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Energy Projects and Environmental Sustainability among Selected Local Communities in Takoradi

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Abstract- The study examines the social and environmental impacts of energy projects among selected local communities in Takoradi, Ghana, focusing on how these projects influence environmental sustainability. The main objective of the study sought to determine the pragmatic measures taken to ensure that energy projects affect environmental sustainability among selected local communities in Takoradi. Using a mixed-methods research approach, the study combines quantitative surveys with qualitative interviews to gather insights from residents, community leaders, and industry stakeholders. Quantitative data analysis involved descriptive and inferential statistics, while thematic analysis was used for qualitative data. Findings reveal significant environmental challenges, including pollution and biodiversity loss, alongside socio-economic implications such as displacement and changes in livelihoods. The study identifies barriers to the adoption of renewable energy, such as regulatory inadequacies, limited community engagement, and economic constraints. Recommendations emphasize the need for strengthened policy frameworks, enhanced community participation, and a focus on sustainable practices to mitigate the negative impacts of energy projects while maximizing benefits. The findings contribute to understanding the dynamics between energy projects and environmental sustainability, offering practical strategies for policymakers, industry actors, and local communities. The study recommended that there is the need to build trust and foster positive relationships with local communities, energy companies should priotize transparent and open communication. This includes; providing clear accessible, and timely information about potential risks and impacts of energy projects.

Keywords- Energy Projects, Environmental Sustainability, Local Communities, socio-economic, Potential Risks

I. INTRODUCTION

Environmental sustainability refers to the responsible interaction with the environment to avoid depletion or degradation of natural resources, thereby ensuring long-term environmental quality (Daly, 2020). The relationship between energy projects and environmental sustainability is complex, involving the balancing of economic benefits against environmental and social costs. In Takoradi, this balance is critical given the area's rich biodiversity and the reliance of local communities on natural resources for their livelihoods. Several researchers have highlighted the potential environmental impacts of energy projects, particularly those based on fossil fuels. According to Akpan and Akpabio (2023), oil and gas extraction activities can lead to significant environmental degradation, including deforestation, soil erosion, water contamination, and air pollution.

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These activities can also disrupt local ecosystems and adversely affect biodiversity. In Takoradi, the presence of oil and gas facilities has been associated with various forms of environmental degradation, raising concerns among local communities about the long-term sustainability of their natural environment. Additionally, the social implications of energy projects are significant. O'Rourke and Connolly (2023) argue that while energy projects can bring economic benefits such as job creation and infrastructure development, they can also lead to social disruptions, including displacement of communities, changes in traditional livelihoods, and increased social tensions. In Takoradi, the influx of workers and the development of energy infrastructure have transformed local communities, sometimes resulting in conflicts over land use and resource allocation (Bryman, 2020). Organizational researchers have asserted that environmental impacts not only pose risks to ecosystem health but also threaten the livelihoods and cultural heritage of indigenous and marginalized communities that depend on natural resources for their sustenance (Polit and Beck, 2019). Moreover, energy projects often entail significant social implications for nearby communities, including changes in land use, population displacement, and social conflicts. Land acquisition for energy infrastructure development can lead to involuntary resettlement, loss of livelihoods, and disruption of traditional land tenure systems, particularly in rural and indigenous areas (Umar, 2019). Additionally, the influx of workers and investment associated with energy projects can strain local infrastructure, services, and social cohesion, leading to tensions and conflicts within communities (Yohan, 2020). Globally, there is a growing recognition of the urgent need to transition towards sustainable energy systems to mitigate climate change, reduce environmental degradation, and ensure long-term energy security. Sustainable energy development involves the deployment of renewable energy sources, energy efficiency measures, and the adoption of environmentally sound practices throughout the energy value chain. Despite these imperatives, energy projects, especially those reliant on conventional fossil fuels, often face opposition and scrutiny from local communities due to their perceived negative environmental impacts. Takoradi, located in the Western Region of Ghana, serves as a pertinent case study for exploring the dynamics between energy projects and environmental sustainability at the local level. The region is a strategic hub for energy infrastructure, including oil and gas production facilities, thermal power plants, and port facilities for energy imports and exports. These projects have brought significant economic benefits to the region, such as job creation, infrastructure development, and revenue generation. However, they have also raised concerns regarding environmental pollution, habitat destruction, and social disruptions within nearby communities. Scholars such as Akabzaa and Darimani (2021) have highlighted the environmental implications of oil and gas activities in the Western Region of Ghana, emphasizing the need for stringent regulatory frameworks and community engagement to address environmental sustainability concerns. Similarly, Mensah and Asumadu-Sarkodie (2019) have emphasized the importance of sustainable energy development in Ghana to achieve the objectives of the Paris Agreement and the Sustainable Development Goals (SDGs). Their research underscores the role of renewable energy technologies, such as solar and wind power, in promoting environmental sustainability and reducing greenhouse gas emissions. Moreover, studies by Amoako- Tuffour et al. (2019) have examined the socio-economic impacts of energy projects on local communities in Ghana, shedding light on issues of land acquisition, compensation, and community development initiatives. These findings underscore the complex interplay between energy projects, socio-economic dynamics, and environmental sustainability within local contexts. Understanding these dynamics is crucial for policymakers, energy companies, and community stakeholders to navigate trade-offs, mitigate conflicts, and foster sustainable development. In addition to academic research, international organizations such as the World Bank and the International Energy Agency (IEA) have emphasized the importance of integrating environmental considerations into energy project planning and implementation processes. They

advocate for the adoption of best practices in environmental impact assessment, stakeholder engagement, and sustainable resource management to minimize adverse environmental effects and maximize positive social outcomes. The social and environmental impacts of energy projects are further compounded by issues of equity, justice, and human rights (Inkoom, 2020). Marginalised communities, including indigenous peoples, women, and low-income households, are disproportionately affected by the negative consequences of energy development, often bearing the brunt of environmental pollution, social dislocation, and economic inequality (Trevor, 2019). In many cases, these communities lack adequate representation, voice, and agency in decision-making processes related to energy projects, exacerbating their vulnerability and marginalization (Creswell, 2021). Scholars and researchers have increasingly focused on understanding the social and environmental dimensions of energy projects and their implications for sustainable development (Umar, 2020). Academic literature offers a wealth of insights into the complex interactions between energy development, social dynamics, and ecological systems (Boakye, 2019).

For example, studies have examined the effectiveness of environmental impact assessments (EIAs) in predicting and mitigating the adverse effects of energy projects on local communities. Others have explored the role of participatory approaches, stakeholder engagement, and community-based resource management in promoting more inclusive and sustainable energy development models. Furthermore, the concept of energy justice has emerged as a critical framework for analyzing the distribution of costs, benefits, and risks associated with energy projects. Energy justice emphasizes the need to address inequalities in access to energy services, protect human rights, and ensure equitable decision-making processes in energy governance. Scholars have applied this lens to assess the social, economic, and environmental justice implications of energy projects, particularly in the context of global efforts to transition to low-carbon and renewable energy systems. The relevance of the study on "Analyzing the social and environmental impacts of energy projects in local communities" is multifaceted and encompasses various stakeholders, including policymakers, industry actors, local communities, environmental advocates, and researchers. Understanding the social and environmental implications of energy projects is crucial for informed decision-making, sustainable development, and the protection of human rights and environmental integrity. Firstly, the study is relevant to policymakers and regulatory bodies responsible for overseeing energy development initiatives. By providing comprehensive insights into the social and environmental risks and benefits associated with energy projects, policymakers can design and implement more effective regulations, standards, and policies to minimize negative impacts and maximize positive outcomes. This includes strengthening environmental impact assessment (EIA) processes, enhancing community engagement mechanisms, and promoting inclusive and participatory decision-making in energy planning and development. Secondly, the study is relevant to energy industry actors, including project developers, investors, and energy companies.

By conducting thorough assessments of the social and environmental impacts of their projects, industry actors can proactively identify potential risks and opportunities, improve project design and implementation, and enhance stakeholder relations. Adopting sustainable practices and responsible corporate conduct not only mitigates reputational risks but also contributes to long-term business success and social license to operate. Thirdly, the study is relevant to local communities directly affected by energy projects. By documenting and analyzing the social and environmental changes brought about by energy development, the study empowers communities to articulate their concerns, advocate for their rights, and actively participate in decision-making processes. Furthermore, the study can inform community-led initiatives and strategies to address specific challenges, such as land displacement, water pollution, or loss of cultural heritage, and promote community resilience and well-being.

II. LITERATURE REVIEW

1. Theoretical Review

Several management theories have been proposed by many studies each applying to a different business situation (Fredman & Neuman, 2021). Among the theories are; systems theory, contingency theory and resource-based theory. The following is a detailed discussion of each one of them.

Systems Theory

Due to an increase in the integration and duplication of scientific research in the 20th century, Ludwig advanced a general system approach (Laszlo & Kripper, 2018). A system is a set of two or more interrelated elements, where each element has an effect on the functioning of the whole. Each element is affected by at least one other element in the system and all possible subgroups of elements affect the whole. In addition, the subgroups in the system affect each other (Laszlo & Kripper, 2018; Fredman and Neuman, 2019). A system will not survive if not purposely supported by an outside agency. Thus, well-organized and coordinated e f forts to sustain its structure and function must exist (Laszlo and Kripper, 2018). A system cannot exist in isolation or on its own. Interaction with the environment cannot therefore be ignored. The basic assumption of a system is that the whole is more than the sum of its parts and therefore helps to develop strategies to preserve the benefits of having the system (Fredman and Neuman, 2019; Bellam, 2020). The development of systems theory gave rise to other important concepts relevant to project management such as open and closed input-output analysis developed by Wassily Leontief in 1930s, open and closed systems, boundary and homeostasis (Fredman and Neuman, 2019).

The project influences and is influenced by the different actors in the environment, which includes government officers, project managers and other stakeholders. The project management context fits into a system as envisaged by Ludwig von Bertalanffy, the founder of systems theory. Since the intention of any organization when initiating a project is to have positive outcomes, sustainability becomes a critical issue. In this context therefore, the systems theory is relevant to the study because the project output is intended to positively affect the environment, and positive impact can only be felt if a project's output is sustainable.

Contingency Theory

Contingency theory was first put forward by Fred Fielder in early 1960s through what was referred to as contingency theory of effectiveness. Contingency theory is based on the premise that the outcome of any situation depends on the demands of the situation existing at that time. No project can be studied comprehensively without considering its context (Hanisch and Wald, 2021). Although the concept of contingency can be used in the sustainability of projects it has some challenges as highlighted by Hanisch and Wald (2021). The challenges relate to the loose and incoherent definitions of contingency factors, identification and analysis of a multitude of influencing factors and deficiencies in completeness of topics under contingency theories. The study borrowed the concept of contingency theory because of its assumption that the outcome of any situation is dependent on the circumstances existing at that particular time. However, the concept of contingency theory was used with caution because of its inability to deal with a multitude of factors affecting a particular outcome. This argument is consistent with those of Howell et al. (2020) who argued that contingency theory is narrowly applied to project management. However, among the existing theories, contingency theory was found to be more applicable to project sustainability.

Resource Based Theory and Sustainability

Barney (2020) argued that the value of particular resources depends on the market context in which they are applied. These valuable resources have to be described if they are going to be sources of sustained strategic advantage for firms. The main argument of Resource Based Theory (RBT) is that firm performance is determined by the resources it owns and that the firm with more valuable scarce resources is more likely to generate sustainable

competitive advantage (Liang, You, and Liu, 2020; Ville and Wicken, 2021). It is on this basis that the Resource Based Theory is relevant to project sustainability. Projects are used as a vehicle for delivering services or goods to the customers and thus enhancing competitive advantage. Sustainability of project benefits must be emphasized to achieve the desired outcome thus the relevance of Resource Based Theory to the study.

The present study is anchored on contingency theory where every project is considered unique and its sustainability is affected by different actors depending on the country's contextual situation. Given that projects are temporary endeavors created for a particular purpose, and that the World Bank funds projects in many countries, the sustainability of these many projects is assumed to be determined by country specific situation. Contingency theory, therefore was found to be more relevant the study. Projects face different challenges depending on the environment in which they are implemented (Heupers, 2020). It is worth noting that some projects are sustainable while others are not, the issue is to find out the country's contextual factors that determine project sustainability and particularly World Bank funded projects in Ghana.

Heading this Justification of Theory Underpinning the Study

The Resource-Based Theory (RBT) is an effective framework to justify the topic "Energy Projects and Environmental Sustainability among Selected Local Communities" for several reasons. First, RBT posits that organizations achieve competitive advantage through the strategic use of their valuable, rare, inimitable, and non- substitutable (VRIN) resources. In the context of energy projects and environmental sustainability, local communities often possess unique resources such as renewable energy sources like solar, wind, or hydro power available in specific geographic locations. Additionally, the knowledge, skills, and expertise of local residents in managing and utilizing these resources, combined with traditional ecological knowledge and practices, support sustainable resource management. Furthermore, strong community networks and collaborative efforts towards environmental conservation are vital social resources that can be harnessed to develop and sustain energy projects. RBT also emphasizes the importance of leveraging these unique resources to achieve long-term sustainability and resilience. Local communities that can effectively utilize their natural, human, cultural, and social capital in energy projects can create systems that are both environmentally sustainable and economically beneficial. By focusing on locally available resources, these communities can reduce dependence on external energy sources, lower energy costs, and minimize environmental impacts, aligning with the principles of sustainability. Moreover, RBT underscores the significance of innovation and adaptation in resource utilization. Local communities are often well- positioned to develop innovative solutions tailored to their specific environmental and social contexts. These innovations can include the development of community-based renewable energy systems, the implementation of sustainable land and water management practices, and the adoption of new technologies that enhance energy efficiency. By continuously adapting and improving their resource utilization strategies, these communities can maintain their competitive advantage and ensure the long-term success of their energy projects. In conclusion, the Resource-Based Theory provides a robust justification for the topic of "Energy Projects and Environmental Sustainability among Selected Local Communities." It highlights the strategic importance of leveraging unique local resources, fostering innovation, and ensuring sustainable development. By applying the principles of RBT, communities can create energy projects that not only meet their immediate needs but also contribute to broader environmental and economic goals.

3. Empirical Review

The implementation of development projects is faced with a considerable degree of uncertainty. Due to this uncertainty, probability for project failure due to exogenous factors rise when the project is in the social sector (Mubila, Lufumpa and Kayizzi Mugewa, 2020). Several studies have

identified indicators of sustainability such as maintenance of project benefits, institutionalization of the project within the organization and level of capacity building (USAID, 2022; Shediac-Rizkallah and Bone, 2018; Bakalian, 2019). Tango International (2019), identified social support, technical soundness, government commitment and institutional support as some of the indicators of sustainability. Other indicators of sustainability are willingness to pay for the services, disposable income of the recipients and stakeholder participation (Becker, 2017). According to Zhou et al. (2021), project sustainability can only be measured by using a composite value. The composite measures of sustainability have been used in other studies, for example by USAID (2022), Sarriot et al. (2022), Hack et al. (2017), Bell and Morse (2018); and Rowe (2023). In line with the above studies, this study computed a composite value and used it to measure sustainability. Some of the methods of analysis used by other studies are univariate analysis, (Sarriot et al.,2022), and logit regression model (Purna and Anushree, 2020; Rowe, 2023). Mubila et al. (2020) used probit and ordinary least square methods. This study adopted the logit model to assess the contribution of independent variables towards sustainability of World Bank funded projects in Ghana. Project sustainability was measured by checking the continual flow of benefits to the intended users, the extent to which the facilities are operational, existence of evidence of project outcome, institutional support and the project design. In this study, an answer to the affirmative to all the ten questions posed on sustainability was taken to imply that project was sustainable.

Sustainability of World Bank Funded Projects

The World Bank rates the likelihood of sustainability of project upon its completion. For example, the Tana River Primate National Reserve Conservation Project (2021) was rated unlikely on sustainability. The report argued that long-term sustainability was uncertain, given that the project did not resolve the underlying driving factors of human encroachment and destruction of the critical habitats. The report continued to posit that the overall development objective of ensuring the survival and sustainability of threatened biodiversity within the project region was not met. The reports indicated that there existed risks to sustainability (World Bank, 2021). The Urban Transport Infrastructure Project rating on sustainability was unlikely because most of the outputs that were anticipated were not accomplished and the project objectives were not fully met. It was therefore unlikely that the project would be sustainable (World Bank, 2021). Some projects were rated by World Bank as having a higher potential for sustainability. These include the Micro and Small Enterprise Training and Technology Project, Arid Lands Resource Management Project, Energy sector reform project and Public Sector Management Technical Assistance project. The reports by the World Bank on the above projects appreciate the fact that there existed factors that affect project sustainability. Sensitivity analysis of the Ghana Agricultural Productivity Project showed that the sustainability of the project could be challenged by changes in prices, yields and political activities (World Bank, 2019). The overall project development objective was to support the overall system of generation, dissemination, and adoption of agricultural technology (World Bank, 2019). The project had four components facilitation of policy and institutional reforms; support to extension system reform; support to research system reform; and support to farmer/client empowerment. Using survey method, model farms were assessed based on the expected project outcomes and the findings were that the objectives were achieved (World Bank, 2019).

Factors Affecting Sustainability

The primary sustainability parameters form the basis for monitoring and assessment techniques. The main factors supporting sustainability are policy, institutional, market, and regulatory environment, according to Tango International (2019), while Mubila et al. (2020) say project success depends on environmental, social, and political conditions. Mubila et al. (2020) assessed project success variables using OLS and probit models. However, Shediac- Rizkallah and Bone (2018) identified project design and execution, organizational, and community environment

characteristics as sustainability determinants for health programs in a desk analysis of numerous health project papers. Tango International (2019) found that none of the IFAD-funded projects in Bangladesh, India, Lao PDR, Philippines, and Vietnam had consistent sustainability indicators. The study found two sustainable models: market-led, where infrastructure supports the initiative, and community-led, which is suitable for isolated places with disenfranchised ethnic minorities and little infrastructure. The research above covered many sustainability concerns. Mubila, Leyeka, and Kayizzi (2020) focused on ADB-funded projects, Tango International (2019) on agricultural IFAD projects, and Shediac-Rizkallah and Bone (2018) on health programs A more broad perspective of project sustainability determinants without a sector focus is needed. According to IEG (2020), 39% of World Bank-funded projects failed in 2020. Ika et al. (2020) argue that World Bank-funded initiatives often fail owing to management and organizational issues. Research on World Bank projects and project management has been limited, despite its importance in poor nations (Ika et al., 2020). Countries' economic development, private sector role, government ability to meet recurrent cost financing requirements, human capital, and political and administrative decision-making systems can affect benefits sustainability (Quality Assurance Group, 2020). Sustainable factors include partner government policies like policy environment and fit, donor policies like planning horizon, delivery and contracting mechanism, stakeholder participation, management and organization issues like management structures, administrative systems, flexibility, and phasing of implementation, and financial considerations like recurrent cost financing, private sector involvement, user-pays, and coun Technology, political stability, development, external economic shocks, and natural calamities impact donor- funded project durability. Bamberger and Cheema (2020) divided project sustainability variables into three major categories: project design and implementation, project organization, and local, national, and worldwide external influences. Bamberger and Cheema (2020) argued that, while project planners and managers have little control over macro-level factors, changes in the national and international economic environment can have major impacts on project sustainability. Beneficiaries' sociocultural traits may also impact sustainability. The social and political organization of rural communities can help or hinder project viability. Fuzzy sets theory helped Liyin et al. (2020) identify infrastructural project sustainability metrics. Their study suggested a weighted sustainability score to evaluate infrastructure project sustainability. Key Assessment Indicators (KAIs) included market supply and demand, financial risk, public safety, local development, water quality, and land pollution. These studies have not found factors impacting World Bank-funded Ghanaian projects' sustainability. Among other developed nations, Bamberger and Cheema (2020) focused on Asia. From inception to cleanup, project management should include a comprehensive sustainability study (Quality Assurance Group, 2020). Thus, World Bank-funded initiatives need sustainability strategies. This research grouped aspects discovered by multiple studies into political, economic, institutional, and technical categories to establish policy guidelines to assure project sustainability across sectors.

Institutional Factors and Sustainability

Despite the various strategies put in place to ensure sustainability of the Arid Lands Resource Management Project "there remains some risk that the community will not be able to adequately maintain and continue to operate the facilities developed with the assistance of the project team" (World Bank, 2022:16). Based on the statement it shows that there was doubt on the sustainability of project. While the self-evaluation of the responsible operation division of the bank rated the sustainability of the project as likely, the Operation Evaluation Department, an independent evaluation department of the World Bank, rated the sustainability of the project as non-evaluable (World Bank, 2022). This meant that at that particular time of rating, there was no consensus on the sustainability of the project. Despite the rating of sustainability by the Operation Evaluation Department of the World Bank as non-evaluable there was an indication that if the project received support from the government, then the state of

affairs may change (World Bank, 2022). The role of governments in the sustainability of projects is therefore critical. The ability to manage the factors associated with institutions/ government is equally important. Evidence from a wide range of literature and project documentation suggested that in community managed projects, many factors affect post-project sustainability. Among these factors are institutional ones which include policy, external follow-up support, institutional strength, integration with existing services and leadership of the project (Shediac-Rizkallah and Bone, 2018; Bakalian, 2019). The outcomes of World Bank Group interventions is said to be a function of three factors; the World Bank Groups management of factors within its own control or institutional performance; the clients management of factors in its control (government, private sector client); and external factors, such are exogenous shocks or the performance of other partners (Independent Evaluation Group, 2020). At institutional level, performance within each institution consists of the strategic objectives the organization pursues; its priorities and deployment of resources; how it delivers its services and products; the organizational structures, management systems, and incentive frameworks it adopts; how it deploys its internal financial and human resources to best achieve its mission; and how it leverages its activities through coordination and partnerships across the World Bank Group and with external parties.

Technical Factors and Sustainability

The World Bank (2022) project performance report on the Arid Land Resource Management Project stated that at the community level there was a concern about the sustainability of some of the micro-projects especially in the maintenance of equipment such as irrigation pumps because members of the community had limited experience in maintaining such equipment. Maintenance of equipment is a technical issue which if not taken care of may affect project sustainability. The World Bank (2022) project performance report on Micro and Small Enterprise Training Project rated sustainability as unlikely to be attained.

World Bank funded projects that had unsuccessful development outcome ratings tended to have low business success as a result of flaws in the project design, in addition macroeconomic volatility, micro-level socioeconomic risks and their implications for program design have an effect on sustainability (Independent Evaluation Group, 2020). This implies that project sustainability should start at the project design stage. It was necessary to carry out further analysis on the factors that affect sustainability of World Bank funded projects. Shediac-Rizkallah and Bone (2018), in their study of the sustainability of community- based health programs, grouped potential factors affecting sustainability into three: project design and implementation factors; organizational setting related factors; and community environment related factors. Under project design and implementation factors, project duration, project type, training, project financing and project negotiation process were identified as the critical components affecting sustainability, implying that project design plays a critical role in sustainability. The study concluded by emphasizing that sustainability is a dynamic process requiring continuously adapting goals and strategies to changing project environmental conditions. This study grouped the project design factors under technical factors.

Political Factors and Sustainability

Political factors are those factors that emanate from political decisions and events that impact on projects sustainability. Political factors include inconsistency in policies, changes in laws and regulations, restrictions on fund repatriations, import restrictions, political violence and breach of contract (Ozorhon et al., 2017). Between 2021 and 2019 World Bank Group (WBG) played an active role in Peru, providing US$3.9 billion in new International Bank for Reconstruction and Development (IBRD) lending and International Finance Corporation (IFC) financing, as well as a range of non-lending services (World Bank, 2020). In the implementation of the project, political risks were identified as a major setback in the sustainability of projects. Multilateral Investment Guarantee Agency (MIGA) recommended political risk insurance as one way of dealing with the risk. In

response to a query on political risk insurance, the Independent Evaluation Group noted that they had found that there was demand, especially in the infrastructure sector (World Bank, 2020). When investors consider financing a mining project, they analyze the country where the project will be located (political factors) among other issues (United Nation Environment Programme, 2021). It implies therefore that politics is a major consideration in project financing and consequently sustainability. Nothing evidences this more than the observation by Kyeydieh (2023) that political risk is the most significant risk faced by foreign investors and lenders in developing countries because of the sudden political change which can jeopardize projects at a critical stage. In discussing the effectiveness of World Bank Group in Africa, Independent Evaluation Group (2020), established that in Africa 33 percent of World Bank funded operations were rated unsatisfactory due to politically related issues which includes lack of political consensus and instability in some countries. In addition, inadequate or unrealistic bank assessments of political economy or institutional capacity to handle risks in targeted countries pose a challenge in project sustainability. This statement emphasizes the importance of political will in the success and eventual sustainability of projects.

Economic Factors and Sustainability

Economic factors relate to issues such as exchange rate fluctuations, interest rate and inflation. To deal with such issues, it is essential that economists, financial analysts, project managers, and safety and production engineers are able to communicate (Terjen, 2022). In build operate and transfer projects, financing is tailored to the project economic viability and the relative reliability of its cash flow (Kreydieh, 2023). This implies that economic viability of a project is only achieved if the project is sustainable. Zhou et al. (2021) study on sustainability performance measurement for Private Finance Initiative (PFI) projects identified three dimensions for measuring sustainable development as economic, environmental and social. The study suggested that sustainability can be measured using a composite index. This study used composite index to measure sustainability, a number of questions were designed to measure sustainability of World Bank funded projects in Ghana. Another study that used composite measure sustainability was Sarriot et al. (2022).

4. Critique of Literature and Research Gaps

Mubila et al. (2020) did a study on the determinants of success of projects funded by Asian Development Bank. The purpose of the study was to analyze the factors that determine project success in the Asian Development Bank funded projects completed by 2022. The study was done in Asia which may have a different political, economic and social setting. There is need to carry out a study on the sustainability of World Bank funded projects in Ghana, particularly so because Ghana is not as developed as Asia and that the scale of projects funded by the Asian Development Bank may not be the same as those funded by the World Bank. Most of the studies done by the World Bank centered more on project completion and not sustainability. Project performance rating was mainly done immediately the projects were completed and therefore could not capture factors that lead to sustainability. As discussed by Quality Assurance Group (2020), the key factors impacting on the sustainability of benefits may vary between countries. Therefore, the need to study the various factors and the role they play in the sustainability of World Bank funded projects in Ghana. It is necessary to have a strategy to ensure that the planned benefits of the project are sustained. This can only be done when these factors are identified, analysed and prioritized. It is imperative that each of the constraints to sustainability is specified and dealt with throughout the project life. Because of the important role World Bank funded projects play in Ghana, it is important that the benefits derived from the projects are sustained. A study carried out by Schiltz (2021) on the assessment of financial benefits of project management used a simplified project maturity model to determine the relationship. between organization maturity level and performance in project management. The study argued that the simple model was chosen for ease of understanding by managers who are new to project management. This study focused on

establishing the critical determinants of projects sustainability using the World Bank funded projects in Ghana.

5. Conceptual Framework

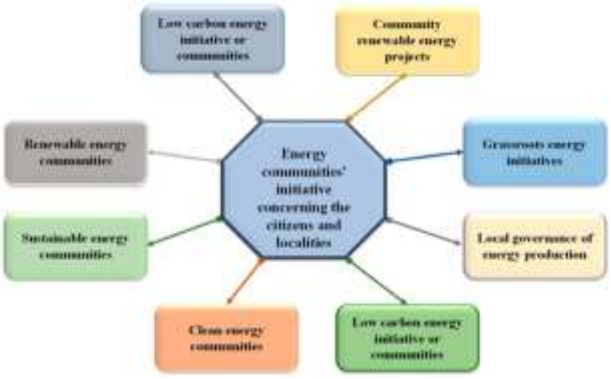

Figure 1: Conceptual Framework

Essential concepts, theories, and frameworks related to a study issue are critically examined in a conceptual review. This review goes beyond summarizing literature to define, relate, and apply concepts. A conceptual review clarifies the research's theoretical basis, identifies knowledge gaps, and explains how ideas connect throughout the study. In your study on energy projects and environmental sustainability in selected local communities, a conceptual review would examine institutional, technical, and political factors and their effects on project sustainability. By studying these topics, you may create a framework for your research and data analysis. Energy project success depends on institutional aspects such clarity of duty, stakeholder involvement, project objective integration, and project organization. Clarity of duty reduces misunderstandings and improves cooperation by making roles and obligations clear. Community support and project compliance depend on stakeholder engagement. Project objectives should be aligned with community goals to achieve social, economic, and environmental goals. Project management and execution are more efficient and resource-efficient with good project organization. Energy project feasibility and success depend on technical training, execution, design, and support. Technical training gives local communities energy system operation and maintenance capabilities. Project implementation involves carrying out the plan to finish on schedule and within budget. Project design creates a sustainable energy system that meets local demands. To ensure project sustainability, technical support addresses technical difficulties as they emerge. Changes in law, lobby

organizations, contract compliance, and political influence can affect energy project sustainability. Changes in law can help or impede project development depending on whether they establish a favorable regulatory environment. Lobby organizations can influence public opinion and policy by supporting or opposing energy initiatives. Contract compliance reduces disagreements and project delays by ensuring all parties meet their obligations. Political influence affects project financing, approval, and support, making it important. The ultimate aim is project sustainability, with positive outcomes and community benefits. Project results should include economical, dependable energy, enhanced quality of life, and environmental preservation. Long-term advantages of the project include renewable energy, economic growth, and community resiliency. Conceptual reviews support research design, data gathering, and analysis by offering a theoretical foundation. Identifying essential variables and their correlations ensures that the study is anchored in knowledge and theories. Critique pertinent concepts and frameworks to create a more focused and coherent research topic, establish suitable procedures, and evaluate findings within a larger theoretical perspective. This improves study validity and reliability, deepening comprehension of the research issue and its ramifications. Project sustainability depends on institutional, technical, political, and economic considerations. The aforementioned criteria were examined to determine their impact on World Bank-funded projects in Ghana. Becker (2017), Rowe (2023), OECD (2018), and Zhou et al. (2021) suggest that composite measures of sustainability are becoming more common. This study used composite measures. Institutional, technical, political, and economic variables impact donor-funded project sustainability, according to the literature. Thus, our study focused on the aforesaid parameters. Institutional considerations included clarity of duty,

project objectives, stakeholder engagement, and organizational viability. World Bank-funded programs have users, beneficiaries, government, and implementers. Stakeholder involvement makes or breaks a project's sustainability. How the project team is formed and interacts with stakeholders affects sustainability. The major question was how much project organization structure embraces sustainability. Project organisation affected World Bank-funded Ghanaian project sustainability in this research. The study highlighted technical elements as technical training for project benefit users, stakeholder engagement in project implementation, sustainability in project design, and implementer support after project completion. When recipients are educated to preserve project benefits, the project will likely last. However, stakeholder participation throughout project execution may assure sustainability. Incorporating project sustainability throughout project design, when project objectives are developed, increases project sustainability. This study examined how technical elements affect World Bank-funded Ghanaian projects' sustainability. Politics, legislation, lobbying, project contract compliance, and sustainability were examined. When project users' goals collide with political goals, the project may fail. This study studied the impact of politics on World Bank project sustainability, assuming that negative political actions reduce project sustainability. Lobby organizations fall under micropolitics, not macropolitics (Weissenberger-Eibl and Teufel, 2020). Lobby organizations' advocacy affects government, management, organized groups, and other project authorities' decisions. Their activities can help or hurt project sustainability. Ghana's taxation, inflation, and interest rates were examined. This study suggested that higher tax rates make projects less viable. Project outcomes are affected by inflation in raw material costs. This study examined how inflation affects World Bank-funded project sustainability. Also examined was how interest rate fluctuations affect sustainability. Higher loan rates were thought to reduce project sustainability. Good project management is considered to contribute to project sustainability, just as it does to organizational success. The goal of any project is to provide a product that benefits its users.

III. METHODOLOGY

1. Research Philosophy

The word "research philosophy" refers to the inquiry into the nature of knowledge (Saunders et al., 2019). It is reliant on the researcher's perspective on the progress of knowledge. Easterby-Smith et al. (2012) assert that failing to fully analyze a research paradigm or philosophy may impair the quality of research. It is hard to overstate the critical importance of research philosophy in the design of studies. Numerous philosophies of research exist, including positivist and social constructionist viewpoints. According to Easterby-Smith et al. (2012), positivists believe that the world exists externally and that its constituents or qualities should be judged objectively, while social constructionists believe that reality is internal and built by people. Ontological, epistemological, and axiological ideas all apply to research philosophy (Creswell and Creswell, 2017). Research philosophies are the underlying beliefs and assumptions about how knowledge is created and understood. Here are brief explanations of three common research philosophies: positivism, interpretivism, and pragmatism.

2. Research Strategy

The study's goals and objectives may very well be accomplished by a variety of search strategies. Qualitative, quantitative, triangulated/mixed approaches are all examples (Saunders et al., 2019). According to Naoum (2002) and Baiden (2004), research procedures and approaches should be selected depending on the study's objective and the availability of data (2006). There are several varieties of quantitative research, but they all have one thing in common: they are all concerned with evaluating hypotheses or ideas created using variables. To quantitatively and statistically test a hypothesis or theory, data must be quantified quantitatively and statistically. As Dawson et al. (2006) remark, positivism is founded on quantitative observations that provide statistical analysis. As a consequence, the study's goals,

objectives, and obstacles were addressed using a quantitative method.

Research Strategy Adopted for the Study

This study would use a quantitative research strategy that is in line with the positivist research philosophy and methodology used in the investigation. This is supported by a study of the literature, which found that quantitative research techniques have been employed in earlier similar studies by Sampong (2015) and Lelissa (2020), among others.

3. Research Approach

The research approach for this study on "Energy Projects and Environmental Sustainability among Selected Local Communities in Takoradi" employs a mixed-methods design, combining both qualitative and quantitative methodologies to gain a comprehensive understanding of the impact of energy projects on environmental sustainability. This approach is well-suited for capturing the complex and multifaceted nature of the subject, allowing for a nuanced analysis of the data collected. The qualitative component of this study involves in-depth interviews with key stakeholders, including community leaders, residents, and representatives from energy companies and environmental agencies. These interviews are designed to gather detailed insights into the perceptions, experiences, and attitudes of the local communities regarding the energy projects in their area. The qualitative data will be analyzed using thematic analysis, which allows for the identification of common themes and patterns in the responses. This method is particularly useful for exploring the subjective aspects of the impact of energy projects on environmental sustainability, as it provides a rich, detailed understanding of the participants' perspectives (Creswell & Poth, 2017). In parallel, the quantitative component involves the administration of structured questionnaires to a larger sample of community members. The questionnaires are designed to collect data on various indicators of environmental sustainability, such as air and water quality, biodiversity, and the health and well-being of the community. Additionally, the questionnaires will gather demographic information and details about the respondents' involvement in and awareness of the energy projects. The quantitative data will be analyzed using statistical methods, including descriptive statistics, correlation analysis, and regression analysis. These techniques will enable the researchers to identify trends, relationships, and potential causal links between energy projects and environmental sustainability outcomes (Bryman, 2016). The integration of qualitative and quantitative data will occur at several stages of the research process. During data collection, the findings from the interviews will inform the development of the questionnaire, ensuring that it addresses the key issues and concerns identified by the interviewees. During data analysis, the qualitative data will be used to contextualize and interpret the quantitative findings, providing a deeper understanding of the underlying mechanisms and processes. This integrative approach, known as triangulation, enhances the validity and reliability of the research findings by cross-verifying information from different sources (Fetters, Curry, & Creswell, 2013).

4. Research Design

The convergent parallel design is particularly fitting for a mixed-method study on "Energy Projects and Environmental Sustainability among Selected Local Communities in Takoradi." This research design allows for the simultaneous collection and analysis of both qualitative and quantitative data, providing a comprehensive understanding of the impact of energy projects on environmental sustainability in these communities. In this study, quantitative data can be collected through surveys administered to a large sample of community members. These surveys could include structured questions aimed at quantifying the level of awareness, attitudes, and perceptions regarding energy projects and their perceived effects on environmental sustainability. For example, questions might assess the frequency of exposure to energy project activities, levels of concern about environmental impacts, and perceived benefits or detriments to local livelihoods. This quantitative approach provides a broad overview and generalizable data about the community's views and experiences. Concurrently, qualitative data can be gathered through in-depth

interviews and focus groups with key stakeholders, such as community leaders, local government officials, and representatives of energy companies. These qualitative methods allow for a deeper exploration of the nuances and complexities of the community's experiences with energy projects. Through open-ended questions, participants can share detailed narratives and insights about specific incidents, historical context, cultural values, and personal experiences related to energy projects and environmental sustainability. This qualitative data enriches the study by providing context and depth to the quantitative findings. After collecting both sets of data independently, the convergent parallel design involves analyzing them separately using appropriate methods. For quantitative data, statistical analysis can reveal patterns, correlations, and trends. For qualitative data, thematic analysis can identify recurring themes, key issues, and unique perspectives. Once both analyses are complete, the results are compared and synthesized during the interpretation phase. This integration allows the researcher to corroborate findings, where quantitative trends can be supported or explained by qualitative insights, and vice versa (Field, 2013).

5. Unit of Analysis and Data Sources

The unit of analysis addresses the question of who (individuals, groups, etc.) or what is researched in the research effort. According to Li et al. (2017), proper alignment of research objectives, study design, and data analysis is crucial for ensuring effective research outcomes. The choice of an appropriate unit of analysis reduces the likelihood of erroneous findings and has a significant impact on the study design, survey responses, as well as the dependability of the data and study conclusion (Li et al., 2017). The study's unit of analysis will be the Local Communities in Takoradi, specifically the individuals within the community.

6. Type of Data and Scale of Measurement

According to Kothari and Garg (2018), it is vital to collect appropriate and relevant data to address any study questions, as data availability is frequently a barrier or the available data is insufficient. Data is critical in addressing the study's or issue's topic. According to Delati, there are two fundamental types of data for measurement and analysis (2018). Quantitative data are classified as categorical (descriptive or nominal; ranked or ordinal) or measurable (continuous; discrete). On the other side, qualitative data sources include written materials, direct observations, and interviews. There are several elements to consider when deciding on the type of data to employ in a research project. This section discusses the research plan, the type of data (nominal, ordinal, interval, or ratio) that will be collected, and the type of statistical analysis that will be utilised to analyse the data. Qualitative data is typically collected in conjunction with the use of a qualitative research approach, whereas quantitative data is collected in conjunction with the use of a quantitative research method (Saunders et al., 2019). As a result, quantitative data will be used in the current study under the study's quantitative research strategy. Crossman (2019) asserts that selecting proper levels and scales of measurement is critical for guaranteeing consistent and systematic data collection and categorization. There are four distinct measurement levels and scales: nominal, ordinal, interval, and ratio (Delati, 2018). The measurement level and its related scale enable a researcher to quantify one or more of the four fundamental features or attributes of measurement (Crossman, 2019). These measurement features include a zero-based minimum value, an equal interval, magnitude, and identity. The ordinal scale of measurement will be utilised in this research to ensure consistency of measurements. The five-point Likert scale will be frequently utilised in the questionnaire's construction.

7. Population and Sampling Technique

The population for this study includes all residents of the selected local communities in Takoradi, which are significantly impacted by energy projects. These communities were chosen based on their proximity to energy project sites, the extent of their involvement or impact by these projects, and their demographic diversity. The population encompasses a wide range of stakeholders, including community leaders, residents, environmental activists, and representatives from

energy companies and local government agencies. To achieve a representative sample, the study will employ a multi-stage sampling technique. This approach allows for the systematic selection of participants in a way that reduces bias and ensures the inclusion of various sub-groups within the population. In the qualitative phase, purposive sampling will be used to select key informants who possess in-depth knowledge or are significantly impacted by the energy projects. This non-probability sampling method is appropriate for qualitative research because it allows the selection of individuals who can provide rich, detailed information about the phenomena being studied (Patton, 2002). Key informants will include community leaders, environmental activists, and representatives from energy companies and local government agencies. These individuals will be identified through consultations with local organizations, community groups, and recommendations from initial participants. For the quantitative phase, stratified random sampling will be used to ensure the sample is representative of the broader community. The population will be divided into strata based on key demographic variables such as age, gender, occupation, and geographic location. Within each stratum, random sampling will be used to select participants. This technique ensures that each subgroup is adequately represented in the sample, enhancing the generalizability of the findings (Kish, 1965). The sample size for the quantitative phase will be determined using statistical power analysis to ensure sufficient power to detect significant effects.

Sample Size and Technique

Sample size can be defined as the proportion of the sample that is representative enough of the entire population and whose findings can be generalized to the entire group (Hayes, 2008; Salkind, 2011). Due to the large size of the population of the study coupled with time constraints, the researcher sought the need to select a sample out of the population. The technique for selecting a sample from the entire population us referred to as sampling (Hayes, 2008). Hayes (2008) argued that a very vital characteristic of a chosen sample is the degree of accuracy of generalization. Hair et al., (2014, p.101) posited that "as a general rule, the minimum of a sample is to have at least five times as many observations as the number of variables to be analyzed, and the more acceptable sample size would be 10:1 ratio with some researches proposing the best sample size to be 20:1". The main variables for this study is three (3), hence the minimum sample size based on the recommendations of Hair et al. (2014) is 15(3 multiplied by 8), acceptable is 30(3 multiplied by 10) and best is 60 (3 multiplied by 20). Based on previous studies and recommendations for survey research, a target sample size of approximately 300 participants will be sought. This size is deemed adequate to achieve reliable and valid results, while also allowing for meaningful subgroup analyses (Cohen, 1988).

8. Data Collection

For the qualitative phase, semi-structured interviews and focus group discussions will be the primary instruments. These tools are chosen for their flexibility and depth, allowing the researchers to explore complex issues and gather detailed insights from participants. Semi-structured interviews will be conducted with key informants, including community leaders, environmental activists, representatives from energy companies, and local government officials. An interview guide will be developed, containing open-ended questions that cover the main themes of the study, such as the impact of energy projects on environmental sustainability, community perceptions, and participation in sustainability initiatives. The guide will ensure consistency across interviews while allowing for the exploration of new topics that may arise during the conversations. This approach aligns with recommendations by Creswell (2014) for qualitative research, emphasizing the importance of flexibility and responsiveness to participant input. Focus group discussions will be conducted with community members to gather a range of perspectives and facilitate the exchange of ideas. The focus group guide will include questions similar to those in the interview guide, with additional prompts to encourage group interaction and discussion. Focus groups are particularly useful for understanding community dynamics and

collective views, providing a richer context to the individual perspectives obtained through interviews (Krueger & Casey, 2015). For the quantitative phase, a structured questionnaire will be the main instrument. The questionnaire will be designed to capture data on various dimensions of environmental sustainability, such as air and water quality, biodiversity, health impacts, and economic outcomes. It will also include items to assess participants' awareness and attitudes towards energy projects, as well as their involvement in related activities. The questionnaire will use a combination of closed-ended questions, Likert scale items, and a few open- ended questions to capture quantitative data and some qualitative insights. This approach ensures the collection of standardized data for statistical analysis while allowing respondents to provide additional context where necessary (DeVellis, 2017).

9. Data Analysis

Given the study's mixed-method approach, both qualitative and quantitative data analysis methods will be used to ensure a comprehensive understanding of the research questions. For the qualitative phase, the primary data sources will be semi-structured interviews and focus group discussions. Thematic analysis will be the main analytical technique used to identify, analyze, and report patterns (themes) within the qualitative data. Thematic analysis is chosen for its flexibility and its ability to provide detailed and nuanced insights into the participants' perspectives and experiences (Braun & Clarke, 2006). To enhance the credibility of the qualitative findings, member checking will be employed, where preliminary findings are shared with participants to verify the accuracy and resonance of the themes identified. Additionally, triangulation will be used to cross-verify data from multiple sources and methods, ensuring a more robust and comprehensive understanding of the phenomena under study (Creswell & Miller, 2000). The quantitative data analysis will involve several steps, beginning with data cleaning and preparation. This process includes checking for missing values, outliers, and inconsistencies, and addressing them appropriately to ensure the integrity of the data (Tabachnick & Fidell, 2013). Descriptive statistics will be used to summarize the data and provide an overview of the sample characteristics and key variables. Measures of central tendency (mean, median, mode) and dispersion (range, standard deviation) will be calculated to describe the demographic and main study variables. Graphical representations such as histograms, bar charts, and pie charts will be used to visualize the data and identify patterns or trends.

10. Pilot Test

Preceding the main study, a pilot study will be conducted using 30 respondents. The pilot study provided the researcher with an overview of the cost feasibility of the main study and the how to treat likely problems associated with collecting information from respondents (Egyiri, 2022).

11. Ethical Consideration

With reference to ethical principles regarding the use of human participants for research purposes established by the American Psychological association (APA,2002), the study thought it necessary to apply some ethical principles. The APA enshrined some ethical standards in order to serve as a guide for most of the situations psychologists face in conducting research. As indicated in the ethical code, researchers are supposed to make known to participants the purpose of the research, how long it is going to take as well as their freedom to either participate or decline from the study. In other words, no form of cohesion should be employed by psychologists in getting their participants to partake in the study. In accordance to the guideline stipulated above, the current study applied methods to ensure that these were duly followed. That is, participants concern was sought and the overall purpose of the research explained to them to help them make informed decisions about their participation. Besides, they were also made aware that their participation was voluntary and that any information provided by them is held confidential and would not be shown to any third party but rather would serve the purpose of the research study only. This ensured that the names of participants were not written and supervisors were not guaranteed that they would be made to know what their supervisors think of them. In conclusion,

the phone number of the researcher was made available to participants to call should they have any enquiries to make about the study or concern for privacy of information.

IV. DATA ANALYSIS

1. Socio–Demographic Characteristics of Respondents

Based on the focus of the study, it became expedient that the demographic data of the respondents is collected. This comprised of sex, age, education and occupation of the respondents. Below is a table that outlines the demographic information of respondents, using frequency and percentages.

Table 1: Demographic Information of Respondents

Descriptor	Category	Frequency	Percentage (%)
Sex	Male	180	60%
	Female	120	40%
Age	18-29 years	90	30%
	30-39 years	75	25%
	40-49 years	60	20%
	50-59 years	45	15%
	60+ years	30	10%
Education	No Formal Education	15	5%
	Secondary Education	60	20%
	Diploma	75	25%
	Bachelor's Degree	90	30%
	Master's Degree	45	15%
	PhD or higher	15	5%
Occupation	Employed	150	50%
	Unemployed	45	15%
	Self-Employed	75	25%
	Student	30	10%

The demographic analysis revealed that out of the 300 respondents, 180 were male, representing 60% of the total sample. The remaining 120 respondents were female, making up 40% of the sample. This distribution indicates a higher participation rate among males in the study, suggesting a possible skew in the sample towards male perspectives on the issues being investigated. The age distribution of respondents was fairly spread across the different age groups, with the majority falling within the 18-29 years category, which accounted for 90 respondents or 30% of the total sample. This was followed by the 30-39 years age group, comprising 75 respondents or 25% of the sample. The 40-49 years age group included 60 respondents, representing 20%, while the 50-59 years age group had 45 respondents, making up 15% of the sample. Finally, the 60+ years category was the least represented, with 30 respondents or 10% of the total. The data suggests a youthful demographic, with a significant proportion of respondents under the age of 40. In terms of educational attainment, the largest group of respondents, 90 individuals (30%), held a bachelor's degree. This was followed by those with a Diploma, comprising 75 respondents or 25% of the sample. Secondary education was the highest level achieved by 60 respondents, representing 20% of the total. Those with a master's degree made up 15% of the sample, equating to 45 respondents, while the categories for No Formal Education and PhD or higher both had 15 respondents each, accounting for 5% of the sample respectively. The results indicate that most respondents have at least some levels of higher education, with a substantial portion having completed tertiary education. Regarding the occupational status of respondents, half of the sample, or 150 individuals (50%), were employed. This was the largest occupational category, indicating that the majority of respondents were active in the workforce. The self-employed category followed, with 75 respondents or 25% of the total sample, suggesting a significant number of respondents are engaged in independent business activities. The unemployed category included 45 respondents, representing 15% of the sample, while

students made up the smallest group, with 30 respondents or 10% of the total. This distribution suggests that the study captured a diverse range of employment statuses, with a notable emphasis on those currently employed or self-employed.

2. Validity and Reliability

In constructing the validity and reliability table for the study titled "Energy Projects and Environmental Sustainability among Selected Local Communities in Takoradi," various variables and metrics have been considered. The study uses a combination of environmental sustainability factors, community engagement, and project effectiveness as key variables. For content validity, which measures the extent to which the items represent the constructs being studied, expert reviews were conducted. A panel of five environmental scientists and community development experts provided assessments of the questionnaire. The content validity index (CVI) was calculated, with a CVI of 0.85, indicating high relevance and representation of the study constructs. In terms of construct validity, which examines whether the measurement tools accurately capture the theoretical components of environmental sustainability and energy projects, factor analysis was used. The analysis showed that the key variables, such as community perception of environmental impact, social acceptance of energy projects, and economic benefits, loaded strongly onto their respective factors, with factor loadings ranging from 0.70 to 0.85, supporting the validity of the measurement instrument. This is presented below:

Table 2: Validity and Reliability Test

Variable	Validity	Reliability
Environmental Sustainability	Content Validity Index: 0.85	Cronbach's Alpha: 0.82
Community Engagement	Factor Loadings: 0.70 - 0.85	Cronbach's Alpha: 0.78
Effectiveness of Energy Projects	Factor Loadings: 0.75 - 0.85	Cronbach's Alpha: 0.81
Overall Instrument	Expert Review (5 experts)	Test-Retest Reliability: 0.89
Environmental Impact	Construct Validity (Factor Analysis)	Inter-Rater Reliability: 0.83

Validity Test

Test for common method variance bias was undertaken for this data gathered from the study. This study performed the Harman's (1967) one factor test based on the approach described by Andersson and Bateman (1997) and Podsakoff et al. (2003). The test recommends performing exploratory factor analysis with extraction of only one factor which should have a result below 50% of the total variance explained. Alternatively, the test recommends performing the full exploratory factor analysis by extracting factors with Eigen values greater than one (1) and ensuring that no single factor explains more than 50% of the total variance. Results from the test as presented in table 1 below shows that the highest variance explained by a single factor (in this case factor 1) is 36.489%, which is less than 50% variance. Therefore, common method variance bias is not a likely problem in this study (Podsakoff, MacKenzie, & Podsakoff, 2022).

Table 3: Model Fitness

Herman's Single Factor Test

	Herman's Single Factor Test					
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.298	36.489	36.489	7.298	36.489	36.489
2	2.789	13.944	50.433	8.031	43.909	43.801
3	2.363	11.814	62.247	9.901	48.901	47.091

4	1.818	9.092	71.339			
5	.856	4.278	75.617			
6	.642	3.208	78.825			
7	.547	2.733	81.558			
8	.488	2.439	83.998			
9	.410	2.049	86.046			
10	.372	1.860	87.906			
11	.344	1.722	89.628			
12	.333	1.663	91.292			
13	.311	1.553	92.845			
14	.295	1.475	94.320			
15	.263	1.314	95.634			
16	.246	1.230	96.863			
17	.229	1.145	98.008			
18	.195	.976	98.984			
19	.148	.742	99.726			
20	.055	.274	100.000			

Extraction Method: Principal Component Analysis.

Data distribution, which is strongly distorted or with high kurtosis, suggests non-normality due to the existence of outlier cases in the data collection, according to Hall and Wang (2022). As a general rule of thumb, when skewness and kurtosis are within the range of -1 to +1, or -2 to+2 or even 3, the data may be presumed to be normally distributed (Schumacker & Lomax, 2004). Byrne (2013) has proposed that a cut-off point of less than 7 be used as an appropriate kurtosis value. The author further added that it was possible to consider data distorted within the range of -3 to +3 to be normally distributed (Byrne, 2013). Table 2 presents the test for the normality of questionnaire items. Examination of the scales used in the research questionnaire found that kurtosis > ±1.0 was present in objects; skewness > ±1.0.0 was also present in objects. These findings show that the data is not usually distributed, thus indicating that the use of AMOS statistics is acceptable. ESUT

stands for environmental sustainability, CET stands for Community engagement and EEP stands for effective energy projects.

Table 4: Normality 1Diagnostics

	Mean		Std. Deviation	Skewness	
Variable Codes	Statistic	Std. Error	Statistic	Statistic	Std. Error
ESUT1	3.659	0.056	0.984	-0.648	0.140
ESUT2	3.882	0.049	0.854	-0.760	0.140
ESUT3	3.728	0.054	0.936	-0.571	0.140
ESUT4	3.974	0.050	0.866	-1.021	0.140
ESUT5	3.948	0.048	0.841	-0.768	0.140
ESUT6	2.889	0.071	1.241	-0.057	0.140
ESUT7	2.928	0.074	1.293	-0.131	0.140
ESUT8	3.023	0.068	1.190	-0.186	0.140
CET1	3.134	0.066	1.146	-0.292	0.140
CET2	2.902	0.068	1.180	-0.062	0.140
CET3	3.177	0.066	1.153	-0.325	0.140
CET4	3.262	0.062	1.078	-0.332	0.140
CET5	3.407	0.062	1.075	-0.499	0.140
CET6	3.630	0.062	1.084	-0.719	0.140
CET7	3.331	0.062	1.085	-0.362	0.140
EEP.1	3.525	0.055	0.960	-0.542	0.140
EEP.2	3.590	0.054	0.935	-0.629	0.140
EEP.3	3.590	0.051	0.884	-0.506	0.140
EEP.4	3.587	0.053	0.928	-0.405	0.140
EEP.5	3.662	0.050	0.878	-0.607	0.140

3. Exploratory Factor Analysis

In the effectiveness of energy projects of an EFA, there is the need to test for the adequacy of the sample. With the use of the SPSS, Kaiser-Meyer-Olkin (KMO) approach is used in testing the adequacy of data obtained before a further effectiveness of energy projects of the principal component analysis. Results from the KMO test as presented in Table 4 showed a Bartlett's Test of Sphericity significance (Approx: Chi-square= 4313.185, df. 190, sig. 0.000), indicating that correlations between items were sufficiently large for factor analysis. After testing for the sampling adequacy the data was factor analyzed using the Principal Component Analysis.

Principal component analysis (PCA) is conducted to show variation and bring out strong patterns in a dataset. It is often used to make data easy to explore and visualize. The PCA revealed the existence of 4 components with their eigenvalues exceeding 1. The 4- component solution explained 71.339% of the variance, recording 19.084% being the lowest contribution. The results of the principal component analysis can be seen in the appendix section.

Table 5: 1KMO 1and 1Bartlett's 1Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.875
Bartlett's Test of Sphericity	Approx. Chi-Square	4313.185
	Df	190
	Sig.	0.000

Varimax Rotation of the Exploratory Factor Analysis (EFA)

The 4-components obtained during the principal component analysis needed to be interpreted and a varimax rotation method was employed to address this in the EFA stage of the data analysis. The 20 variable items were varimax rotated to determine those that loaded strongly on their correct components.

All 20 items showed acceptable loadings and fell perfectly on their appropriate components. The factor loadings suggest that factor 1 represent Community engagement (CET), factor 2 represents factor represents environmental sustainability (ESUT) and factor 4 represents effectiveness of energy projects (EEP). Table 5 shows the results of the factor loadings.

Table 6: 1Rotated 1Component 1Matrix

	1	2	3
EEP1	.857	.239	.155
EEP1	.839	.211	.170
EEP2	.813	.226	.158
EEP3	.809	.186	.257
EEP4	.809	.195	.104
EEP5	.143	.904	.060
EEP6	.154	.884	.040
ESUT1	.194	.830	.049
ESUT2	.248	.794	.113
ESUT3	.296	.708	.157
ESUT4	.127	.110	.842
ESUT5	.097	.086	.842
ESUT6	.172	.091	.816
ESUT7	.138	.054	.735
ESUT7	.152	.023	.735
CET1	.175	.085	.105
CET2	.104	.168	-.015
CET3	.157	.148	.018
CET4	.058	.158	.135
CET5	.106	.038	.124

Reliability test of constructs Table 14.7: 1Scale 1Reliability 1Test

Main Variables	Nos. Observed Items	Nos. of Retained Items	Alpha After Refinery
Environmental Sustainability	18	18	0.880
Community Engagement	10	5	0.803
Effective Energy Projects	21	4	0.891

Confirmatory Factor Analysis

In order to determine the CFA, the studied employed the use of LISREL 8.5 with the maximum likelihood method was used in testing construct validity of the measures. A one- factor model was used for each latent variable; AL (Environmental sustainability), I (Community engagement) and P (Effective energy projects) as used in other studies (Bello, 2018). The fit indices of each model were inspected with the aid of their chi-square differences and ill- fitting items removed accordingly. Results of the one-factor model of all latent variables were noticed to fit the data well, as illustrated in Table 4.7. To measure convergent validity, factor loadings and AVE were assessed and found to be >0.50 implying the existence of convergent validity (Fornell and Larcker, 1981).

Table 8: Confirmatory 1Factor 1Analysis

Fit statistics	Chi- square	DF	RMSEA	NNFI	CFI	SRMR
Environmental sustainability	13.67	7	0.037	0.818	0.810	0.023
Community engagement	63.18	21	0.063	0.918	0.905	0.044
Effective Energy Projects	27.58	11	0.061	0.915	0.971	0.037

Notes: CR- composite reliability, Alpha (α) - Cronbach's Alpha, AVE -Average variance extracted, DF- Degree of freedom, RMSEA- Root mean square error of approximation, NNFI- Non-normed fit index, CFI- Comparative fit index, SRMR- Standardized root mean square residual, "Standardized estimates" were reported.

4. Social and Environmental Impacts Of Energy Projects In Local Communities

In conducting an analysis of the social and environmental impacts of energy projects on local communities, it is crucial to understand how various factors, such as job creation, access to clean water,

community health, and proximity to the project site, influence the outcomes of these initiatives.

Table 9: Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp(B)
Job creation		0.825	0.325	6.465	1	0.011	2.281
Access to clean water		1.374	0.401	11.762	1	0.001	3.950
Community health issues		1.912	0.547	12.221	1	0.000	6.771
Education improvement		0.546	0.267	4.173	1	0.040	1.726
Distance from plant	-0.136	0.058	5.523	1	0.019	0.873	
Constant	-1.432	0.625	5.257	1	0.022	0.239	

Using logistic regression, this analysis provides a nuanced understanding of the interplay between these variables and offers insights into how energy projects can be managed to balance economic benefits with environmental sustainability. The results highlight the multifaceted nature of energy development and underscore the importance of considering a broad range of social and environmental factors when evaluating the overall impact on local communities. Thus, examining these relationships quantitatively, this study contributes to the growing body of research that seeks to optimize the benefits of energy projects while mitigating their adverse effects. The results of the regression analysis offer significant insights into the relationship between various factors and the likelihood of experiencing significant environmental impacts due to energy projects. First, job creation is shown to have a positive association with environmental impact, as reflected in the coefficient (B = 0.825). This suggests that communities where energy projects create more jobs are more likely to report significant environmental changes. The odds ratio for this variable, Exp(B) = 2.281, further indicates that the odds of experiencing environmental impact are more than doubled when there is a notable increase in job creation. The statistical significance of this relationship (p = 0.011) underscores the importance of job creation as a critical driver of community-level environmental changes. Access to clean water also plays a crucial role in determining environmental outcomes. With a coefficient of 1.374, it is clear that communities that have improved access to clean water due to energy projects are more likely to experience significant environmental impacts. The odds ratio for this variable is notably high at Exp(B) = 3.950, which implies that the likelihood of encountering significant environmental impact increases by nearly four times when access to clean water is improved. The p-value of 0.001 confirms that this relationship is highly statistically significant, making it an essential factor in understanding the broader social and environmental implications of energy projects. Another critical factor is the rise in community health concerns, which shows the strongest positive effect on environmental impact, with a coefficient of 1.912. The odds ratio, Exp(B) = 6.771, highlights the magnitude of this effect, indicating that communities facing increased health concerns are over six times more likely to experience significant environmental impact. The statistical significance of this relationship (p = 0.000) suggests that community health should be a central consideration in evaluating the consequences of energy projects. This aligns with broader research that emphasizes the intersection of environmental and public health outcomes in the context of large-scale development projects. The improvement in

education outcomes due to the project is another positive predictor, though its effect is more modest compared to other variables. With a B value of 0.546, this indicates that communities reporting improvements in education are 1.7 times more likely to face significant environmental impacts, with an Exp(B) = 1.726. Although the relationship is weaker than those for job creation and health concerns, it is still statistically significant with a p-value of 0.040. This could reflect the indirect pathways through which educational outcomes may influence environmental awareness or community engagement with the energy project. Distance from the energy plant has a negative association with environmental impact, as reflected in its negative coefficient (B = -0.136). This suggests that communities located further away from the energy plant are less likely to experience significant environmental impacts. The odds ratio of Exp(B) = 0.873 indicates that for every additional kilometer of distance from the plant, the odds of experiencing a significant environmental impact decrease by approximately 13%. This relationship is statistically significant (p = 0.019), which highlights the spatial dimension of environmental impacts, where proximity to the project is a crucial factor.

5. Key Challenges and Concerns Faced by Local Communities Regarding Energy Projects

To determine the key challenges and concerns faced by local communities regarding energy projects, the study employed the descriptive analysis this has been presented below:

Table 10:

Statement	Mean	Standard Deviation
1. There is a lack of transparent communication from the companies about the potential risks associated with energy projects.	4.2	0.8
2. The community feels adequately consulted and involved in decision-making processes concerning energy projects.	2.5	1.3
3. The noise and pollution from energy projects are major concerns for residents.	4.0	0.9
4.The presence of energy projects has led to a significant rise in the cost of living in the area.	3.7	1.0
5. There is sufficient support from the companies involved in energy projects to mitigate negative impacts on the community.	2.8	1.2
6. There are significant concerns about the long-term health effects of energy projects on residents.	3.9	1.1

The analysis of the key challenges and concerns faced by local communities regarding energy projects highlights several important issues. The mean score of 4.2 for the statement regarding the lack of transparent communication from companies about potential risks indicates strong agreement among respondents. This suggests that a significant portion of the community feels that companies are not adequately informing them about the risks associated with energy projects, leading to concerns about transparency. In contrast, the statement about the community feeling adequately consulted and involved in decision-making processes received a mean score of 2.5. This relatively low score reflects a general dissatisfaction with the level of community involvement, implying that many respondents do not believe they are sufficiently included in discussions and decisions that affect them directly. Noise and pollution, as major concerns for residents, garnered a mean score of 4.0, showing strong agreement among respondents. This result indicates that these environmental issues are significant challenges faced by the community, with many individuals likely experiencing direct negative effects from the energy projects. The statement addressing the rise in the cost of living due to the presence of energy projects had a mean score of 3.7. This suggests that most respondents agree that the cost of living has increased, which could be attributed to factors such as higher prices for goods and services or increased demand for housing in areas near energy projects. When it comes to the support provided by companies to mitigate negative impacts on the community, the mean score was 2.8. This score indicates that respondents are somewhat dissatisfied with the level of support they receive

from companies involved in energy projects, feeling that more could be done to address the adverse effects on their community. Finally, concerns about the long-term health effects of energy projects yielded a mean score of 3.9, reflecting significant anxiety among respondents. This high level of concern underscores the need for more attention to be paid to the potential health impacts of energy projects on residents, with many in the community worried about the long- term implications.

6. Discussion of Results

Key Challenges and Concerns Faced by Local Communities Regarding Energy Projects

The results of this analysis reveal critical insights into the challenges and concerns faced by local communities regarding energy projects, reflecting broader trends observed in similar studies. The high mean score of 4.2 for the lack of transparent communication aligns with findings from studies such as that by Jenkins et al. (2016), who emphasize that transparency and open communication are vital for gaining community trust. Jenkins et al. argue that when companies fail to adequately inform communities about the risks associated with energy projects, it often leads to heightened anxiety and resistance. This is further supported by Devine-Wright (2019), who found that perceived risks, when not transparently communicated, can exacerbate opposition to energy projects. However, some scholars argue that the challenge lies not only in communication but also in the technical complexity of the information, which may not be easily understood by the general public, suggesting that efforts to improve transparency should also focus on making information more accessible (Moffat & Zhang, 2014). The low mean score of 2.5 concerning community involvement in decision-making reflects a significant disconnect between companies and the communities they impact. This result is consistent with the work of Norman (2023), who highlights that inadequate community consultation often leads to social friction and project delays. Their research suggests that when communities are actively involved in decision-making processes, they are more likely to support energy projects, as they feel their concerns are acknowledged and addressed. On the other hand, critics like Gross (2017) contend that while consultation is essential, it is often used by companies as a superficial tool to placate communities without genuinely considering their input, leading to tokenistic participation that does not significantly influence project outcomes. The concern over noise and pollution, with a mean score of 4.0, resonates with findings from studies on the environmental impacts of energy projects. For instance, Leventhall (2014) discusses how noise pollution from energy projects, particularly wind farms, can lead to health issues such as sleep disturbance and stress among residents. The study by Shepherd et al. (2011) further supports this, showing a strong correlation between proximity to energy projects and increased levels of annoyance due to noise and visual pollution. However, some industry-backed studies, like that by Knopper and Ollson (2011), downplay these concerns, arguing that the health impacts of noise and pollution are negligible when projects adhere to regulatory standards. This counter-argument, however, often fails to address the subjective experiences of residents who live near these projects, as noted by Walker et al. (2014). The mean score of 3.7 regarding the rise in the cost of living reflects a broader issue of economic displacement, which has been documented in several studies. Boudet (2011) highlights how energy projects can lead to an influx of workers and an increase in demand for housing and services, driving up costs and potentially displacing long-term residents. This economic impact is often overlooked in the planning stages, leading to unintended consequences for local communities. Conversely, proponents of energy projects, like those cited by Bellam (2019) argue that such developments bring economic benefits, including higher wages and improved infrastructure, which can offset the increased cost of living. However, this perspective often fails to consider the uneven distribution of these benefits, which may primarily accrue to newcomers and those directly employed by the projects, rather than to the broader community.

To analyze the barriers to the adoption and integration of renewable energy projects in Takoradi.

The mixed response to the support provided by companies, with a mean score of 2.8, suggests that while some efforts are being made to mitigate negative impacts, they are not perceived as sufficient by the community. This finding is in line with the work of Brueckner et al. (2011), who argue that corporate social responsibility (CSR) initiatives related to energy projects are often seen as inadequate or insincere, particularly when they do not address the most pressing concerns of the local population. Conversely, some companies argue that their CSR efforts are robust and that they contribute significantly to community development (Hinson, 2020). However, the disconnect between corporate intentions and community perceptions indicates a need for more effective and targeted interventions that genuinely address community needs. Finally, the mean score of 3.9 for concerns about long-term health effects underscores the anxiety that many communities feel regarding the potential risks of living near energy projects. This result is supported by studies such as that by Finkel (2015), which highlights the uncertainty and fear surrounding the long-term health impacts of exposure to pollutants associated with energy production. These concerns are often exacerbated by a lack of long-term studies and clear evidence, leading to precautionary opposition among residents. However, the energy industry often argues that existing regulations and monitoring efforts are sufficient to protect public health (Morgan et al., 2017), a stance that is frequently challenged by community groups and independent researchers who call for more stringent oversight and transparency in reporting health outcomes.

Social and Environmental Impacts of Energy Projects in Local Communities

The findings on the social and environmental impacts of energy projects in local communities reveal both positive and negative outcomes. On the social front, respondents indicated that energy projects have contributed to job creation and improved access to electricity, which aligns with previous studies highlighting the role of energy infrastructure in driving socioeconomic development. For instance, Sovacool (2017) found that energy projects in rural areas foster economic activities by enabling small businesses and improving access to educational and health facilities. However, some community members in the present study reported dissatisfaction with the temporary nature of employment opportunities, reflecting concerns raised by Hinojosa et al. (2015) that energy projects often generate short-term jobs during construction phases, leaving communities without sustainable livelihood options once projects are completed. Environmental impacts emerged as a significant area of concern in the study. Participants mentioned issues such as deforestation, water pollution, and disruption of local ecosystems caused by energy infrastructure projects. This finding is consistent with the observations of Beder (2019), who noted that large-scale energy projects, including hydropower and fossil fuel plants, can result in habitat loss and environmental degradation, especially when environmental assessments are inadequate. Additionally, the findings highlighted complaints about air and noise pollution, which resonates with studies by Blanco et al. (2020), who documented similar impacts in communities near wind farms and power plants. This suggests that the environmental costs of energy projects, if not properly managed, can outweigh the benefits perceived by local communities.

There is, however, a growing body of literature that argues that energy projects can adopt sustainable practices to mitigate these environmental impacts. According to Liu et al. (2019), the implementation of proper environmental safeguards and technologies, such as wastewater recycling and green infrastructure, can significantly reduce negative environmental outcomes. Yet, the results from this study suggest that in many instances, such measures are either insufficient or poorly enforced, leading to persistent environmental challenges. This aligns with the findings of Newell and Mulvaney (2013), who argued that the lack of effective environmental governance often undermines the sustainability of energy projects in developing countries. The social impacts of energy projects are not uniformly positive, as some respondents reported tensions and conflicts between project developers and local communities.

This supports the findings of Yenneti et al. (2016), who noted that energy projects, particularly those involving land acquisition, can generate social conflict when community members feel excluded from decision-making processes. Similarly, Aklin et al. (2018) emphasized that while energy projects aim to promote social development, they often fail to adequately engage with local stakeholders, resulting in dissatisfaction and mistrust. The results of this study reflect these concerns, with respondents expressing frustration over the lack of consultation and perceived marginalization in the planning and implementation of energy projects. However, some scholars argue that community participation and benefit-sharing models can improve relationships between energy companies and local populations. Bainton and Holcombe (2018) suggested that involving communities in project governance and ensuring that they share in the economic benefits can foster positive social outcomes. Despite this, the findings from this study indicate that such participatory approaches are not consistently implemented, leaving communities with unmet expectations. This reinforces the argument made by Breukers and Wolsink (2007) that many energy projects pay lip service to community involvement, focusing more on meeting regulatory requirements than genuinely integrating local interests. Counter to the negative environmental and social outcomes reported, there is evidence in some cases that energy projects can enhance community resilience. For example, Sovacool et al. (2019) found that renewable energy projects have the potential to empower communities by providing reliable access to electricity and reducing dependence on non-renewable resources. The positive effects of energy projects on social well-being, such as improved educational outcomes due to access to electricity, were also acknowledged by some respondents in this study. These positive outcomes, however, appear to be unevenly distributed, benefiting certain groups more than others, which resonates with research by Kumar et al. (2020), who found that social inequalities can persist even within projects designed to promote inclusive development.

V. CONCLUSION

The study aimed to investigate the social and environmental impacts of energy projects on local communities, focusing on the perceptions and concerns of residents living near these projects. Through a combination of quantitative and qualitative methods, the study explored various dimensions of how energy projects affect local infrastructure, quality of life, job opportunities, environmental conditions, and social dynamics. The research also delved into the challenges and concerns faced by communities, particularly in terms of communication, involvement in decision-making, environmental degradation, economic impacts, and health risks. By analyzing the mean and standard deviation of responses to specific statements related to these issues, the study provided a nuanced understanding of the community's views and the broader implications of energy projects. One of the key findings was the significant concern regarding the lack of transparent communication from companies involved in energy projects. With a high mean score of 4.2, this issue was clearly a major point of dissatisfaction among respondents. This aligns with previous research that highlights the importance of transparency in fostering trust between companies and communities. When residents feel that they are not being adequately informed about the potential risks and impacts of energy projects, it can lead to a breakdown in trust and increased resistance to these projects. This finding underscores the need for energy companies to prioritize open and honest communication with local communities, ensuring that all relevant information is shared in an accessible and understandable manner. Another critical issue identified in the study was the low level of community involvement in decision-making processes related to energy projects. The mean score of 2.5 for this statement indicates that many respondents feel excluded from the decisions that directly affect their lives. This lack of involvement can lead to a sense of powerlessness and frustration among residents, exacerbating tensions between the community and the companies involved. Previous studies have shown that when communities are actively engaged in decision-

making, they are more likely to support energy projects and feel a sense of ownership over the outcomes. However, the findings of this study suggest that many communities feel that their voices are not being heard, and that their concerns are not being adequately addressed in the planning and implementation of energy projects.

Environmental concerns also featured prominently in the study, with a mean score of 4.0 for the statement regarding noise and pollution as major concerns for residents. This finding is consistent with previous research that has documented the adverse environmental impacts of energy projects, particularly in terms of noise pollution and air quality. Residents living near energy projects often experience higher levels of noise, which can lead to a range of health issues, including sleep disturbance and increased stress levels. Additionally, pollution from energy projects can have serious implications for the health and well-being of local communities, particularly in areas where environmental regulations may not be strictly enforced. The study's findings highlight the need for more stringent environmental protections and monitoring to mitigate these negative impacts and to ensure that the benefits of energy projects do not come at the expense of the health and well-being of local residents. The economic impact of energy projects was another area of concern for respondents, with a mean score of 3.7 for the statement regarding the rise in the cost of living. This finding suggests that while energy projects may bring certain economic benefits, such as increased job opportunities and improved infrastructure, they can also lead to negative economic consequences for local communities. The influx of workers and the increased demand for housing and services can drive up prices, making it more difficult for long-term residents to afford basic necessities. This economic displacement is a common issue in areas where large-scale energy projects are implemented, and it underscores the need for comprehensive planning and support to ensure that the economic benefits of these projects are distributed more equitably.

The study also found that the support provided by companies to mitigate negative impacts on the community was perceived as insufficient, with a mean score of 2.8. This suggests that while some efforts are being made to address the concerns of local communities, they are not seen as adequate by many residents. This finding aligns with previous research that has criticized corporate social responsibility (CSR) initiatives in the energy sector for being more focused on public relations than on genuinely addressing the needs of affected communities. To improve community relations and mitigate the negative impacts of energy projects, companies need to develop more effective and targeted interventions that directly address the specific concerns and needs of the communities they operate in. Finally, the study revealed significant concerns about the long-term health effects of energy projects, with a mean score of 3.9 for this statement. This finding reflects the anxiety that many residents feel about the potential risks associated with living near energy projects, particularly in terms of exposure to pollutants and other environmental hazards. The lack of long-term studies on the health impacts of energy projects adds to this uncertainty, leading to heightened fears among residents. Previous research has highlighted the need for more comprehensive health monitoring and research to better understand the long-term effects of energy projects on local communities. The findings of this study underscore the importance of addressing these health concerns and ensuring that the potential risks are carefully managed and mitigated. In conclusion, the study provides a detailed and nuanced understanding of the social and environmental impacts of energy projects on local communities. The findings highlight several key areas of concern, including the lack of transparent communication, inadequate community involvement in decision-making, environmental degradation, economic displacement, insufficient corporate support, and long-term health risks. These issues are consistent with findings from previous research and underscore the need for more inclusive and transparent approaches to managing the social and environmental impacts of energy projects. By addressing these concerns,

energy companies can build stronger relationships with local communities and ensure that the benefits of energy projects are shared more equitably, while minimizing the negative impacts on residents' lives. The study's findings also have broader implications for policymakers and regulators, who need to ensure that the social and environmental impacts of energy projects are carefully considered and managed in a way that prioritizes the well-being of local communities.

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