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THE ROLE OF ENGINEERS IN PROJECT EVALUATION AND ENVIRONMENTAL IMPACT ASSESSMENT IN NIGERIA

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Abstract

The escalating impact of uncontrolled utilization of environmental resources has prompted a call for Environmental Impact Assessment (EIA). EIA, as a multifaceted and inclusive domain, necessitates the involvement of engineering experts, among others, in achieving the objectives of environmental development and sustainability. Consequently, this study examined the contributions of engineering professionals to EIA in Nigeria. A total of two hundred (200) questionnaires were distributed to engineering professionals in Lagos State, with one hundred and thirty-one (131) collected and deemed suitable for analysis. The gathered data underwent descriptive statistical analysis. According to the findings, 66% of engineering professionals have engaged in EIA, and 77% of respondents opine that engineering professionals should play a significant role in EIA. Additionally, the study revealed that civil engineers and transportation engineers were the most

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actively involved disciplines in EIA, while mining engineers exhibited the highest rate of non-participation. The study recommended that both government authorities and professional organizations encourage engineering professionals to enhance their involvement in EIA through continuous training and awareness initiatives. This would facilitate their engagement in decision-making processes concerning environmental preservation and sustainability.

Introduction

The engineering sector is known for its demanding and challenging nature due to its diverse range of professions and skill sets involved. A proficient project team is essential to ensure the timely and successful completion of projects. Engineering operations, as highlighted by Hussin and Omran (2009), encompass a wide array of specialists, including civil engineers, transportation engineers, energy engineers, water resources engineers, mining engineers, industrial engineers, agricultural engineers, coastal engineers, urban planners, waste management engineers, and environmental engineers.

In general, engineering professionals are tasked with overseeing the entire project lifecycle, from inception to completion, in various fields such as civil engineering, transportation engineering, energy engineering, water resources engineering, mining engineering, industrial engineering, agricultural engineering, coastal engineering, urban planning and development, waste management, and environmental engineering. This involves balancing the competing needs of clients, users, and the community throughout the process. It is the responsibility of engineering professionals to apply their expertise with due diligence, adhering to professional standards in accordance with the norms of the current engineering world.

As highlighted by Mac-Barango (2006) and Ojo & Odediran (2010), human existence is intricately linked to the environment, which sustains all activities. Anago (2002) emphasized the critical relationship between underdevelopment and environmental integrity, as recognized in the 1972 United Nations Conference on the Human Environment. This awareness has led to the formation of organizations dedicated to environmental protection and preservation, aiming to mitigate the adverse effects of uncontrolled exploitation of environmental resources on wildlife, ecosystems, flora, fauna, and human security.

According to Anago (2002), Nigeria stands out among developing nations with specific applicable legislation serving as a tool to achieve the necessary balance and meet the operational requirements of a sustainable development plan. Environmental Impact Assessment (EIA) is described as a planning methodology aimed at integrating environmental considerations into the decision-making process by thoroughly evaluating

the environmental impacts of planned activities before implementation. This concept holds significant implications for nearly all development initiatives, as sustainable development hinges on the preservation of natural resources, as noted by Alan (1995).

EIA encourages decision-makers to factor in environmental values when making choices and to justify those decisions through comprehensive environmental assessments and public feedback on potential environmental ramifications (Holder, 2004). Given their expertise in environmental development and sustainability, engineers in various fields play a crucial role in decision-making processes. Therefore, their involvement in the EIA process is paramount. Recognized by IAIA (2013) as a multidisciplinary field, EIA is expected to be conducted prior to project commencement (EIA Act, 1992; Wang, 2007; Martin, 2008; Comfortasokoroogaji, 2011). It is imperative for all engineering companies and contractors to undertake EIA to avoid hefty fines or legal repercussions. EIA holds significant importance throughout all project stages, from planning to construction, operation, and beyond.

Consequently, engineering professionals, among others, serve as key stakeholders in EIA, necessitating their involvement at the appropriate stages. Environmental Impact Assessment (EIA), as emphasized by Nwokoro and Onukwube (2011), should occur throughout the project planning and design phases. These stages are critical for engineers, and their contributions to assessing the anticipated environmental impacts of actions taken during these phases are essential. Consequently, this article evaluated the engagement of engineers in various disciplines in the EIA process, aiming to raise awareness and enhance their performance in the competitive engineering industry. With this context in mind, the objective of this article was to examine the involvement of Nigerian engineers across various fields in EIA procedures and assess the factors influencing their level of participation. This endeavor seeks to promote awareness and active participation of all engineering professionals in EIA for enhanced environmental growth and sustainability.

Environment Impact al Assessment (EIA)

Environmental Impact Assessment (EIA) is defined as a comprehensive tool utilized to identify, predict, interpret, and communicate the potential impacts of proposed, planned, or ongoing projects across the entirety of the environment. It also involves the development of a monitoring plan to mitigate or alleviate identified negative impacts post-evaluation of alternatives (Adibe, Essaghah, and Arthur, 1998; The International Association for Impact Assessment (IAIA), 1999 & 2013; Ithnin, 2006; Nwoko, Zagi, 2013).

According to IAIA (1999, 2013) and Nwoko (2013), this assessment should be conducted prior to making critical decisions and commitments regarding the project. An Environmental Impact Assessment (EIA) entails an analysis of the potential

environmental, social, and economic ramifications of a proposed project. Additional definitions provided by Edmon (1978), Jeffery (1989), Yusuf (2008), the Canadian Environmental Assessment Act 2012 (CEAA, 2012), the Supreme Court of Canada (SCC, 2012), CSE (2013), and the EU (2013) emphasize the importance of EIA in informed decision-making processes (SCC, 1992).

The benefits outlined by various authors include environmental protection, optimal resource utilization, time and cost savings, reduced conflicts through enhanced community involvement, and informing decision-makers to promote environmentally sound projects (Adibe and Essaghah, 1999). The primary objectives of EIA, as highlighted by Adibe and Essaghah (1999), are to protect the bio-geophysical environment. Seeley (1997) emphasizes the need for sensitivity in conducting operations such as quarrying, open-cast mining, motorway construction, waste disposal sites, and extensive urban and rural development schemes, as they require detailed environmental impact assessments to ascertain their effects during and after implementation. Consequently, professionals in related engineering fields should be actively involved. This article adopts the definitions provided by IAIA (1999, 2013) and Nwoko (2013) since many of the duties associated with EIA can be fulfilled by engineering professionals due to their expertise in proposed, planned, and ongoing projects.

Environmental Impact Assessment (EIA) recognizes impacts that can be structural, design-related, or financial in nature. Given that these impacts often arise from engineering projects, it is expected that professionals in engineering fields would be able to identify and propose mitigation solutions. Engineers, including civil engineers, transportation engineers, energy engineers, water resources engineers, mining engineers, industrial engineers, agricultural engineers, coastal engineers, urban planners, waste management experts, and environmental engineers, play a crucial role in recognizing the benefits of EIA, such as environmental conservation, efficient project cost management (optimal resource utilization, time and cost savings), and conflict resolution through community engagement.

The need for a systematic approach to analyze the environmental impacts of projects or plans has been recognized for decades, leading to the formal introduction of environmental impact assessment (EIA) in the United States in the early 1970s. Since its inception, EIA has gained global popularity and has been refined and adapted to various decision-making objectives at different levels within engineering disciplines and society. Environmental management became a significant concern in engineering practices in the 1990s, prompting the development of appropriate systems analytic tools to identify environmental issues within technological systems, along with the increased utilization of EIA.

Anderson (2000) emphasized that the information provided in EIA must be of sufficient quality for stakeholders, including decision-makers, the public, and developers, to have confidence in the conclusions upon which they are expected to act. This necessitates the involvement of the right professionals at the appropriate stage of the project. One of the primary aims of EIA is to offer alternative solutions to decision-makers. EIA, as a decision-making tool, not only requires legal and institutional approval or a formal application process (Onaiwa, 1995), but also entails an ongoing evaluation of impact assessment throughout the project life cycle (Adibe et al., 1998).

According to Nwoko (2013), Environmental Impact Assessment (EIA) is a globally recognized tool for achieving sustainable development, with the main objective of ensuring that potential environmental impacts are identified during the project design phase and addressed before any project decisions are made. Prior to commencing any planned project, engineers must carefully consider the environmental consequences.

Environmental Impact Assessment (EIA) stands as one of the most significant environmental policy advancements of the twentieth century (CSE, 2013). Originating in the 1960s, EIA emerged as part of efforts to heighten environmental consciousness. Clark and Canter (1997) note that EIA gained traction in the United States in 1969 with the passage of the National Environmental Policy Act. Since then, EIAs have been increasingly adopted worldwide, notably in countries like Canada, Australia, and New Zealand in the early 1970s. Even emerging nations like Colombia (1974) and the Philippines (1978) embraced EIAs relatively early on.

The momentum for EIA accelerated after the mid-1980s, with the World Bank endorsing EIA for major development projects in 1989, mandating borrower countries to conduct EIAs under the Bank's oversight. Nigeria incorporated EIA into its regulatory framework, making it mandatory for all development projects starting in March 1991 (Comfortasokoroogaji, 2011). Presently, EIA is utilized in over 100 nations across the globe (Jay et al., 2007; Nwoko, 2013).

Various authors (Ithnin, 2006; Yusuf, 2008; Comfortasokoroogaji, 2011; EU, 2013; CSE, 2013; NRMED, 2013; Nwoko, 2013) have defined and discussed EIA processes, employing diverse frameworks and classifications. CSE (2013), for instance, outlined eight steps in an EIA report, encompassing screening, scoping, impact analysis, mitigation, reporting, EIA review, decision-making, and post-monitoring. On the other hand, Dougherty and Hall (2006) delineated the entire process into five steps: screening, scoping, prediction and mitigation, management and monitoring, and auditing.

Professionals Engaged with EIA

Environmental Impact Assessment (EIA) is described as a thorough examination of the environmental consequences of a proposed project, plan, or program (Ogola, 2007), aimed at improving project outcomes by involving individuals directly or indirectly

affected. Dougherty and Hall (2006) advise initiating the EIA process early in the project cycle to mitigate disputes, emphasizing effective management of a diverse range of technical expertise. Professionals from various engineering disciplines and related fields can collaborate to develop the Environmental Impact Statement for submission to the planning authority. An Environmental Assessment typically encompasses a broad spectrum of disciplines, although it is uncommon for all, or even the majority, of them to be represented on any assessment team. Shah (2013) notes that an EIA practitioner should represent a diverse network of individuals from different educational and professional backgrounds collaborating to assess the significant impacts a project may have.

Shah (2013) underscores that Environmental Impact Assessment integrates a wide array of subjects such as sciences, arts, society, economics, and more, necessitating expertise from various fields to evaluate the impacts of a single project on both the environmental and socioeconomic aspects concurrently. It is important to note that EIA encompasses various areas beyond engineering, as outlined by Dougherty and Hall (2006), including health-related impacts, pollution effects, chemical reactions, among others, which require the expertise of qualified specialists.

While the entire EIA process may not fall solely within the purview of engineering professionals, Adibe et al. (1998), CSE (2013), IAIA (2013), Ithnin (2006), Nwoko (2013), and Zagi (2013) underscore the significant roles that engineers play in EIA, which are often overlooked. Ogola (2007) and the International Association for Impact Assessment (IAIA, 1999) stress the importance of multidisciplinarity in the EIA process, emphasizing the inclusion of appropriate methodologies and specialists from relevant fields.

Various authors have identified challenges to the effectiveness of EIA, including capacity building and reliance on foreign experts (Winbourne, 2002; Lawrence, 2003; Wood, 2003; Kakonge, 2006 & 2013; Martin, 2007; Mumias, 2007; Omondi, 2008; Yusuf, 2008; King, 2009; Komen, 2011; Ridl, 2012; Shepherd, 2012; World Bank, 2012). They recommend the involvement of qualified and suitable professionals in the EIA process. Shah (2013) highlights the importance of consultant credibility in ensuring the quality of an assessment report, advocating for a consulting team comprising credible, knowledgeable, and experienced specialists in relevant domains. Depending on project complexity, a consulting team may choose to include subject specialists alongside core EIA professionals. According to Münster (2005), defining the function and scope of topic specialists engaged in the EIA process is crucial for ensuring the integrity of the information provided in the report. The professional competence, knowledge, skills, and educational backgrounds of individual EIA practitioners all contribute to forming a robust EIA team.

According to Edwards (nd), the Environmental Impact Assessment (EIA) process necessitates input from various individuals, including professionals and civil servants with expertise in environmental science and engineering, local officials familiar with local, state, and federal environmental management procedures and regulations, and community members knowledgeable about and interested in the local environment and natural resources. Additionally, involvement of the developer, planner, local politicians, and possibly a paid consultant is recommended. Given that the EIA process often requires technical expertise and consideration of multiple environmental compliance issues, it is common to include additional personnel such as engineers, land or ecological conservation specialists, and state agency officials.

Selecting appropriate individuals to participate in the assessment ensures that potential development impacts are promptly and adequately addressed. The initial effort in identifying and engaging key stakeholders in the process can prevent costly mistakes in planning and assessing consequences in the long run. While it is widely accepted that EIA should be conducted by EIA specialists, the purpose of this paper is to assert that professionals in the general engineering field, based on their training, skills, and the nature of the development or project under consideration, should be involved at the appropriate time and stage to contribute to a successful EIA process.

Construction Professionals' Involvement in Environmental Impact Assessments

One of the fundamental requirements for Environmental Impact Assessment (EIA), as highlighted by Canter and Sadler (1997), is a comprehensive description of the project, including its physical characteristics, scale, design, and the quantities of materials needed for construction and operation. This information is typically provided by specialists in the engineering field, including urban planners, architects, engineers, and environmental consultants. Atilola (2013) demonstrated that opting for less qualified individuals over hiring suitable experts often leads to financial losses. Therefore, the inclusion of these professionals is essential to ensure that the project delivers value for the investment and mitigates adverse impacts on stakeholders, aligning with the objectives of EIA.

Adibe et al. (1998, 1999) identified specific engineering professionals and their environmental expertise likely to be utilized in assessing a project's impacts. Similarly, Ithnin (2006) and Dougherty and Hall (2006) detailed the roles of various engineering disciplines in the EIA process. Urban planners are required to assess structural plans, local ordinances, and potential environmental impacts, particularly in areas designated for conservation or environmental protection. Engineers, particularly civil and environmental engineers, play pivotal roles in evaluating the environmental consequences of major earthworks, constructions, and infrastructure projects. Traffic engineers collaborate with civil engineers to analyze the placement and impacts of transportation projects on the

environment. Architects evaluate the aesthetic impact of projects, especially in sensitive areas or near historic structures, while landscape architects assess visual impacts on the landscape. Quantity surveyors, as experts in construction cost management, are essential throughout the project lifecycle to provide cost estimates and financial assessments for various stages of the EIA process, ensuring that management proposals are accurately specified and budgeted.

Dougherty and Hall (2006) emphasized that individuals conducting engineering and economic analyses for a proposal must actively participate in the scoping phase of the Environmental Impact Assessment (EIA). Therefore, professionals such as Quantity Surveyors and other engineering experts should be directly involved in predicting and mitigating potential impacts, as realistic and cost-effective mitigation measures require a thorough understanding of the scope of impacts, including their financial implications. As highlighted by the Centre for Science and Environment (CSE, 2013), EIA evaluates various project alternatives to identify the option that offers the best balance between economic and environmental costs and benefits. Cost-benefit analysis (CBA), a crucial responsibility for certified quantity surveyors, is integral to this process.

While the EIA process typically involves input from various specialists to assess the project's impact on different aspects of the environment, this study focuses specifically on professionals involved in the design and implementation of engineering projects. According to the Institute of Environmental Management and Assessment (IEMA, 2011), EIA has significantly improved the consideration of environmental and social factors in over 10,000 major development projects in the UK, underscoring its importance in guiding infrastructure development with minimal environmental impact.

Furthermore, the perspectives of diverse stakeholders, from environmental organizations to local communities, are considered in the EIA process. However, there has been limited research on the contributions of engineering professionals to EIA, particularly in developing countries like Nigeria. Previous studies have primarily focused on EIA specialists, project proponents, and the legislative framework, rather than the role of engineering professionals. Therefore, this research aims to shed light on the importance of involving relevant professionals in EIA processes, with a particular focus on Nigerian engineers, to enhance performance assessment in EIA-related sectors both locally and globally.

RESEARCH METHOD

Data was gathered through a questionnaire survey method, following an extensive review of literature on topics related to Environmental Impact Assessment (EIA) and engineering professionals. The concerns identified were then evaluated by respondents. This study focused on engineering professionals involved in various engineering fields in

Southwestern Nigeria, including Civil Engineers, Environmental Engineers, Urban Planners, Energy Engineers, and Water Resources Engineers, selected from their respective professional organizations' directories. The objective was to assess their level of involvement in the EIA process.

Questionnaires were distributed to 200 systematically selected registered and experienced engineering professionals. One hundred and thirty-one (131) responses were fully completed and deemed suitable for further analysis. The questionnaire comprised two sections: Section A captured the demographic characteristics of the respondents, while Section B addressed queries regarding the participation of different engineering specialists in EIA.

Additionally, respondents' viewpoints on factors influencing their level of involvement were evaluated using a five-point Likert scale, ranging from high to low. The Likert scale, as utilized by previous studies such as Jennings and Holt (1998), Assaf and Al-Hejji (2006), and Carmichael et al. (2007), is an effective method for gauging the strength of opinions by assigning numbers to convey implicit meanings. The collected data were analyzed using a Mean Index (MI) adapted from Shehu and Akintoye (2008). A higher mean score indicates responses suggesting a greater emphasis on the respective perspectives in the questionnaire.

ANALYSIS AND DISCUSSION OF RESULTS

General Characteristics of Respondents

Table 1 presents the breakdown of survey respondents, consisting of 23% civil engineers, 18% environmental engineers, 15% urban planners, 13% mining engineers, 14% agricultural engineers, and 18% water resources engineers. These professionals were sourced from both private firms and governmental bodies. The implication drawn from this data is that Environmental Impact Assessment (EIA) is deemed necessary for all engineering projects, whether undertaken by private or public entities, as highlighted by Wang (2007), Martin (2008), and Comfortokoroogsaji (2013).

Additionally, the table indicates that 74% of the respondents were affiliated with their respective engineering professional organizations, such as the Nigerian Society of Civil Engineers (NSCE), the Nigerian Society of Environmental Engineers (NSEE), and the Nigerian Society of Mining Engineers (NSME), among others, enhancing the reliability of the information provided. Furthermore, the analysis of respondents' years of professional experience, as depicted in Table 1, reveals that 64% had accumulated six to fifteen years of experience in the engineering field, with an average of eleven years. Given their extensive engineering expertise, it is expected that they possess knowledge of EIA procedures. Although this may not suffice to gauge their level of involvement in EIA, the credibility of the data collected is bolstered by the expertise of these professionals.

The study also explored respondents' perceptions of engineering professionals' engagement in EIA and their actual level of participation. The findings, as presented in Table 1, indicate that 77.1% of respondents concurred with the notion that engineering professionals should be actively engaged in EIA, while 21.4% expressed dissent. According to Dougherty and Hall (2006), it is imperative for all engineering professionals to fully participate in EIA processes to leverage their extensive experience in the engineering domain and contribute to enhancing environmental quality.

The interdisciplinary nature of EIA, as recognized by the International Association for Impact Assessment (IAIA, 2013), underscores the importance of engineering experts' involvement. This aligns with the perspective presented by Ithnin (2006), advocating for professionals' accountability and active contribution to mitigating negative environmental impacts, and Nwoko (2013), emphasizing the inclusion of relevant authorities in the EIA process.

Table 1: Respondents' Information

Profession of the Respondent	Frequency	Percentage	Cum. Percent
Quantity Surveyors	30	22.90	22.90
Architects	23	17.56	40.46
Town Planners	19	14.50	54.96
Builders	17	12.98	67.94
Estate Surveyors	18	13.74	81.68
Civil Engineers	24	18.32	100.00
TOTAL	131	100.00	
Professional Affiliation	**Frequency**	**Percentage**	**Cum. Percent**
NIQS	23	17.56	17.56
NIOB	11	8.40	25.95
NIA	18	13.74	39.69
NIESV	12	9.16	48.85
MNITP	14	10.69	59.54
NSE	19	14.50	74.05
Others	13	9.92	83.97
No response	21	16.03	100
TOTAL	131	100.00	
Years of Experience	**Frequency**	**Percentage**	**Cum. Percent**
1 – 5 years	23	17.56	17.56
6 – 10 years	39	29.77	47.33
11 – 15 years	44	33.59	80.92

16 – 20 years	16	12.21	93.13
Above 20 years	9	6.87	100.00
TOTAL	131	100.00	
Respondent's Perception of the Professional Involvement in EIA	**Frequency**	**Percent**	**Cum. Percent**
Always	101	77.10	77.10
Sometimes	28	21.40	98.50
Not at all	2	1.50	100.00
TOTAL	131	100.00	
Professionals' Involvement in EIA	**Frequency**	**Percentage**	**Cum. Percent**
often	36	27.48	27.48
Rarely	50	38.17	65.65
Not at all	45	34.35	100
TOTAL	131	100	

Source: Data Analysis, 2024

In terms of their actual involvement, the findings revealed that 66% of the engineering professionals were actively engaged in EIA processes, with 28% being fully immersed, and 34% showing no involvement at all. This data suggests a widespread awareness of the practice among professionals. However, the proportion of individuals who have not participated at all raises concerns within the engineering industry. Therefore, it is imperative for those who have engaged in EIA to educate and inform others about the importance of participation. Continuous Professional Development (CPD) initiatives, including workshops and seminars, can serve as effective platforms for encouraging and educating other professionals about EIA activities (Münster, 2005; Ithnin, 2006; Ogola, 2007).

The primary objective of this study is to examine the participation of engineering professionals in EIA processes and evaluate the factors influencing their level of engagement. Figure 1 illustrates the engagement levels by occupation. The results indicate that Urban Planners (100%) exhibit higher levels of activity in EIA activities compared to other professionals, while Quantity Surveyors show the lowest level of involvement (40%).

Additionally, other specialists, apart from civil engineers, demonstrate relatively lower participation rates in the EIA process. This underscores the inadequate engagement of certain engineering professionals in EIA activities within Nigeria's engineering sector. This outcome may suggest a lack of complete understanding among Nigerian engineering professionals regarding the expectations outlined in the International Labour Organization's (ILO) Built Environment Professionals Practice Manual. It could also be

attributed to a lack of awareness among Nigerian engineering professionals regarding the opportunities for participation in EIA or a lack of familiarity with the roles they are expected to fulfill in the process.

There is an urgent demand for professional associations to educate their members on the ILO Practice Manual and develop proactive strategies to enhance awareness through ongoing training and other initiatives, enabling active participation of their members in the EIA process. It is essential for engineers and other professionals to comprehend the various roles they play in the EIA process, as outlined by Dougherty and Hall (2006) and Ithnin (2006). Therefore, professional bodies in Nigeria should educate their members through appropriate platforms, akin to countries like China, which are leading in EIA practices. Members should be trained in EIA skill development, encouraged to engage in technical discussions on EIA, advocate for the inclusion of EIA-related courses in academic and professional curricula, foster the development of EIA software, and promote knowledge sharing among professionals on EIA-related matters, thus enhancing their readiness to participate effectively in the process.

Looking at the data presented in Figure 1, all surveyed Urban Planners (100%) were actively involved in EIA, likely due to their roles focusing on environmental restructuring, conservation, and ecosystem well-being. Civil Engineers exhibited a commendable 83% involvement, indicating strong representation within the EIA process. Moreover, the majority of surveyed Environmental Engineers (72%) had some level of experience with EIA, which is understandable given their involvement in initial stages and feasibility assessments, particularly in environmental impact estimations for projects. Their expertise in estimating potential environmental impacts can be valuable in EIA reporting. Fifty-seven percent (57%) of the surveyed Energy Engineers reported involvement in EIA activities, while 43% had not participated. This level of non-involvement is significant, considering the pivotal role of Energy Engineers in assessing the environmental ramifications of energy-related projects, aligning with the early and continuous EIA advocated by various scholars. Among surveyed Water Resources Engineers, 53% had engaged in the EIA process, while 47% had not. The level of involvement among Water Resources Engineers remains below expectations, despite their expertise being crucial in evaluating the environmental implications of water-related projects, emphasizing the need for enhanced participation.

In summary, while there is notable engagement across various engineering disciplines in the EIA process, there remains room for improvement, particularly in fostering greater involvement among professionals to ensure comprehensive environmental assessment and sustainable development. Quantity Surveyors play a pivotal role in the EIA process, leveraging their expertise in cost analysis, feasibility studies, and life cycle costing to enhance infrastructure quality. Their active involvement in EIA is crucial, as it ensures

thorough assessment of project viability and cost implications. While each engineering discipline has its unique contribution to EIA, the underrepresentation of certain professionals, particularly Quantity Surveyors, is concerning due to their significant impact on project success.

The low participation rate observed in this study may stem from a lack of dedicated EIA courses in engineering education, creating a gap between industry demands and students' skillsets. To address this issue, engineering curricula should be revised to incorporate modules on EIA practices across various engineering disciplines. This would better prepare students for EIA-related challenges post-graduation, aligning their skills with industry needs and enhancing their contributions to sustainable development initiatives.

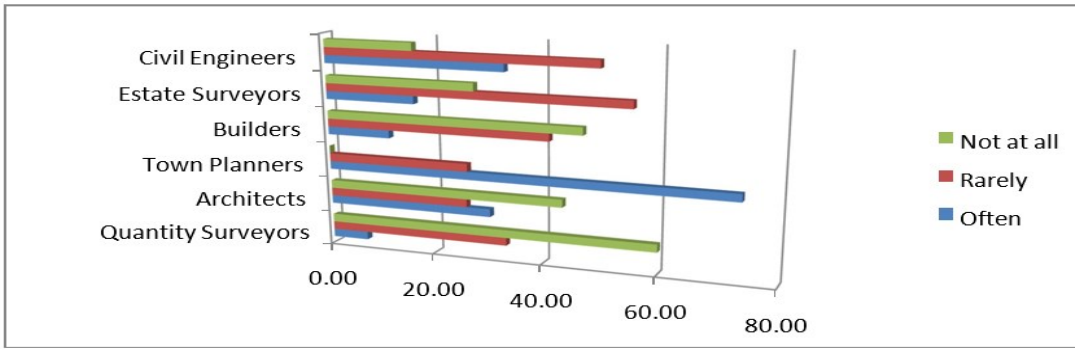

Figure 1: Involvement of Construction Professionals in EIA Process based on individual profession

Source: Data Analysis, 2024

All surveyed respondents assessed the significance of processes within Environmental Impact Assessment (EIA), as demonstrated in Figure 2. They considered all phases crucial, with mean index (MI) scores ranging from 3.89 to 4.41. 'Identifying key impacts' ranked highest (MI = 4.41), indicating its fundamental role as the starting point for other EIA procedures. The evaluation of impacts followed closely as the second most important process, involving the assessment of environmental and societal effects.

Conversely, 'Public Participation' received the lowest rating (MI = 3.89), despite its high mean index score, reflecting respondents' perception of public apathy toward EIA importance. This lack of community engagement underscores the urgent need for public education on environmental stewardship to foster active participation in successful EIA processes. While respondents acknowledged the necessity of all EIA activities, their individual involvement in specific processes was limited (MI ratings ranged from 2.31 to 2.69). This trend, depicted in Figure 8, highlights construction professionals' highest participation in 'identifying important impacts' (MI = 2.69).

This highlights the pivotal nature of the process, as it plays a crucial role in shaping the outcomes of all subsequent processes; without accurately identifying the key impacts of EIA, other processes such as environmental baseline description, project screening, impact evaluation, and project description may become ineffective. Therefore, it is imperative to encourage active involvement of all professions in this foundational process. Additionally, Figure 8 illustrates that 'post decision monitoring' is the least engaged activity among professionals in the general engineering field (MI = 2.31). This observation is not unexpected, considering that post-decision monitoring activities are often overlooked in Nigeria, not limited to the EIA process alone. Consequently, stakeholders in EIA are urged to adopt a more proactive approach in this aspect of the EIA process, echoing the emphasis placed by Dougherty and Hall (2006), CSE (2013), and Shah (2013) on the significance of all stages within the EIA framework.

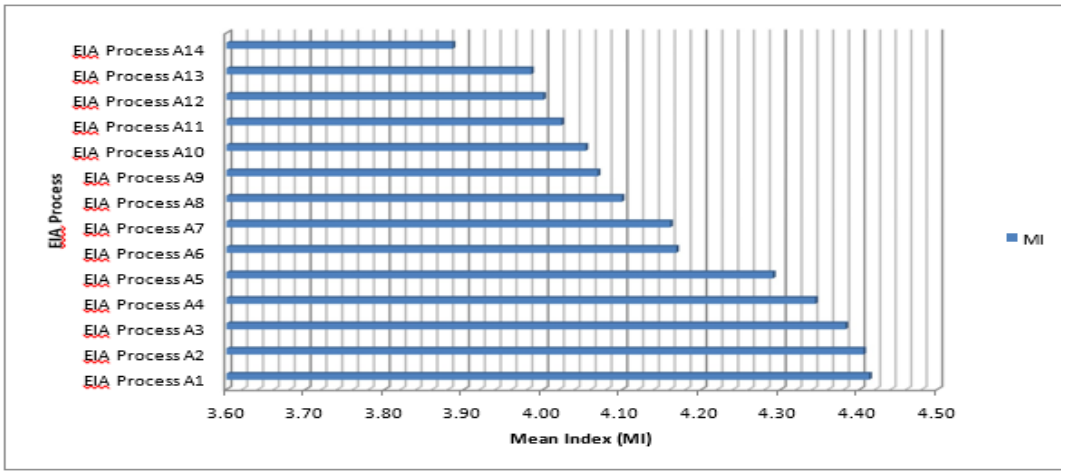

Fig. 2: Importance of EIA Processes **Source:** Data Analysis, 2024

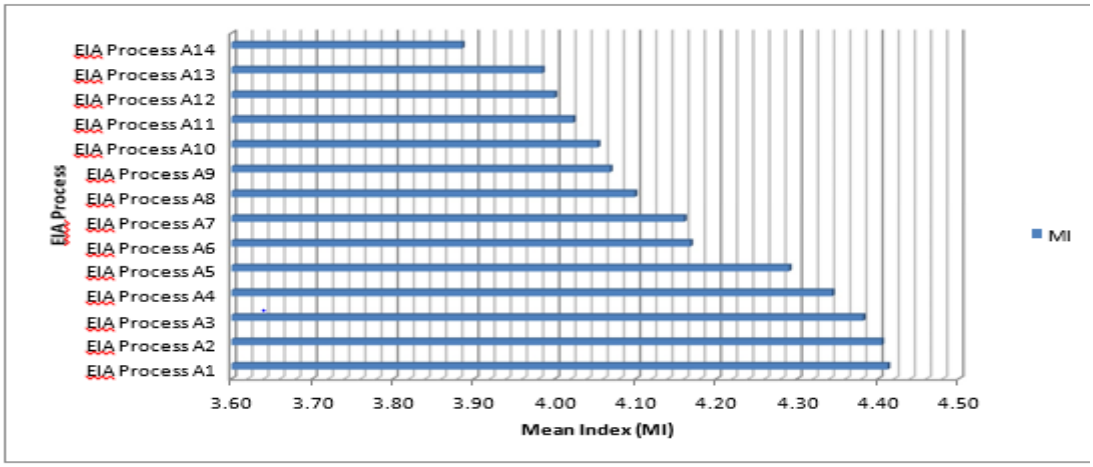

Figure 3: Level of Participation of Construction Professionals in EIA Processes
Source: Data Analysis, 2024

Where:

EIA Process A1	Identification of key impacts
EIA Process A2	Evaluation of impacts
EIA Process A3	Description of environmental baseline
EIA Process A4	Project Screening
EIA Process A5	Description of the project
EIA Process A6	Decision making
EIA Process A7	Presentation of findings in an Environmental Impact Statement (EIS)
EIA Process A8	Identification of mitigating measures
EIA Process A9	Prediction of impacts
EIA Process A10	Post decision monitoring
EIA Process A11	Scoping
EIA Process A12	Review of the EIS
EIA Process A13	Auditing of predictions and mitigating measures
EIA Process A14	Public participation

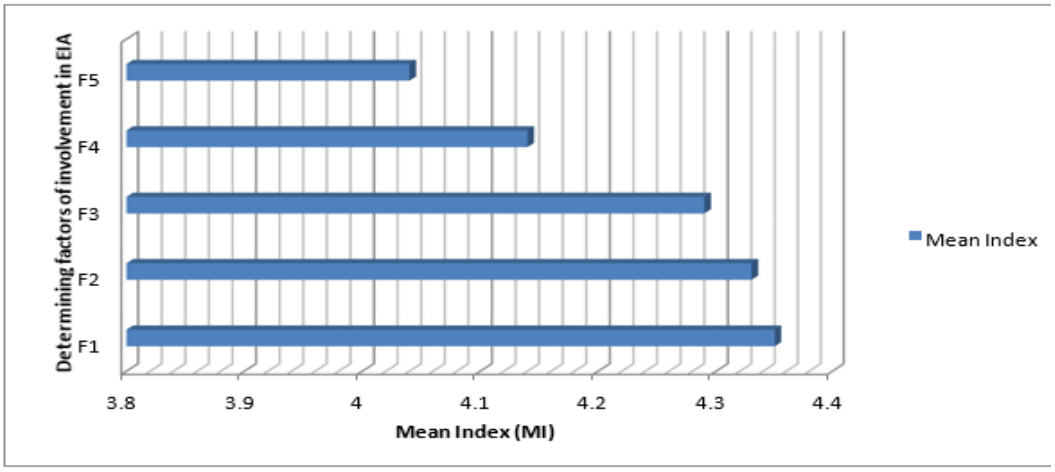

Fig. 4: Factors determining the involvement of the construction professionals in the EIA
Source: Data Analysis, 2024

Where:

F1	EIA-related roles to be performed by different profession
F2	Acquired skill in EIA by individual professional
F3	Level of awareness through the professional bodies concerned
F4	Frequency and regularity of individual professional development in EIA
F5	The procedure involved in EIA

Factors influencing the engagement of engineering professionals in Environmental Impact Assessment (EIA) were compiled from literature and evaluated by respondents,

as depicted in Figure 4. The findings indicated that all components scored highly, with MI values ranging from 4.04 to 4.35. The most highly rated component was "EIA-related roles to be performed by different professions" (MII = 4.35), while the least ranked factor was "the procedure involved in EIA" (MII = 4.04). These results underscore the significant influence of these factors on engineering professionals' involvement in EIA, highlighting the need for timely and adequate attention to enhance their participation.

Professional bodies are expected to delineate the required obligations, tasks, and functions of their members in EIA, as emphasized by Ithnin (2006), in order to foster increased knowledge and commitment among all stakeholders. The responsibility lies with these bodies to assist their members in acquiring the necessary expertise and skills through Continuous Professional Development (CPD), as advocated by Ogola (2007) and Münster (2005), by organizing workshops, seminars, and professional discussions on challenging areas in EIA. This approach mirrors practices in locations like China (IAIA, 2013), where participants convene to exchange insights with global counterparts in the built environment.

CONCLUSION AND RECOMMENDATIONS

This study analyzed the contributions of engineering professionals to Environmental Impact Assessment (EIA) and identified factors influencing their participation. While the engagement of engineering experts was generally positive, disparities were observed among different disciplines. Civil Engineers, Urban Planners, and Environmental Engineers demonstrated significant involvement in EIA, whereas other fields such as Energy Engineering and Industrial Engineering showed lower levels of engagement. The identification of critical impacts emerged as the most crucial EIA method employed by engineering professionals. Factors influencing their engagement, including "EIA-related roles across various engineering disciplines" and "individual proficiency in EIA," should be prioritized.

Based on these findings, professional bodies should encourage their members to increase participation in EIA through awareness campaigns and training initiatives. Additionally, governmental support is essential, given the critical roles that engineering professionals play in fostering environmentally friendly practices. Future research could explore a comparative analysis of professionals' perspectives on their engagement in EIA across different engineering disciplines and investigate variables contributing to the diversity of viewpoints. Moreover, including perspectives from other engineering domains not covered in this study would enrich our understanding of EIA involvement across the engineering spectrum.

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