

East African Journal of Environment and Natural Resources

eajenr.eanso.org

Volume 8, Issue 3, 2025

Print ISSN: 2707-4234 | Online ISSN: 2707-4242

Title DOI: <https://doi.org/10.37284/2707-4242>



EAST AFRICAN
NATURE &
SCIENCE
ORGANIZATION

Original Article

Efficacy of Environmental Impact Assessment (EIA) Process on the Management of Selected Irrigation Schemes Funded by Baringo County Government, Kenya

Dorothy Jerop Chepkwony^{1*}, Dr. Ann Sitienei, PhD¹, Dr. Keith K. Rono, PhD¹

¹ University of Kabianga, P. O. Box 2030-20200, Kericho, Kenya.

*Correspondence Email: dorothyjerop4@gmail.com

Article DOI: <https://doi.org/10.37284/eajenr.8.3.3791>

Date Published: ABSTRACT

09 October 2025

Keywords:

*Irrigation Schemes,
Management,
EIA,
Stakeholders,
County Government.*

Environmental Impact Assessment (EIA) plays a vital role in ensuring the sustainable implementation of irrigation schemes by identifying and mitigating potential environmental and social risks. This study assessed the efficacy of the EIA process in the management of selected irrigation schemes funded by the Baringo County Government, Kenya. A descriptive survey design was adopted, targeting 192 beneficiaries, 10 irrigation scheme managers, 4 county irrigation engineers, and 4 environmental experts. Data were collected through questionnaires and key informant interviews. Descriptive statistics was used for quantitative analysis, while qualitative data were thematically analysed. The findings revealed that stakeholders perceived the EIA process as crucial for regulatory compliance, conflict resolution, and improved decision-making. The study concludes that strengthening the EIA process enhances sustainable irrigation outcomes and recommends stakeholder involvement and regulatory enforcement for improved effectiveness.

APA CITATION

Chepkwony, D. J., Sitienei, A. & Rono, K. K. (2025). Efficacy of Environmental Impact Assessment (EIA) Process on the Management of Selected Irrigation Schemes Funded by Baringo County Government, Kenya. *East African Journal of Environment and Natural Resources*, 8(3), 204-218. <https://doi.org/10.37284/eajenr.8.3.3791>.

CHICAGO CITATION

Chepkwony, Dorothy Jerop, Ann Sitienei and Keith K. Rono. 2025. "Efficacy of Environmental Impact Assessment (EIA) Process on the Management of Selected Irrigation Schemes Funded by Baringo County Government, Kenya". *East African Journal of Environment and Natural Resources* 8 (3), 204-218. <https://doi.org/10.37284/eajenr.8.3.3791>

HARVARD CITATION

Chepkwony, D. J., Sitienei, A. & Rono, K. K. (2025) "Efficacy of Environmental Impact Assessment (EIA) Process on the Management of Selected Irrigation Schemes Funded by Baringo County Government, Kenya", *East African Journal of Environment and Natural Resources*, 8 (3), pp. 204-218. doi: 10.37284/eajenr.8.3.3791.

IEEE CITATION

D. J., Chepkwony, A., Sitienei & K. K., Rono "Efficacy of Environmental Impact Assessment (EIA) Process on the Management of Selected Irrigation Schemes Funded by Baringo County Government, Kenya", *EAJENR*, vol. 8, no. 3, pp. 204-218, Oct. 2025.

MLA CITATION

Chepkwony, Dorothy Jerop, Ann Sitienei & Keith K. Rono. "Efficacy of Environmental Impact Assessment (EIA) Process on the Management of Selected Irrigation Schemes Funded by Baringo County Government, Kenya". *East African Journal of Environment and Natural Resources*, Vol. 8, no. 3, Oct 2025, pp. 204-218, doi:10.37284/eajenr.8.3.3791

INTRODUCTION

Irrigation is recognised globally as a critical intervention for enhancing food security, sustaining agricultural productivity and improving rural livelihoods (Bélanger & Pilling, 2019). As the global human population continues to increase to the projected 10.5 billion by 2050 from 7 billion in 2009, there is mounting pressure on the utilisation of natural resources such as soil, water, and energy (UNEP, 2012). Historically, irrigation systems have played a significant role in early civilisations in Mesopotamia, Egypt, and China (Angelakus *et al.*, 2020). In contemporary times, irrigation is widely seen as a strategic measure for stabilising food supply, especially in regions prone to erratic rainfall patterns and climate variability (Mhembwe *et al.*, 2019). Globally, irrigated agriculture contributes about 40% of total food production and is particularly critical in arid and semi-arid regions (Rosa, 2020).

Different irrigation technologies are adopted globally depending on climate, topography and financial capabilities. Trivedi & Nandeha (2021) categorised irrigation schemes into small-scale (<200 hectares), medium-scale (200–300 hectares), and large-scale (>300 hectares) and highlighted the dominance of small-scale schemes managed by local farmers using accessible and affordable technologies. However, large-scale irrigation schemes account for 18% of global irrigated areas and are often plagued by operational inefficiencies, with many becoming non-functional within a few years of implementation (Higginbottom *et al.*, 2021).

While irrigation brings immense agricultural benefits, it also poses significant environmental risks if not properly managed (Mateo-Albou *et al.*, 2024). Globally, the construction of irrigation infrastructure, such as dams, canals, and water

abstraction systems, alters hydrological patterns of streams and rivers, causing water scarcity downstream and disrupting aquatic ecosystems. Moreover, improper use of agro-chemicals leads to water pollution, soil degradation and threatens long-term agricultural sustainability (Mateo-Albou *et al.*, 2024). These challenges of irrigation necessitate robust environmental safeguards during the planning and implementation of irrigation schemes.

One of the key tools adopted worldwide to address environmental concerns associated with development projects, including irrigation schemes, is the Environmental Impact Assessment (EIA) process. By definition, EIA is a systematic process of identifying, predicting, and evaluating the potential environmental effects of proposed projects during their design, decision-making, and before implementation phases (Enríquez-de-Salamanca, 2021). The concept originated in the United States in 1969 and has since been widely adopted across both developed and developing nations (George *et al.*, 2020). EIA processes vary across countries: in the United States, legislation mandates EIA for public projects with potentially harmful environmental effects (Abdulkadir, 2021), while in Canada, the process is integrated into sustainable development strategies, involving social reviews and public consultations (López-Felices *et al.*, 2020). In China, EIA has evolved into a Strategic Environmental Assessment (SEA), which includes broader planning frameworks and enhanced public engagement (Wirojanagud, 2020).

In Africa, the implementation of EIA has gained recognition through continental initiatives, including the African Ministerial Conference on Environment and the Pan-African Initiative for Capacity Development and Linkages for EIA (Ofoezie *et al.*, 2022). However, the actual execution of EIA in many African countries faces

challenges such as weak enforcement, limited public awareness, and inadequate funding. Consequently, development projects that include irrigation projects across the continent often fail to achieve desired impacts due to poor planning, ineffective management, and a lack of community participation. For instance, Pittock *et al.* (2020) reported that donor-funded irrigation projects in Africa and similar contexts were less successful since the local community was not adequately involved in their design and implementation. Consequently, Bjornlund *et al.* (2020) noted that most African countries have not harnessed the full potential of irrigation due to mismanagement, insecurity of land tenure, and the exclusion of beneficiaries from key decision-making processes.

Kenya has adopted the EIA process as a legal requirement for developmental projects under Article 69 (1)(f) of the Constitution of Kenya, 2010, and the Environmental Management and Coordination Act (EMCA), 1999. This legal instrument prescribes that all development projects with potential environmental impacts, including irrigation schemes, should undergo environmental impact assessments and acquire relevant licenses before implementation (Kiremu *et al.*, 2022). The EIA process in Kenya plays a crucial role in mitigating environmental risks associated with projects' implementation, reducing resource-use conflicts, encouraging stakeholder participation, and enhancing sustainability (Omenge *et al.*, 2020).

At the local level, the irrigation potential of Baringo County, which is a region characterised by a semi-arid climate and significant socio-political challenges such as banditry and resource-based conflicts, is estimated at 65,000 hectares, yet only about 640 hectares were irrigated by 2017 (CIDP, 2012). According to Baringo County Government (2023) and the National Irrigation Authority (2024), over KES 200 million (USD 1.6 million) has been utilised in funding and supporting irrigation schemes within the County. Despite these huge public investments and support, the performance of

irrigation schemes remains suboptimal. Many irrigation schemes are currently obsolete or have collapsed due to issues which could have ordinarily been addressed by EIA such as weak maintenance, insecurity, and a lack of effective stakeholder engagement. For example, Perkerra Irrigation Scheme in Baringo South, established in 1954, was envisioned to enhance onion production and food security but has consistently failed to meet its objectives due to lack of environmental safeguards and participatory project design (Chebii *et al.*, 2022).

According to the CIDP-Baringo County (2023–2027), Environmental Impact Assessments (EIA) must be carried out for all irrigation projects to comply with national environmental laws and ensure long-term viability. Thus, while Baringo County holds considerable potential for irrigation-led agriculture, realising this potential requires the systematic and inclusive application of EIA processes. Streimikiene *et al.* (2021) argued that EIA should be tailored to meet local sustainability goals. In this regard, there was an urgent need for this study to assess the efficacy of the EIA process in the management of irrigation schemes funded by Baringo County Government. The aim was to understand how EIA helps to mitigate environmental threats, enhance community participation, and ensure sustainable agricultural development. By identifying obstacles and analysing existing gaps, the study offered a pathway for the adoption of effective mitigation strategies that are both contextually relevant and environmentally sound.

Statement of the Problem

The Environmental Impact Assessment (EIA) process ideally serves as a robust tool for safeguarding environmental integrity, enhancing stakeholder participation, and guiding the sustainable management of development projects such as irrigation schemes. However, implementation of the EIA process in many developing countries including Kenya falls short of

this ideal due to weak institutional capacity, low public involvement, and poor enforcement of EIA recommendations. In Baringo County, irrigation schemes funded by the County government continue to face challenges such as environmental degradation, resource-use inefficiencies, and community conflicts, suggesting possible gaps in the EIA process and its integration into project management. It is speculated that while EIA may be conducted, its influence on actual decision-making and operational practices remains limited, possibly due to inadequate awareness, superficial stakeholder engagement, and non-compliance with regulatory frameworks. The absence of empirical studies assessing the efficacy of the EIA process in informing irrigation schemes' management in devolved contexts further exacerbates this knowledge gap. This study, therefore, assessed the efficacy of the EIA process in the management of selected irrigation schemes funded in Baringo County, with a view to informing evidence-based improvements in environmental governance and sustainable development at the county level.

Literature Review

This section presents a review of related literature, a theoretical framework and a conceptual framework.

Environmental Impact Assessment (EIA)

Environmental Impact Assessment (EIA) is globally recognised as a systematic process for identifying, predicting, and evaluating the potential environmental and social effects of proposed development projects before decisions are made and actions taken. Enríquez-de-Salamanca (2021) defines EIA as a structured approach that informs decision-making by analysing the likely environmental consequences of development interventions and recommending mitigation strategies. Since the 1980s, EIA has become a core component of environmental governance, particularly in sectors such as agriculture, infrastructure, and irrigation (Shammi *et al.*, 2022;

United Nations Environment Programme [UNEP], 2002).

The efficacy of an EIA process refers to its ability to achieve intended outcomes such as promoting environmental sustainability, reducing adverse environmental and social impacts, ensuring regulatory compliance, and supporting sustainable planning. Sadler (1996) proposed a multidimensional framework for assessing EIA effectiveness, encompassing procedural (adherence to formal steps), substantive (influence on decisions), transactive (efficiency in resource use), and normative (contribution to sustainability goals) dimensions. According to Glasson *et al.* (2021) and Sánchez & Gallardo (2020), an efficacious EIA process is typically characterised by a clear legal framework, robust assessments, enforceable mitigation measures, and institutional capacity for monitoring and follow-up.

Empirical studies across various regions underscore the critical role of institutional strength and regulatory enforcement in shaping EIA outcomes. Caro-González *et al.* (2021), in a meta-analysis of EIA practices in Latin America, found that jurisdictions with strong environmental mandates and well-resourced agencies reported better compliance with EIA recommendations and more positive environmental outcomes. In contrast, Komakech & van der Zaag (2017) observed that in Uganda and Tanzania, EIAs for irrigation schemes were often sidelined in project design, resulting in unresolved resource-use conflicts and environmental degradation.

In Kenya, Nyanchama (2021) evaluated EIA practices in the upstream petroleum industry and found that despite constitutional provisions for public involvement, poor dissemination of information, minimal stakeholder feedback loops, and weak post-approval oversight hindered EIA effectiveness. Kabera & Mutavu (2023), in a study on infrastructure development, revealed that many EIA reports lacked depth and specificity and were often not monitored after approval, reducing their

impact on project sustainability. This raises concern that EIA is sometimes treated as a compliance checkbox rather than a tool for sustainable planning.

EIA report quality also significantly affects process efficacy. Wood (2003) and Morrison-Saunders & Arts (2012) emphasise that effective EIA reports must include comprehensive baseline data, accurate predictions, and actionable mitigation strategies. Roos *et al.* (2020), through interviews with regulators in South Africa, noted that inadequate technical expertise and rushed review timelines compromise report quality and reduce EIA's influence on project decisions. Likewise, Adu *et al.* (2023) reported that delays, poor inter-agency coordination, and inconsistent enforcement of environmental management plans (EMPs) hindered EIA performance in irrigation and energy projects across West Africa.

Improving EIA efficacy, particularly in irrigation scheme management, requires capacity building, stakeholder involvement, strengthened legislation, and integration of monitoring systems (Maphanga *et al.*, 2022). When EIA recommendations are effectively implemented and enforced, irrigation schemes tend to experience fewer environmental issues, better water management, and improved inter-agency coordination.

In conclusion, although stakeholder engagement is critical, a high-performing EIA system must go beyond participation to include rigorous assessments, institutional enforcement, and resource-backed implementation. For irrigation schemes in Kenya, this means developing context-specific, science-based EIAs supported by adequate institutional and legal frameworks to ensure their effective contribution to sustainable development.

Research Gap

Although Environmental Impact Assessment (EIA) is widely recognised as a critical tool for sustainable project planning, limited empirical studies have specifically evaluated its effectiveness in managing environmental and social effects specifically for

irrigation schemes. Much of the existing literature focuses on EIA compliance or procedural aspects, but few studies have examined whether EIA processes such as stakeholder engagement and participation, report quality, conflict mitigation and regulatory oversight actually translate into tangible environmental protection and social benefits on the ground. Furthermore, little is known about the perceptions of local stakeholders and the public concerning the actual impact of EIA on reducing environmental degradation and resolving social tensions in rural irrigation schemes. The gap is particularly significant given the increasing investments in irrigation and the rising environmental and social challenges reported in these schemes. This study seeks to address a crucial gap by examining the real-world efficacy of EIA as a management tool for environmental and social sustainability within County-led irrigation projects using Baringo County as a case study.

Theoretical Framework

This study is grounded in the Sustainable Development Theory, a foundational paradigm in global discourse on environmental governance, equitable economic progress, and long-term societal well-being. The theory was formally articulated in the landmark report *Our Common Future* (1987) by the World Commission on Environment and Development, commonly referred to as the Brundtland Commission. The report defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland Commission, 1987).

At its core, the Sustainable Development Theory advances the idea that environmental integrity, economic viability, and social equity are not mutually exclusive objectives but interdependent pillars that must be balanced for development to be genuinely sustainable (Karpan *et al.*, 2020; Purvis *et al.*, 2019). The theory critiques traditional development approaches that prioritise economic

growth at the expense of ecological systems and marginalised populations. Instead, it advocates for development models that are inclusive, ecologically sound, and economically justifiable.

In this context, the Sustainable Development Theory provides a compelling and relevant framework for evaluating the role of Environmental Impact Assessment (EIA) in the management of county-funded irrigation schemes. Specifically, the theory underscores the importance of integrating environmental and social considerations into the early stages of project planning, a principle operationalised through EIA processes. According to Nita *et al.* (2022), EIA serve as an essential tool in ensuring that development interventions such as irrigation schemes are not only technically feasible, economically profitable, but also environmentally sustainable and socially acceptable.

Moreover, the Sustainable Development Theory emphasises inclusive stakeholder engagement, recognising that sustainable outcomes are more likely when local communities, interest groups, and marginalised populations are actively involved in decision-making (Freeman, 1984). This aligns with a key focus of the study, which examines the extent to which stakeholder participation in EIA processes contributes to improved project legitimacy, conflict resolution, and regulatory compliance within selected irrigation schemes in Baringo County.

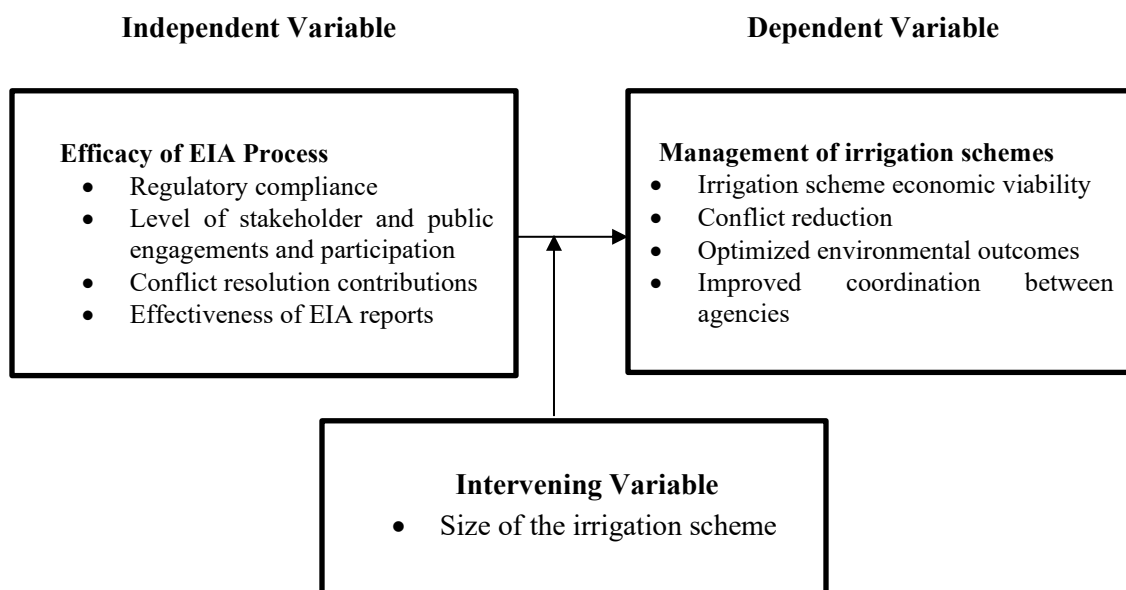
This theory reinforces the study's main objective of assessing the efficacy of EIA as a governance tool in developmental projects. Sustainable Development Theory provides both a normative foundation, that is, why it matters for environmental and social balance and a practical lens on how EIA can operationalise this balance in public-sector

development initiatives. It informs the study's examination of whether EIA processes in Baringo County are efficient in safeguarding ecological systems, promoting social inclusion, and enhancing the long-term viability of irrigation investments.

In summary, Sustainable Development Theory is appropriately adopted in this study as it aligns conceptually and practically with the investigation's central concern on the efficacy of the EIA process on the management of irrigation schemes under a devolved governance framework.

Conceptual Framework

This study is anchored on a conceptual framework that outlines the presumed relationship between the efficacy of the Environmental Impact Assessment (EIA) process and the management of selected irrigation schemes in Baringo County. The independent variable, efficacy of the EIA process, is operationalised through four dimensions: regulatory compliance, the level of stakeholder and public engagement, the extent of conflict resolution and the effectiveness of EIA reports in addressing potential environmental and social effects. The dependent variable, management of irrigation schemes, is captured through four indicators: irrigation scheme economic viability, conflict reduction, optimised environmental outcomes, and improved coordination between agencies. To strengthen the analytical model, the framework also incorporates intervening variables (size of the irrigation scheme), which may influence the nature and strength of the relationship between the independent and dependent variables. The relationships among these variables are illustrated in Figure 1.

Figure 1: Conceptual Framework of the Study

Methodology

Study Area

The study was undertaken within Baringo County, which is located in the former Rift Valley province, Kenya. Baringo County is mostly agro-based, growing cash crops such as pyrethrum, macadamia, cotton, and coffee. Other crops include: onions, tomatoes, finger millet, cassava, sorghum, sweet and Irish potatoes, beans, maize, and pigeon peas. Livestock products include: mutton, beef, honey, and hides and skins. According to the reports for the Department of Water and Irrigation schemes (2023), there are 10 irrigation schemes funded by Baringo County government with a total of 369 registered beneficiaries.

Research Design

The study adopted a descriptive survey research design, which facilitated the collection of both quantitative and qualitative data.

Population and Sampling

The target population comprised 369 beneficiaries across all 10-county government-funded irrigation schemes. A multi-stage sampling approach was employed, where purposive sampling was used to

select all 10 irrigation schemes based on their relevance to the study. Stratified random sampling was applied to select 192 beneficiaries across the schemes proportionate to their population size. The 10 irrigation scheme managers, 4 County irrigation engineers, and 4 environmental experts were selected purposively due to their technical knowledge and direct involvement in the design and oversight of EIA processes.

Data Collection Procedures

Primary data were collected through administering structured questionnaires to all 192 beneficiaries and conducting semi-structured interviews with the 10 irrigation scheme managers, 4 County irrigation engineers, and 4 environmental experts. Quantitative data were analysed using descriptive statistics such as frequencies, means, and standard deviations to summarise respondent characteristics and perceptions. In contrast, qualitative data obtained from interviews were thematically organised and analysed through a process of open coding, theme identification, and narrative synthesis to provide a deeper contextual understanding of the EIA process from managerial and policy perspectives. This mixed-methods approach

ensured triangulation, enhancing the validity, reliability, and richness of the study findings.

Results and Discussion

Stakeholders’ Perceptions of the Efficacy of the Environmental Impact Assessment

The study assessed stakeholders’ perceptions of the efficacy of the Environmental Impact Assessment (EIA) process in managing the selected irrigation schemes. A key indicator of this perception was the level of importance respondents attached to conducting EIA before the implementation of irrigation projects.

Table 1: Importance of Conducting Environmental Impact Assessment (EIA) before Initiating Irrigation Schemes

Response	Frequency (n = 192)	Percentage (%)
Very Important	147	76.6%
Moderately Important	18	9.4%
Slightly Important	21	10.9%
Not Important at All	6	3.1%

Source: *Field Data, 2024*

The results in Table 1 indicate that a significant majority of respondents (76.6%) regard the EIA process as very important before the commencement of irrigation schemes. An additional 9.4% consider it moderately important, while 10.9% and 3.1% view it as slightly important and not important at all, respectively.

These findings suggest a strong awareness among stakeholders regarding the preventive and planning functions of EIA. The high percentage of respondents who support pre-implementation EIA points to a general consensus that it plays a critical role in anticipating and mitigating environmental and social risks associated with irrigation schemes.

This aligns with findings from Glasson *et al.* (2021) and Nakwaya-Jacobus *et al.* (2021), who

emphasised that the effectiveness of irrigation scheme management significantly improves when EIA is conducted before project rollout. It enhances foresight, compliance with environmental regulations, and stakeholder participation, all of which are essential for sustainable irrigation development.

Involvement of Stakeholders in the EIA Process

The study also sought to assess perceptions on the importance of involving stakeholders in the Environmental Impact Assessment (EIA) process in the context of irrigation schemes. Table 2 presents respondents' views on whether stakeholder involvement contributes to better decision-making in the planning and management of these schemes.

Table 2: Involvement of Stakeholders in EIA Process

Question	Yes	No	Not sure	Mean	SD
Do you believe involving stakeholders in the EIA process for irrigation schemes would improve decision-making?	186 (96.9%)	5 (2.6%)	1(0.5%)	1.04	0.21

Source: *Field Data, 2024*

As shown in Table 2, an overwhelming 96.9% of the respondents agreed that involving stakeholders in the EIA process improves decision-making for irrigation schemes. Only 2.6% responded

negatively, while 0.5% were unsure. The mean score of 1.04 with a very low standard deviation of 0.21 further demonstrates a strong consensus among the participants.

These findings underscore the value that stakeholders place on inclusive and participatory approaches in environmental governance. According to Roos *et al.* (2020) and Kaku *et al.* (2022), stakeholder involvement enhances transparency, ensures local knowledge is integrated into project planning, and fosters ownership, which are essential for the sustainability of irrigation initiatives.

Moreover, active participation helps to identify site-specific concerns that may not be apparent to external experts. This aligns with the best practices outlined by Glasson *et al.* (2021), who advocate for participatory EIA frameworks, particularly in rural and agriculturally intensive regions, to ensure equitable and environmentally sound outcomes.

The findings of the interview schedule revealed that stakeholder engagement is crucial to the success of the EIA process. Several respondents noted that

while stakeholders were generally invited to participate in the EIA process, the level of engagement varied. Key decision-makers, such as government officials and irrigation scheme managers, were well represented, but local farmers and community members reported feeling marginalised. Many felt that their contributions were limited to formal meetings, with little follow-up on how their input influenced the final decisions. This led to a perception that the EIA process was top-down, rather than a truly participatory process.

Importance of Involving the Public in the EIA Process

The study further sought to examine respondents' perceptions regarding the importance of public involvement in the Environmental Impact Assessment (EIA) process, especially in relation to the planning and implementation of irrigation schemes. The findings are presented in Table 3

Table 3: Importance of Involving the Public in the EIA Process for Irrigation Schemes

Question	Very Important	Moderately important	Slightly important	Not important at all
How important do you think it is to involve the public in the EIA process for irrigation schemes?	148(77.1%)	39(20.3%)	5(2.6%)	0(0%)

Source: *Field Data, 2024*

A majority of the respondents, 148(77.1%), indicated that it was very important to involve the public in the EIA process for irrigation schemes. On the other hand, 39(20.3%) respondents stated that it was moderately important, and 5(2.6%) respondents indicated that it was slightly important. Therefore, these findings imply that most farmers considered the involvement of the public in the EIA process as very important. The findings were supported by George *et al.* (2020), whose study on assessing the importance of public involvement in the Environmental Impact Assessment (EIA) in farm projects in Nigeria established that engaging

stakeholders such as governmental organisations, relevant government agencies, local government, professionals, and the local population was critical in farm projects.

Contribution of EIA in Resolving Conflicts Related to Irrigation Schemes

To assess stakeholder perspectives on the role of the Environmental Impact Assessment (EIA) process in conflict resolution, the study examined the perceived extent to which EIA contributes to resolving disputes associated with irrigation schemes. The findings are presented in Table 4.

Table 4: The Contribution of EIA in Resolving Conflicts Related to Irrigation Schemes

Question	Significantly	Moderately	Slightly
How do you anticipate EIA could contribute to resolving conflicts related to irrigation schemes?	106(55.2%)	79(41.1%)	7(3.6%)

Source: *Field Data, 2024*

As shown in Table 4, a majority of respondents, 55.2%, believe that the EIA process contributes significantly to conflict resolution in the context of irrigation schemes. Another 41.1% indicated that it contributes moderately, while only 3.6% viewed its contribution as slight.

These results highlight a strong belief in the potential of the EIA process to act as a platform for mediating and mitigating conflicts related to land use, water allocation, environmental degradation, and social equity. The findings align with Kaku *et al.* (2022) and Kabera & Mutavu (2023), who argue that when EIA is executed with stakeholder engagement, it facilitates transparent dialogue, reduces misunderstandings, and helps prevent disputes from escalating.

Furthermore, as Bjornlund *et al.* (2020) and Caro-González *et al.* (2023) note, the EIA process, when inclusive and participatory, can proactively identify potential conflict triggers and recommend mitigation strategies, particularly in resource-sensitive projects like irrigation development.

Regarding conflict resolution, the respondents of the interview schedule emphasised that EIA should play a vital role in addressing potential disputes arising from irrigation scheme management. However, the findings showed that conflicts between local communities, irrigation scheme managers, and environmental bodies were not always adequately resolved through the EIA process. In some cases, the lack of meaningful stakeholder engagement led to disputes regarding water use, land allocation, and environmental degradation. Key informants suggested that integrating conflict resolution mechanisms into the EIA process could enhance its overall efficacy, ensuring that all parties' concerns are addressed early in the planning phase.

Effectiveness of EIA Reports in Addressing Environmental and Social Effects

The study sought to evaluate perceptions regarding the effectiveness of Environmental Impact Assessment (EIA) reports in identifying and addressing potential environmental and social impacts of irrigation schemes. The results are presented in Table 5.

Table 5: Preparation of EIA Reports for Irrigation Schemes and their Effectiveness in Identifying and Addressing Potential Environmental and Social Effects of Irrigation Schemes

Effectiveness Level	Frequency (n = 192)
Very effective	87 (45.3%)
Moderately effective	100 (52.1%)
Slightly effective	5 (2.6%)
Not effective at all	0 (0%)

Source: *Field Data, 2024*

The results show that a combined total of 97.4% of the respondents view EIA reports as either very effective (45.3%) or moderately effective (52.1%) in addressing environmental and social issues tied to irrigation projects. Only 2.6% considered the

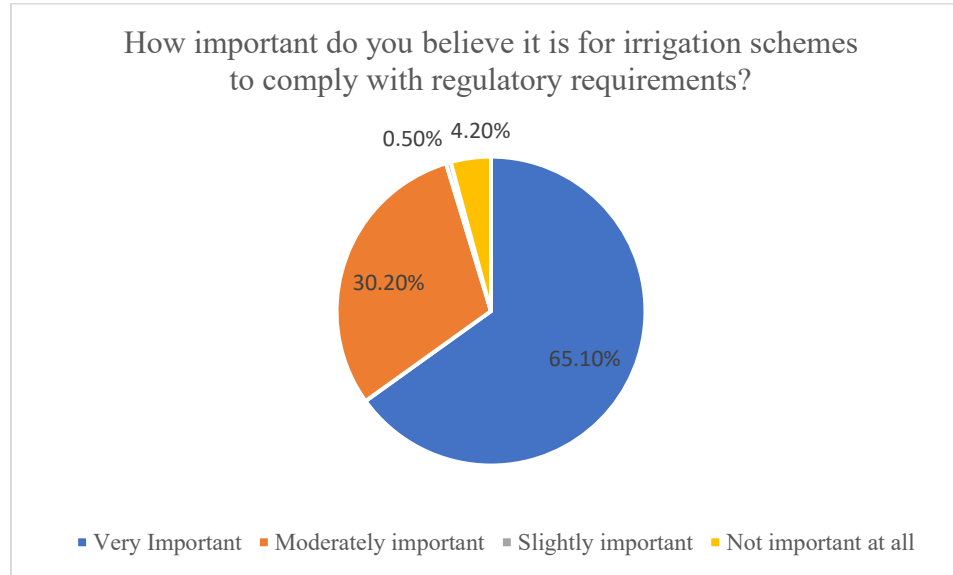
reports to be slightly effective, and notably, none of the respondents found them completely ineffective.

These findings reflect a strong confidence in the practical utility of EIA reports in identifying

project-related risks and recommending mitigation measures. This supports the observations by Glasson *et al.* (2021) and Caro-González *et al.* (2021), who argue that comprehensive and well-implemented EIA reports are instrumental in ensuring sustainable project outcomes, particularly in sectors like agriculture where environmental and social stakes are high.

Moreover, Roos *et al.* (2020) emphasise that the effectiveness of EIA depends significantly on how rigorously the assessment is conducted and the extent of stakeholder engagement. The positive perception reported here likely reflects both an increasing awareness of EIA processes among local stakeholders and an appreciation for their contribution to proactive risk management.

Figure 1: Compliance with Regulations



The researcher sought to inquire how important the respondents believed it is for irrigation schemes to comply with regulatory requirements and found that a majority of the respondents, 125(65.1%), believed this was very important, giving a mean of 1.43 and a standard deviation of 0.71. The findings showed that 58(30.2%) respondents indicated that it was moderately important, 1(0.5%) respondent indicated that it was slightly important, and 8(4.2%) respondents indicated that it was not important at all for irrigation schemes to comply with regulatory requirements. Thus, most respondents believed that the irrigation schemes needed to comply with regulatory requirements. The findings concur with those of Nita *et al.* (2022) and Ho *et al.* (2020), which emphasised the need for compliance with the EIA process.

The researcher also interviewed 14 key informant members on the regulatory compliance aspect of the

EIA process, which was generally acknowledged by respondents as being critical, though challenges were reported. While most irrigation schemes followed the basic guidelines set forth by the National Environment Management Authority (NEMA), informants noted gaps in the consistent enforcement of these regulations. Several participants mentioned instances where EIA reports were approved without thorough on-ground assessments, reducing the overall effectiveness of regulatory oversight. Furthermore, some key informants believed that regulatory compliance was more of a formality, with less emphasis on monitoring and implementation after the approval phase.

Conclusions and Recommendations

Based on the descriptive statistics and narrative analyses, comprehensive conclusions can be drawn

that a strong stakeholder recognition of the EIA process is a critical tool for guiding environmentally sound and socially inclusive irrigation development. In addition, conducting an EIA before project initiation was very important and a clear indication of its role in pre-empting adverse impacts and enhancing project sustainability.

Therefore, the EIA process is widely perceived by stakeholders as effective in guiding the management of irrigation schemes, particularly in enhancing planning, promoting participatory governance, preventing conflicts, and ensuring regulatory compliance. However, for EIA to achieve its full potential, gaps in stakeholder engagement and regulatory enforcement must be addressed through more inclusive, transparent, and accountable processes. Strengthening the operationalisation of EIA frameworks in Baringo County would significantly contribute to the long-term sustainability of irrigation development and broader environmental stewardship.

Recommendations

To enhance the efficacy of the (EIA) process in managing irrigation schemes in Baringo County, the county government should strengthen stakeholder engagement, improve public awareness, and institutionalise conflict resolution mechanisms. The County Government, in collaboration with NEMA and other stakeholders, should adopt inclusive engagement frameworks that actively involve local communities throughout the EIA process. This can be supported by targeted awareness campaigns and training programs aimed at building the capacity of residents to understand and participate meaningfully in environmental governance. Furthermore, embedding formal grievance redress systems within EIA procedures will help manage environmental and social conflicts effectively.

In addition, the County Government of Baringo should improve the quality, implementation, and monitoring of EIA reports. Regulators and project proponents should ensure that proposed mitigation

measures are actionable, enforced, and regularly reviewed. Strengthening monitoring and compliance frameworks through increased field presence, digital tools, and enforcement task forces will enhance accountability. Lastly, integrating EIA into county planning and promoting continuous research on its effectiveness will ensure that environmental considerations are central to sustainable development efforts.

REFERENCES

- Abdulkadir, M. (2021). *Environmental impact assessment as a tool for sustainable development in developing countries*. Journal of Environmental Law and Policy, 4(1), 45–60. <https://doi.org/10.1234/jelp.2021.0045>
- Adu, P., Boamah, N., & Addai, R. (2023). Early stakeholder engagement and sustainable environmental outcomes: A qualitative review of development projects in West Africa. *Environmental Development*, 45, 100798. <https://doi.org/10.1016/j.envdev.2022.100798>
- Angelakus, A. N., Kapelan, Z., & Makropoulos, C. (2020). Evolution of irrigation systems in early civilizations: Case studies from Mesopotamia, Egypt, and China. *Water History*, 12(2), 109–126. <https://doi.org/10.1007/s12685-020-00252-0>
- Baringo County Government. (2023). *Baringo County Annual Development Report 2022/2023*. Department of Agriculture and Irrigation.
- Bélanger, J., & Pilling, D. (2019). *The state of the world's biodiversity for food and agriculture*. FAO.
- Bjornlund, H., van Rooyen, A. F., & Stirzaker, R. (2020). Improving irrigation productivity in sub-Saharan Africa: Insights from research and practice. *International Journal of Water Resources Development*, 36(1), 1–20.

- <https://doi.org/10.1080/07900627.2019.1678048>
- Brundtland Commission. (1987). *Our common future: Report of the World Commission on Environment and Development*. Oxford University Press. <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>
- Caro-González, A. L., & co-authors. (2023). A review of the evolution of effectiveness in Environmental Impact Assessment. *Environmental Impact Assessment Review*, 102, 106789. <https://doi.org/10.1016/j.eiar.2023.106789>
- Caro-González, A., Díaz-Balteiro, L., & González-Pachón, J. (2021). Evaluating the effectiveness of environmental impact assessment: A Latin American perspective. *Impact Assessment and Project Appraisal*, 39(2), 120–132. <https://doi.org/10.1080/14615517.2020.1824913>
- Chebii, M. K., Kilel, E. C., & Rono, E. (2022). Assessment of environmental safeguards in irrigation projects: A case study of Perkerra Irrigation Scheme, Kenya. *African Journal of Environmental Science and Technology*, 16(5), 177–186. <https://doi.org/10.5897/AJEST2022.3052>
- County Government of Baringo. (2012). *County Integrated Development Plan (CIDP) 2013–2017*.
- County Government of Baringo. (2023). *County Integrated Development Plan (CIDP) 2023–2027*.
- Enríquez-de-Salamanca, Á. (2021). Environmental Impact Assessment: Historical evolution, present, and future. *Environmental Impact Assessment Review*, 86, 106494. <https://doi.org/10.1016/j.eiar.2020.106494>
- Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman.
- George, C., Bond, A., & Retief, F. (2020). The evolution of EIA systems: Lessons from developed and developing countries. *Impact Assessment and Project Appraisal*, 38(4), 289–299. <https://doi.org/10.1080/14615517.2020.1717697>
- Glasson, J., Therivel, R., & Chadwick, A. (2021). *Introduction to environmental impact assessment* (5th ed.). Routledge.
- Higginbottom, K., Stirzaker, R., & Dunn, G. (2021). Sustainability challenges facing large-scale irrigation schemes in Africa. *Water Policy*, 23(2), 394–412. <https://doi.org/10.2166/wp.2021.078>
- Ho, P., Nor-Hisham, B. M. & Zhao, H. (2020). Limits of the environmental impact assessment (EIA) in Malaysia: Dam politics, rent-seeking, and conflict. *Sustainability*, 12(24), 10467.
- Kabera, B., & Mutavu, A. (2023). Institutional capacity and the effectiveness of EIA in Kenya's infrastructure sector. *African Journal of Environmental Science and Technology*, 17(3), 112–124. <https://doi.org/10.5897/AJEST>
- Kaku, P. M., Zhu, H., & Fangnon-Firmin, F. (2022). *Evaluation of the EIA process in Zanzibar: The participation of stakeholders in public and private projects*. Environment, Development and Sustainability. Advance online publication. <https://doi.org/10.1007/s10668-022-02334-2>
- Karpan, A., Petrosillo, I., & Zurlini, G. (2020). The sustainability triangle revisited: A systems thinking approach to environmental, economic, and social interactions. *Ecological Indicators*, 110, 105869. <https://doi.org/10.1016/j.ecolind.2019.105869>
- Kiremu, M., Wekesa, B. W., & Njagi, J. (2022). Environmental impact assessment in Kenya: Legal framework and practice. *Environmental Law and Policy Review*, 11(2), 58–72. <https://doi.org/10.4314/elpr.v11i2.5>

- Komakech, H. C., & van der Zaag, P. (2017). EIA for water and irrigation development: Evidence from East Africa. *Water Policy*, 19(5), 871–886. <https://doi.org/10.2166/wp.2017.029>
- López-Felices, B., Alonso, J. M., & Romero, A. (2020). Integration of social aspects in Canadian environmental impact assessments. *Environmental Impact Assessment Review*, 80, 106311. <https://doi.org/10.1016/j.eiar.2019.106311>
- Maphanga, T., Musango, J. K., & Brent, A. C. (2022). Enhancing environmental impact assessment systems: Lessons from Southern Africa. *Environmental Impact Assessment Review*, 93, 106710. <https://doi.org/10.1016/j.eiar.2021.106710>
- Mateo-Albou, C., Garcia, D., & Valera, D. (2024). Environmental implications of modern irrigation technologies: A global review. *Journal of Environmental Management*, 350, 119558. <https://doi.org/10.1016/j.jenvman.2023.119558>
- Mhembwe, N. J., Chiunya, J., & Dube, E. (2019). The role of irrigation in food security and poverty alleviation in Zimbabwe. *Journal of Sustainable Development in Africa*, 21(2), 34–46.
- Morrison-Saunders, A., & Arts, J. (2012). *Assessing impact: Handbook of EIA and SEA follow-up*. Earthscan.
- Morrison-Saunders, A., & Arts, J. (2012). Walking the sustainability assessment talk: Progressing the practice of Environmental Impact Assessment (EIA). *Environmental Impact Assessment Review*, 36, 34–41
- Nakwaya-Jacobus, D. N., Hipondoka, M., Angombe, S., Stringer, L. C., & Dougill, A. J. (2021). Evaluating the performance and procedural effectiveness of Namibia's Environmental Impact Assessment system. *Environmental Impact Assessment Review*, 89, Article 106670. <https://doi.org/10.1016/j.eiar.2021.106670>
- National Irrigation Authority. (2024). *Annual performance report: 2023/2024 financial year*. Government of Kenya.
- Nita, A., Doberstein, B., & Geneletti, D. (2022). The role of environmental impact assessment in advancing sustainable development goals. *Impact Assessment and Project Appraisal*, 40(1), 6–16. <https://doi.org/10.1080/14615517.2021.1997220>
- Nyanchama, J. M. (2021). Public participation in Kenya's EIA process: An analysis of petroleum projects. *Environmental Policy and Law*, 51(1), 43–56. <https://doi.org/10.3233/EPL-200157>
- Ofoezie, I. E., Ayoade, A. A., & Oluwole, B. A. (2022). Pan-African approaches to environmental impact assessment. *African Environmental Review*, 10(1), 1–14.
- Omenge, P., Ndungu, H., & Wachira, M. (2020). Effectiveness of Environmental Impact Assessment in managing rural development projects in Kenya. *International Journal of Environmental Planning and Management*, 6(3), 56–69.
- Pittock, J., Bjornlund, H., Stirzaker, R., & van Rooyen, A. (2020). Climate change and donor-funded irrigation development in Africa. *Global Environmental Change*, 63, 102093. <https://doi.org/10.1016/j.gloenvcha.2020.102093>
- Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: In search of conceptual origins. *Sustainability Science*, 14(3), 681–695. <https://doi.org/10.1007/s11625-018-0627-5>
- Roos, C., Retief, F., & Bond, A. (2020). Insights from EIA practitioners on implementation challenges in South Africa. *Journal of Environmental Assessment Policy and*

- Management*, 22(1), 2050002. <https://doi.org/10.1142/S1464333219500023>
- Rosa, L. (2020). Global trends in irrigated agriculture and their implications for food security. *Nature Sustainability*, 3(1), 20–25. <https://doi.org/10.1038/s41893-019-0446-9>
- Sadler, B. (1996). *Environmental assessment in a changing world: Evaluating practice to improve performance*. Canadian Environmental Assessment Agency.
- Sánchez, L. E., & Gallardo, A. L. C. F. (2020). On the pursuit of EIA effectiveness. *Impact Assessment and Project Appraisal*, 38(3), 205–213. <https://doi.org/10.1080/14615517.2020.1761297>
- Shammi, M., Kabir, M., & Hossain, F. (2022). Environmental governance and EIA in the Global South: Challenges and opportunities. *Environmental Science & Policy*, 135, 41–52. <https://doi.org/10.1016/j.envsci.2022.05.001>
- Streimikiene, D., Balezentis, T., & Zhang, T. (2021). Environmental assessment tools and sustainable development: The need for local adaptation. *Sustainability*, 13(1), 203. <https://doi.org/10.3390/su13010203>
- Trivedi, R., & Nandeha, H. (2021). Classification and sustainability of irrigation systems in developing countries. *Irrigation and Drainage Systems Engineering*, 10(3), 1–9. <https://doi.org/10.4172/2168-9768.1000242>
- UNEP. (2012). *21 Issues for the 21st Century: Results of the UNEP Foresight Process on Emerging Environmental Issues*. United Nations Environment Programme.
- United Nations Environment Programme (UNEP). (2002). *Environmental impact assessment training resource manual* (2nd ed.).
- Wirojanagud, P. (2020). Strategic environmental assessment: Lessons from China. *Journal of Environmental Assessment Policy and Management*, 22(3), 2050021. <https://doi.org/10.1142/S1464333220500218>
- Wood, C. (2003). *Environmental impact assessment: Comparative review* (2nd ed.). Pearson Education.