage and recreational amenities were barriers to tourism development. About 58% of respondents reported progress in tourism product diversification, but noted developments are limited. Additionally, 52% of them observed positive local economic impacts with job creation and, though many jobs are low skilled sectors. Furtherer more, 42% of respondents highlighted socio cultural shifts such as increased community pride and unity, although these changes were less pronounced than other impacts. The finding suggests that GERD has contributed investments in tourism infrastructure, local skills development, and marketing strategies to realize its full tourism potential. Future research should focus on long-term impacts of GERD and sustainable development.

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Introduction

Globally, over 1,200 large dams are located across 80 countries which are suited with in protected areas, with a significant number in North America, Europe, South Africa, and Asia (Thieme et al., 2020). These dams, initially designed for water storage, irrigation, and energy generation, have increasingly become key players in regional tourism development (Angelakis et al., 2024). However, the literature lacks a detailed exploration of how such large infrastructure projects specifically contribute to the growth of tourism development in their respective regions. The social and ecological impacts of large dams, such as those seen in northern Mato Grosso, Brazil, underscores the complexity of integrating tourism in to dam development (Pelegriani et al., 2024). Despite the global attention on these issues, a focused analysis on the direct influence of dam on tourism development remains underexplored.

In Africa, large-scale infrastructure projects have become essential drivers for economic development. East Africa, known for its rich cultural heritage and diverse landscapes, is increasingly focusing on such projects as a catalyst for tourism growth. However, while the region has seen significant infrastructural developments, the role of these projects in tourism has been less studied. East Africa, with its growing tourism potential, stands at the crossroads of balancing large-scale development with sustainable

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tourism practices. Among the significant infrastructural projects in East Africa, the Grand Ethiopian Renaissance Dam, located on the Blue Nile River, has garnered particular attention.

The GERD's potential as a driver of regional tourism development has been recognized (Ismail, 2024), yet its direct impact on tourism remains an underexplored area in East Africa's tourism literature. This study specifically investigated the relationship between large-scale infrastructure projects like the GERD and tourism development, with a focus on Ethiopia's North Western cities. The research aimed to fill this gap by examining how infrastructure improvements, economic benefits, socio-cultural changes, and tourism product diversification influence the local tourism industry. Although the GERD has enhanced regional connectivity, the study identified a critical gap in tourism-specific infrastructure, such as signage, recreational amenities, and services for tourists, which limits the full potential of these advancements. To fully unlock tourism potential, the study calls for targeted investments in tourism infrastructure to create a more integrated and sustainable tourism ecosystem. By exploring the changes in infrastructure, economic benefits, and cultural shifts along the dam's route, the research addressed key questions on the impact of infrastructure improvements on tourism accessibility, economic opportunities for local businesses, and the diversification of tourism products in the region.

Literature review

Scholars proposed various definitions of tourism infrastructure. Adebayo and Iweka in (2014) conceptualized tourism infrastructure are generally regarded as the physical element that is created or made to cater for visitors. In addition Pizam and Mansfeld in (2006) defined as tourism infrastructure refer to the essential physical and organizational structures required for tourism to operate efficiently. Furthermore, Dwyer and Kim in 2003 stated that tourism infrastructure encompasses all the facilities and services that support the needs of tourists, ensuring their comfort, safety, and convenience.

Many research studies revealed infrastructure positively contributes for regional tourism development. Specifically dam infrastructure construction is often promoted for its potential to stimulate economic growth and job creation with employment opportunities in construction, engineering and related sectors (Brown & Green, 2023; Lee & Martinez, 2024). In developing countries dam projects contribute to GDP growth through enhanced economic activity and infrastructure investments (Lee & Martinez, 2024), although critics argue that the long term economics benefits may be offset by environmental and social costs such as habitat destruction and community displacement (Jones & Bull, 2020). The sustainability of these benefits is questioned as a region may become dependent on a single sector like hydropower, potentially leading to job losses (Martinez & Kim, 2024). Dams also create opportunities for tourism which landmarks like Hoover and the Three Gorges dam boosting local economics through visitor spending (Brown & Green, Smith et al., 2024), although increased tourism strained local infrastructure and natural resources, requiring sustainable management practices (Jones et al., 2023).

Beyond tourism and immediate economic impacts, dam construction plays a crucial role in infrastructure development. Dams provide essential functions such as flood control, water supply, and hydropower generation, which are critical for supporting agriculture, urbanization, and industrial activities (Brown & Green, 2023; Martinez & Kim, 2024). Investments in dam infrastructure often lead to broader improvements in regional infrastructure, including roads, bridges, and utilities, thus enhancing connectivity and economic diversification (Lee & Martinez, 2024). Nevertheless, critics argue that these benefits must be carefully weighed against the environmental and social costs associated with dam projects. Displacement of communities, loss of cultural heritage, and ecological disruptions can have profound and lasting impacts that overshadow short-term infrastructure improvements (Jones et al., 2023). Therefore, adopting integrated planning approaches that prioritize environmental sustainability, stakeholder engagement, and adaptive management is essential to maximize the positive impacts of dam projects while mitigating adverse effects on local communities and ecosystems.

Furthermore, the quality of infrastructure, encompassing accommodation, accessibility, and amenities, play a crucial role in enhancing tourist satisfaction, as demonstrated in the case of Tasikmalaya Regency (Sugiama et al., 2022). Similarly transport infrastructure, alongside non transport infrastructure and additional factors such as income, distance and relative price, significantly impacts international tourist

demand for destinations like Mauritius (Khadaroo & Seetanah, 2007). In Africa, the development of information communication and infrastructure has shown a positive correlation with tourism growth, where increased infrastructure has led to higher tourist arrivals (Adeola & Evans, 2020). Furthermore, infrastructure including both transportation and tourism services is essential for the competitiveness of the global travel and tourism industry, continuing to improve as a critical element of its foundation (Soshkin, 2019). The relationship between tourism and infrastructure is dynamic with both playing interconnected roles in facilitating mobility and exchange while being shaped by broader geopolitical forces such as security, war and migration (Adey & Lisle, 2025). Theoretically, the findings from the empirical studies mentioned above are supported by established models and frameworks in tourism theory. According to the Gravity Model, large economies and proximity enhances tourism flow, with infrastructure reducing travel costs and frictions (Khadaroo & Seetanah, 2008). Additionally, the stage of growth in tourism destinations, as outlined by Builer in 1980, emphasis the critical role of infrastructure plays, particularly during the development and maturity stages .Furthermore, the quality of infrastructure is directly linked to the destination's competitiveness, as noted by Dywer and Kim (2003).

Conceptual framework

This conceptual framework shows the context of the GERD's influence on regional development, the relationship within the conceptual framework of this study emphasizes the interdependence of the infrastructure development, economic growth, tourism, and socio-cultural dynamics as shows in figure one (Figure 1). Furthermore, better roads and transportation systems are examples of infrastructure upgrades that support economic activity by promoting economic activity and easier access to markets. These advancements also support tourism development, though its full potential is hindered by limited infrastructure. Meanwhile, the socio-cultural dynamics reflects the community's response to these changes, with local pride and unity emerging as a result of improved regional connectivity. Finally, the framework underscores how each element influences and amplifies the others, creating a complex, multifaceted impact on the region's development.

Research methods

Description of study area

The selection of Bahir Dar, Dangila, Adis Kidam, Injibara, Chagni and Gelgel Belses cities as the focus of this study is both strategic and purposeful. These destinations were chosen because they serve as route cities for the GERD, through which the majority of transportation to the dam occurs. Additionally, these cities are readily accessible for researchers, facilitating efficient data collection and investigation into the impacts of the GERD on regional tourism development. By concentrating on these critical locations along

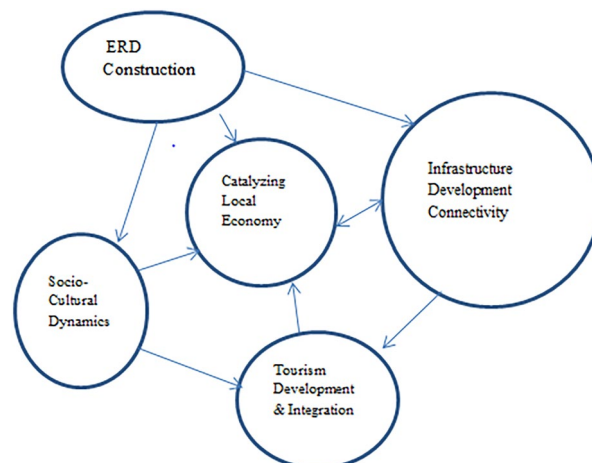


Figure 1. Conceptual framework.

the GERD route, the study aims to gain valuable insights into the specific impacts of dam construction on tourism dynamics in these areas. This focus provides a comprehensive understanding of the interplay between infrastructure development and regional tourism. As figure two (2) shows, the dam has attractive and has placed in at its route cites of the study area (Figure 2).

Sampling and sample size determination

This study employed qualitative dominant mixed-methods research design to investigate the impact of GERD infrastructure on regional tourism development. The selection of this qualitative approach was driven by the intention to obtain in depth insights from industry professionals and service providers. Purposive sampling was employed to identify participants who were actively engaged in tourism and hospitality along the GERD routes cities. This sampling strategy was deliberately chosen to ensure that the sample included individuals with position, expertise and experiences, there by contributed valuable perspectives on the research topic. A total of 75 leaders from tourism and hospitality institutions situated along the GERD route were selected as participants. Taking all leaders as participant to recognize they possess more comprehensive information than general staff members. Furthermore, this approach facilitated a balance between obtaining diverse view points and addressing practical constraint such as resources and time for data collection and open ended response served as a supplement to the interviews. The data from 75 participants comprising 25 interviews with leaders both from respective city administration tourism office and Wordea (district) office of six cities along the GERD route, and 50 from open ended responses provided by hotel leaders in the same cites were cross- checked to ensure the validity and reliability of the findings. The interview participants were 5 from Bahir Dar and 4 from each of other cites (Dangila, Addis Kidam, Injibara, Chagni, and Gelgel Belese). The open ended participants were 10 from Bahir Dar and 8 from other each of the other cites (Dangila, Addis Kidam, Injibara, Chagni, and Gelgel Belese). The researchers ensured that at 75 participants, the data saturation was occurred which indicated sufficient information has been gathered to replicate the study and no new insights could be obtained (Fusch & Ness, 2015; Lowe et al., 2018; Mwita, 2022).

Consent for participation

The researchers obtained oral consent from participants to complete the questionnaires, which were already signed on the coverage, indicating implied written consent. Oral consent was used to due to logistical constrains and in line with ethical standards. Participants were fully informed about the study's



Figure 2. Ethiopian great renaissance dam (source, Hailu et al., 2022).

purpose, their voluntary participation, and their right to withdraw. Anonymity and confidentiality were maintained, and ethical approval was obtained from our university before data collection.

Ethics approval statement

The study titled '*Exploring the Role of Infrastructural Development for Tourism Growth in East Africa: Evidence from the Ethiopian Great Renaissance Dam*' adheres to strict ethical guidelines to ensure the protection of participants' rights and well-being. All participants were fully informed about the study, and their oral consent was obtained, confirming that their participation was voluntary and that they had the right to withdraw at any time without facing any negative consequences. The study's design, data handling, and confidentiality procedures are carefully developed to protect participants' privacy, with all data stored and managed in accordance with institutional and international data protection standards. This research aims to contribute valuable insights to the academic community while upholding ethical standards and conducting the study with due diligence. The study was approved by the Ethics Committee of Injibara University under registration number IU/IRERC/09/24.

Data analysis

Regarding to data analysis, this study utilized thematic analysis, as developed by Braun and Clarke, to analyze qualitative data by identifying and reporting patterns (themes) within it. Thematic analysis is favored for its flexibility and ability to offer a rich interpretation of complex information through organized themes that reflect participants' experiences. Specifically, the study employed reflexive thematic analysis, emphasizing the researcher's role and perspective in shaping data interpretation, which marks a shift from mechanistic to critically reflective analysis (Braun et al., 2021; Braun & Clarke, 2019). This approach underscores the importance of reflexivity in qualitative research. The study also followed Braun and Clarke (2006) six-phase framework, incorporating inductive coding to capture meaningful data on the GERD's impact on regional tourism. Themes were refined through team discussions and reported with illustrative quotes to provide in-depth insights into participants' perspectives on GERD's effects. Initial codes were generated through both inductive and deductive approaches, capturing meaningful units of data related to the effects of GERD construction on regional tourism development. The interview data was coded and grouped in to themes; it is provided an excerpt from the coding process Table two (2) to demonstrate how data from both interviews and open ended surveys were systematically categorized in to themes like infrastructure development, economic impacts, job creation, and socio-cultural transformation. In phase three, thematic development further explains how initial codes were refined in to clear themes and a finalized thematic map (Figure 3) shows the interrelationships among themes. Both interview and open ended survey data were integrated and analyzed together for consistency. While formal validation methods like triangulation and members checking were not used in this study, we conducted reflexive thematic analysis through team discussion to refine the themes. These codes were then organized into potential themes, which underwent iterative refinement through team discussions. Final themes were selected based on their relevance, coherence, and ability to encapsulate the breadth and depth of participants' experiences. Themes were interpreted in light of existing literature on infrastructure development, job creation, revenue generation, and socio-cultural impacts within the tourism and hospitality sectors. Results: were reported with precise quotes to illustrate key themes

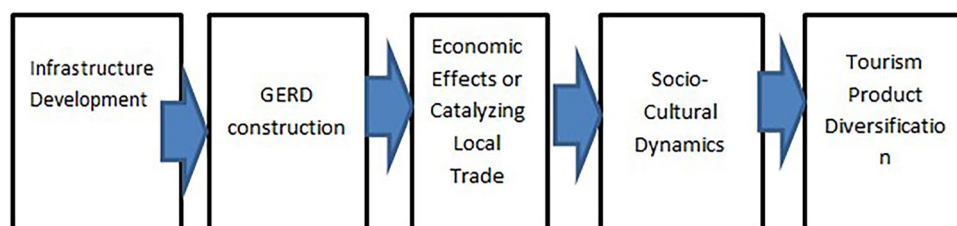


Figure 3. Interrelationships among the identified candidate themes.

and provide insights into participants' perspectives on the impact of GERD on regional tourism development.

Findings on effect of GERD on regional tourism development

Phase one: Familiarization

In phase one, data review and familiarization, researchers comprehensively examined a range of impacts associated with GERD on regional tourism development. This included examining effects on infrastructure development, job creation, revenue generation, local trade stimulation, diversification of tourist products, and socio-cultural impacts within the tourism and hospitality sectors across route cities of GERD. The primary emphasis was on conducting analysis of qualitative data sources, which encompassed interview records and open ended survey responses. This process aimed to deepen understanding of the different perspectives and experiences related to GERD's influence on regional tourism dynamics.

Phase two: Coding

Phase two of the research involves coding to analyze the impacts of GERD on regional tourism development. We researchers generated initial codes using inductive method approach that is data driven approach. As indicated at Table one (1) This approach aimed to systematically capture and categorize significant data points related to GERD's effects on regional tourism development. Key themes were identified during the coding process that includes infrastructure improvements, economic impacts, changes within the tourism and hospitality sectors, socio-cultural transformations, and impacts on image and reputation. This systematic categorization shows the foundation for further thematic development and analysis, facilitating a thorough exploration of how GERD influences regional tourism development (Table 1).

The following themes are initial thematic map indicating four candidate themes that are based on the preliminary coding, here are four candidate themes identified. This thematic map provides an initial overview of the main categories under which the impacts of GERD on regional tourism development are organized for further analysis and development. The relationships among the identified themes illustrate significant interdependencies within the context of GERD's impact on regional development. Infrastructure development plays a crucial role by enhancing regional transportation networks and amenities, thereby affecting both economic activities and tourism. Job creation and economic effects are closely tied to infrastructure improvements and resource dependencies, exerting influence over regional labor markets. Catalyzing local trade highlights the diverse economic benefits across sectors, yet underscores disparities influenced by infrastructure development and economic activities. Meanwhile, tourism product diversification emphasizes the need for integration with the tourism industry, fostering new product development and necessitating infrastructure enhancements. This holistic figure visually delineates these relationships, offering a comprehensive view of how each theme intersects and mutually influences others, shaping the broader landscape of regional tourism development and economic dynamics impacted by GERD.

Phase Three: Thematic development

During phase three of the reflexive thematic analysis, the focus was on developing coherent and comprehensive themes that capture the multifaceted impacts of the GERD. As shown on figure three (3) this phase involved organizing coded data derived from qualitative results of interviews and surveys into distinct themes that reflect the breadth of experiences related to GERD's influence. These are Theme 1: Infrastructure Development and Connectivity, Theme 2: Economic Impacts and Local Trade, Theme 3:

Table 1. Theme frequency statistical results.

Theme	Percentage
Infrastructure development and connectivity	72%
Tourism development and integration	58%
Catalyzing local economic activity	52%
Socio-cultural dynamics	42%

Tourism Development and Integration, Theme 4: Socio-Cultural Dynamics. These themes were derived through a careful process of data refinement, ensuring they accurately capture the diverse impacts of GERD on regional tourism development. By synthesizing qualitative data into clear and distinct categories, the thematic development process facilitated a structured framework for understanding the complex interactions between large-scale infrastructure projects like GERD and regional tourism dynamics. This framework serves as a foundational tool for further analysis and the formulation of policy recommendations aimed at maximizing GERD's positive impacts while mitigating its associated challenges on regional tourism development.

Phase four: Review of themes

Phase four of the thematic analysis involved reviewing and defining themes that emerged from a study on the impacts of the GERD on regional tourism and hospitality sectors. These themes sum up the multifaceted effects of GERD on tourism and hospitality, highlighting impacts across local business stimulation, socio-cultural dynamics, tourism development and integration, infrastructure evolution, and connectivity enhancements. Each theme was carefully named to reflect its specific focus and significance. The process ensured internal similarity within each theme, maintaining coherence in how economic impacts, shifts in socio-cultural dynamics, changes in tourism patterns, infrastructure developments, and connectivity enhancements were represented. Concurrently, external difference was maintained to emphasize the distinctiveness of each theme and its ability to capture diverse impacts of dam construction. A thematic map was made to visually illustrate how these themes intersect and influence each other within the broader context of dam construction. Ultimately, the finalized thematic structure provided a comprehensive framework that effectively communicated the intricate implications of dam projects across various dimensions of regional tourism development.

The finalized thematic structure as shown on figure four (4) comprehensively captures the diverse impacts and dimensions of dam construction, encompassing local business, socio-cultural dynamics, tourism development, infrastructure improvements, and connectivity enhancements. Through systematic application of analysis steps, researchers gain a thorough understanding of how dam projects affect both local communities and broader regional contexts, allowing for a nuanced assessment of their multifaceted impacts (Figure 4).

Phase five: Data interpretation

In phase five of reflexive thematic analysis, the interpretation of data from the study on the impacts of the GERD on regional tourism and hospitality sectors involves several critical steps. First, researchers immerse themselves in the data, deeply engaging with findings that highlight how GERD has significantly improved regional infrastructure such as roads and bridges while revealing deficiencies in tourism-specific amenities like signage and recreational facilities. Contextualization places these themes within broader regional and economic contexts, recognizing the dual effects of enhanced connectivity and limited tourism infrastructure development near the dam sites. Pattern recognition identifies recurring patterns such as positive economic impacts in hospitality and transportation sectors, alongside

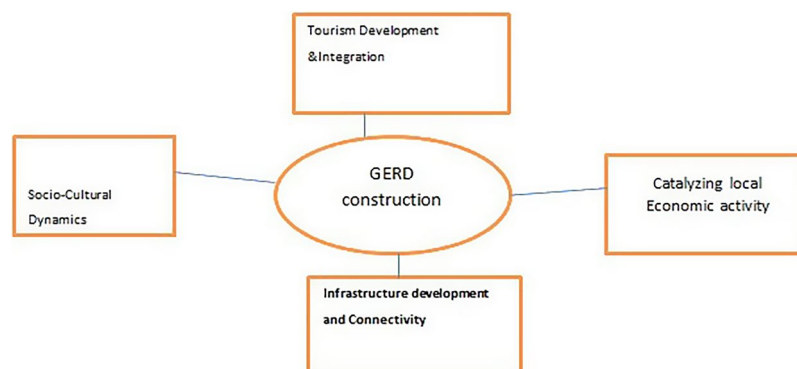


Figure 4. Finalized thematic map contains four themes.

challenges like unequal economic gains and post-construction job loss concerns. Development of explanations involves formulating insights into the economic benefits and socio-cultural dynamics reshaped by GERD.

Phase six: Reporting the finding

In the study, 75 participants were 25 interviewees 5 were female and 20 were male and 50 open-ended survey respondents that were 10 female, 40 male. Key themes which contain 72% of respondents reported significant infrastructure improvements, particularly in roads and transportation., And 52% noted catalase economic sectors, 58% in tourism product diversification, while 42% observed socio-cultural changes, such as increased community unity and pride. The interview and open ended response related theme1, Infrastructure Development and Connectivity

GERD stimulated regional infrastructure at the route cities. Specifically, it has led to significant improvements in roads, bridges, and fuel stations, thereby boosting connectivity across Benishangul-Gumuz region and Amhara region of Ethiopia. These advancements have facilitated easier access and improved transportation networks throughout the region. However, while the GERD has substantially improved infrastructure, there are notable deficiencies in tourism-specific facilities. The lack of adequate signage and recreational amenities limits the potential for enhancing tourist experiences. These shortcomings hinder the development of a robust tourism infrastructure, which is crucial for maximizing the economic benefits derived from improved regional connectivity.

In theme 2: Catalyzing local economic activity

The GERD created revenue opportunities for local businesses and created jobs, particularly benefiting the tourism, hospitality, and transportation sectors along its routes. This has led to improved market access and fostered economic cooperation among local businesses. Despite these benefits, there are notable challenges. Disparities in economic gains and a reliance on imported materials pose significant obstacles to sustainable economic development and Decline in labor demand post-construction. The benefits of the GERD have not been evenly distributed, raising concerns about economic inequality.

In Theme 3: Tourism Development and Integration

.....While main reason construction of GERD is hydropower generation but it has also a valuable chance to boost tourism. Despite these benefits, the integration efforts have been limited. There has been insufficient diversification of tourism products directly linked to the dam, missing opportunities for significant investments in tourism-related infrastructure. Additionally, there are ongoing challenges in new tourism products linkage and accessibility to tourist attractions associated with the GERD. While the hospitality sector has seen some benefits from the GERD, the overall potential for tourism development remains constrained. To fully capitalize on GERD's tourism potential, more comprehensive efforts are needed to diversify tourism products and improve accessibility to attractions related to the dam.' In theme 4: socio cultural dynamics 'the GERD, as a national initiative, embodies progress and unity, becoming a central symbol of local pride and culture. It has positively affected local culture and social interactions, supporting the idea that involvement in collective projects fosters trust and cooperation within communities. The GERD has also contributed to strengthening community identity and social cohesion, it is essential to address these challenges to ensure that the project's benefits are fairly distributed and cultural diversity is respected.

Phase six: Reporting the discussion

The study involved 75 participants, including 25 interviewees (5 female, 20 male) and 50 open-ended respondents (10 female, 40 male), providing diverse perspectives on the impacts of the GERD on regional development. Infrastructure development and connectivity emerged as the most prominent theme, as indicated in table (2) with 72% of respondents reporting substantial improvements, particularly in roads and transportation networks. These advancements have facilitated better regional connectivity, making travel easier and boosting local access to essential services and markets, which is critical for economic and tourism growth. In terms of local economic activity, 52% of participants noted significant job creation as a key benefit of the GERD. However, these new jobs were mostly in low-skill sectors, this finding suggests that the economic benefits are in their nascent stages and are perceived as being limited in quality and specialization, highlighting that while the region is beginning to experience economic growth, the benefits are still in their early stages and primarily affect less specialized areas of the labor market. In tourism product diversification and integration, 58% of respondents acknowledged that the

GERD had contributed to tourism development and product diversification, indicating a positive shift in the region's tourism offerings. However, these advancements were tempered by barriers to further growth, such as insufficient infrastructure and limited facilities, which prevent the region from fully capitalizing on its tourism potential. Lastly, socio-cultural dynamics were also a noteworthy theme, with 42% of respondents observing changes in local social dynamics due to the GERD. These shifts include diversified community which created local pride and unity, although they were less pronounced than the more tangible impacts on infrastructure and economic factors. Together, these themes reflect a complex and multifaceted impact of the GERD on the region, showcasing both progress and ongoing challenges in leveraging the dam's benefits for sustainable regional development. Finally, collectively it shows a compressive understanding of GERD's impacts showing both positive outcomes such as infrastructure and business growth as well as ongoing challenges and particularly in tourism development (Table 2).

As indicated by the interview data and open ended responses, the construction of the GERD has significantly advanced regional infrastructure tourism development and integration in East Africa, enhancing water resources management and promoting cross border cooperation, aligning with the African union's program for infrastructure development in Africa which prioritizes integrated transport and energy networks to foster regional trade and economic growth (African Union, 2012). As a strategic initiative by Ethiopia, GERD aims to leverage natural resources for economic development and regional influence (Sindi, 2021). However, despite these infrastructural advances, there remain notable deficiencies in tourism infrastructure, limiting the economic benefits from improved connectivity (Ogutu, 2019). To fully capitalize on these benefits, infrastructure planning must incorporate not only transport and energy sectors but also tourism related facilities to enhance visitor experiences (Ogutu, 2019). Additionally sustainability principles including renewable energy and nature based storage should guide dam design and operations (Bulti, 2024; Schmitt & Rosa, 2024). Major water projects, such as the Hoover Dam and Three Gorges Dam reshape arid regions and affect hydrological and ecological systems (Hansen & Lowe, 2024; Tan et al., 2024). consequently the future dam management should prioritize sustainability, advanced technologies and balance economic, environmental and social impacts (Angelakis et al., 2024; Lele et al., 2023). Moreover, reevaluating energy planning in Africa is key to reduce hydropower impacts and exploring alternative energy solutions (Carlino et al., 2024). Maintaining river connectivity is also essential for preserving inland fisheries and aquatic (Ditya et al., 2021).

Additionally, China's Belt and Road initiative has bolstered infrastructure investment in Africa but raised concerns regarding debt sustainability and strategic influences (Mutai et al., 2024). Theoretical frameworks on infrastructure emphasize its role in regional integrations, yet such projects can also escalate geopolitical tensions, as seen in the Nile resources dispute (Blinken, 2021). Collaborative frameworks that integrate both hard and soft infrastructure are necessary for maximizing benefits of large scale projects like GERD while addressing diverse stakeholders interests (Meyer, 2020; Ogutu, 2019).

Furthermore, as supported various theoretical frameworks, infrastructure is crucial for tourism development. Proper planning of infrastructure is essential for sustainable growth (Mousazadeh et al., 2023), further (Zhao et al., 2025) supports the idea that investment in livelihood infrastructure significantly contribute to tourism. Social exchange theory suggests road and transport infrastructure especially initiatives like China-Pakistan economic corridor can greatly enhance local community support for tourism. Kanwal et al. (2020) argue that when the communities perceive tangible benefits from tourism, they become more invested in its success. However, when we look at development theory, it seems to fall short in fully explaining the tourism development relationships. It does not provide o understand the complexities of tourism's impact on development. In addition, Sharpley (2022) argues that, in light of global environment concerns, degrowth could serve as a more viable path for tourism and development, focusing on reducing over consumption and aligning development with environmental sustainability.

Table 2. Excerpt of spreadsheet tracking code changes.

Data points	Initial code
Enhanced roads	INF-DEV
Lack of signage	INF-DEV
Boost local trade	JOB-CREATION
Unequal economic gains	LOCAL-TRADE
Cultural revitalization	SOCIO-CULTURAL

The synthesized results derived from the interview and open ended response indicate that the GERD has stimulated substantial economic growth in Ethiopia, particularly in sector like hospitality, retail, transportation, fostering regional cooperation and market access (Sindi, 2021). Its expected capacity to double Ethiopia's electric city generation plays a crucial role in powering industries and attracting investments, thus driving demand within the hospitality sector due to improved connectivity (ERF, 2020). However, despite these economic benefits, challenges related to the unequal distribution of resources raise concern about social equity and sustainable development (Boehlert et al., 2020; Info Nile, 2022). Endogenous growth theory supports the GERD's role which state that the GERD converts Ethiopia's own natural endowment into a non-rival, infinitely reusable stock of knowledge-cum-energy that raises the marginal productivity of every other input, exactly the Romer mechanism for self-propelled, ever-accelerating growth (Romer, 1990), but issues such as dependence on external materials and uneven befits highlight the need for inclusive policies (Meyer, 2020). The dam also plays a pivotal role in regional energy security and integration, especially within horn of Africa (Mohammed, 2024), though it has heightened geopolitical tensions in the Nile Basin over water rights (Tadesse, 2022; Hailu, 2022). Furthermore, while, Ethiopia's electrification efforts aim to expand energy accesses, the GERD disputes from 2015 to 2021 illustrates the complex challenges of water diplomacy and resources sharing (Jungudo, 2023), with broader lessons on balancing environmental impacts and water management, as seen in global efforts such as Turkey's renewable energy initiatives (Gürer, 2021).

Along with the findings of empirical research, theories indicate that infrastructure investment is essential for sustained economic growth, especially in areas like energy, transportation, and communication, as described in Jacobs et al.' (1997) 'Infrastructure Investment Theory.' Zhou (2019) highlights how government-driven infrastructure and reforms helped China's tourism industry grow more competitive. The impact of infrastructure, according to Harrison (2015) and Fourie (2006), is complicated and influenced by market failures as well as the worldwide nature of tourism, necessitating an integrated approach for sustainable development.

The interview responses and open ended feedback cited in the results illustrates, the construction of the GERD has been a key driver in promoting regional economic integration, in line with economic integration theory, which emphasis the role of infrastructure projects in enhancing connectivity and diversifying economies (Ethiopian Embassy, 2023). The GED's energy production boost is expected to support sectors like tourism and generate employment, although challenges such as inadequate infrastructure and marketing strategies hinder its full economic potential (Ethiopian Embassy, 2023). Successful tourism development around the dam requires diversification of offerings, including cultural and adventure tourism, as well as improvements in transportation and infrastructure. Additionally, sustainable tourism practices and community engagement are vital to ensuring long-term benefits minimizing environmental impacts. Regional examples from china and southeast Sulawesi highlight both the opportunities and challenges of integrated tourism development, including resistance to the technological change and coordination issues (Zhao & Chen, 2020). Lastly, the need to balance tourism growth with climate changes adaption and cultural preservation underscores the complexity of the development process, necessitating effective management and planning to address environmental, technical, and socio cultural challenges (Steiger et al., 2022; Tang & Xu, 2023; Tehseen et al., 2024). The above study findings align with the theory that tourism can foster socio-economic transformation, particularly in rural areas, where transition management becomes a crucial governance tool to guide adoptive and sustainable development (Salvatore et al., 2018). In additionally, other theory suggests that tourism market diversification positively impacts economic growth mainly in lower-income countries, while its effect diminishes or turns negative in high-income countries at higher growth levels (Saboori et al., 2023).

From the coated results socio-cultural dynamics as reflected in the interview and open-ended responses the GERD has fostered significant community identity and social cohesion in Ethiopia, aligning with putnam's (2000) theory of social capital, which highlights the role of shared projects in strengthen trust and cooperation. The dam has initiated community events that celebrate cultural heritage and collective pride reinforcing social ties (Baker & McLoughlin, 2016). This approach also aligns with the intersection of identities in development initiatives (Kabeer, 2003). On the contrary, large infrastructure projects sometimes cause social and economic upheaval, as seen in similar causes such as the Merowe Dam in Sudan and the El Quimbo and HidroItuango dams in Colombia, where forced displacement and loss of livelihoods indicated

the need for effective community engagement and conflict resolutions mechanisms (Abdullah & Rahman, 2021; Koops, 2024). These examples underscore the importance of culturally sensitive and participatory approaches to managing the socio cultural impacts of such projects (Sossa et al., 2024; Zhuang et al., 2019). In conclusion, the GERD's impact on tourism and regional development can be best understood as a tension between the economic integration and growth theories that justify its construction and the critical sustainability frameworks that question its long-term viability and equity. The project embodies the potential for infrastructure to be a catalyst, as per endogenous growth theory (Romer, 1990), but its ultimate success depends on integrating the lessons from destination management (Butler, 2006; Inskip, 1991) and critical tourism studies (Bianchi, 2009; Fletcher, 2011). This requires a conscious pivot from top-down development to a nuanced strategy that prioritizes community well-being, environmental sustainability, and the careful, staged planning of the tourism product to ensure the GERD's legacy is both prosperous and just.

Generally, the relationship between themes particularly infrastructure development, economic growth, tourism, and socio-cultural cohesion in the context of the GERD reveals a complex interdependency. The GERD has catalyzed significant infrastructure improvements, enhancing regional connectivity and facilitating access for businesses, tourists, and local communities. On the economic front, the dam or the infrastructure built is catalyzed local economic activity particularly in the tourism, hospitality and transportation sectors by opening up new market accesses. While, the lack of tourism specific infrastructure limits the sector's growth potential and uneven distribution of economic benefits underscores the need for an equitable development strategy, ensuring that all communities, particularly those impacted by imported goods, share in the opportunities. Furtherer more socially, the GERD fostered sense of national pride and unity among the local community in the route cites.

Implications

The findings of this study on the GERD offer a nuanced perspective on its implications for regional tourism development. Theoretically, the research illustrates how large-scale infrastructure projects like GERD can catalyze regional economic activity by enhancing connectivity through improved roads, bridges, and other infrastructure. This aligns with theories of endogenous growth, which posit that such investments can support economic development and regional integration. Practically, however, while GERD has led to notable advancements in regional infrastructure, the study revealed that tourism development has not kept pace. Key deficiencies such as inadequate signage and limited recreational facilities near the dam sites have constrained the potential for tourism growth. Addressing these deficiencies is critical for leveraging the infrastructure improvements to attract diverse tourist demographics and stimulate economic growth through tourism. This practical implication underscores the necessity for a comprehensive approach to infrastructure planning that includes tourism-related facilities to fully capitalize on the economic benefits of GERD. Furthermore, large scale infrastructure projects including GERD contributed to enhancing connectivity and driving regional economic growth. Which emphasized infrastructure investments such as roads; bridges transport links simulated the local economy, promoted regional integration and somehow supported tourism sector at the route of GERD. However there is also a gap between infrastructure development and tourism development such as in adequate signage, in sufficient rotational facilities and lack of tourism specific infrastructure. Ethiopian government road and infrastructure minister authorities should prioritize funding for tourism related infrastructure, develop compressive tourism development strategy, and promote skills development programs for local community. Investors should be encouraged to focus on building tourist facilities and investing in marketing efforts, and raising awareness of the GERD region's tourism potential.

Limitations and future directions

In terms of limitations and future directions, the study acknowledges potential biases and constraints in data collection and analysis, which may impact the generalizability of the findings. These limitations highlight the need for ongoing research to address gaps in understanding the long-term impacts of large-scale infrastructure projects like GERD. Future studies should focus on sustainable development practices, environmental stewardship, and inclusive community engagement to better manage the socio-cultural and

ecological impacts associated with such projects. Longitudinal research tracking the evolving impacts of GERD on regional dynamics will provide deeper insights into the project's effectiveness over time. Additionally, comparative analyses with other global dam projects can offer valuable lessons and best practices for optimizing the benefits while mitigating challenges. Such research will be crucial in developing strategies to maximize GERD's positive impacts and address its limitations, contributing to more sustainable and inclusive development practices. Longitudinal studies is very necessary that need to be done to track the long-term effects of GERD on regional dynamics and comparative analyses with other large-scale infrastructure projects to assess best practices and optimize development outcomes.

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Originality

East Africa, known for its cultural richness and diverse landscapes, is increasingly prioritizing infrastructural development to boost tourism growth, with the GERD serving as a pivotal case study. Located on the Blue Nile River, the GERD has significant implications for water management, energy production, and regional tourism, reflecting global trends that demonstrate how large-scale dams can impact local economies and tourism dynamics. While the dam's development has sparked interest in its tourism potential, it also poses challenges, including environmental degradation and socio-economic impacts that require careful management. This study investigates the GERD's effects on infrastructure, job creation, and socio-cultural aspects in Northwestern Ethiopia, aiming to provide insights into how such projects can enhance regional tourism while addressing associated challenges. Through 25 interviews and 50 open-ended surveys analyzed via reflexive thematic analysis, the research identifies key effects of the GERD, including improvements in local infrastructure and economic activity, alongside limitations like unequal economic benefits and insufficient tourism facilities. The findings underscore the necessity for inclusive strategies to maximize the positive impacts of the GERD while mitigating socio-cultural tensions and enhancing tourism infrastructure.

Author contributions

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Data availability statement

The data that support the findings of the study is available upon reasonable request. Anyone who has interest can contact the corresponding author, Zemene Guadie, via email at guadiezemene@gmail.com.

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