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Assessment of the Level of Biodiversity Integration in Environmental Impact Assessment Reports in Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Inclusion of biodiversity into Environmental Impact assessment (EIA) process has been recognised as a means of addressing biodiversity loss. This study evaluated the extent of biodiversity inclusion in Nigeria`s EIA reports. One Hundred (100) sectoral EIA reports from Power, Manufacturing, Agric/Roads, Petroleum, and Infrastructure were assessed using the Biodiversity Inclusion Index obtained from 6 blended criteria and 38 attributes used across the globe for similar research. Results showed: above average assessment of biodiversity in the Project areas, integration of different levels of biodiversity elements, elucidation of short and long-term impacts on biodiversity, description of impact identification methodology/approaches as well as the rationale for using them. There were clear identification of project vulnerable stakeholders / beneficiaries of ecosystem services and allocation of responsibilities for managing impacts. In contrast, maps of the project

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area did not highlight biodiversity sensitive areas, urban and other industrial establishments, and projects, including distances to coastal area, water bodies and their ecologically sensitivities. There was insufficient identification of biodiversity components likely to be affected by project activities to enable impact prediction; non or poor identification and assessment of species habitats; limited explanation of ecosystem interactions and services rendered by endemic species. The study found gaps on the description of primary, secondary, and cumulative biodiversity impacts at ecosystem, species, and genetic levels as well as in species compositions and functions. Thus, specific measures for biodiversity conservation / restoration plans as well as financial allocation for biodiversity related action plan were poorly provided or non-existent. The results indicated biodiversity inclusion mean score of Power (65.7%), Petroleum (60.5%), Manufacturing (53.7%), Infrastructure (53.1%) and Agric/Road (42.5%)) with overall mean of 55.7%. The results confirmed significant biodiversity inclusion mean difference between Agric/Roads, Power, and Petroleum sectors. Recommendations were made to improve EIA processes in Nigeria by domesticating advancements in biodiversity conservation.

Keywords: Biodiversity; sectoral EIA reports; biodiversity inclusion Index; mean score; conservation.

1. INTRODUCTION

Biodiversity which is a merger of two different words “biological” and “diversity” is essential for survival on earth through direct and indirect provision of ecosystem functions. Nature`s ability to balance the environment, cleanse it from pollution, regulate natural hazards, ensure fresh water and its resources, pest control, food, medicine, even spiritual wellbeing are all crucial to human existence. Convention on Biodiversity (CBD) [1] described biodiversity as the variation between organisms, among others, land and water ecosystems, and the ecological intricacies they are part of, including variations within, between/among species and a higher level of species diversity in the environment. Biodiversity includes differences in genes within species (genetic diversity), diversity among species (species diversity), a higher level of diversity of species in an environment (Ecosystem diversity). It also includes the way species act, feed and interact with other living and non-living things in an ecosystem (Functional Diversity). As observed by Allaby et al [2], the nature of diversity among species is an indication of ecosystem’s species richness and evenness. Thus, where there is a weak species diversity in an ecosystem, that ecosystem may not function properly. Therefore, a mixed grouping among species promotes ecosystem diversity [3]. Balun [4] highlighted ecosystem efficiency noting that productivity of an ecosystem improves species diversity. However, several authors, [5,2,3], have noted uneven distribution of Biodiversity across the earth. Whereas biodiversity is rich in the tropics, it is lowest in the deserts, the poles, and subtropical regions of the earth. Climate conditions, elevation, soil, and the availability of other species are sure enablers to the existence, well-being and survival of plants and animal species.

Wilson [6] highlighted the numerous contribution of biodiversity to human development and culture as well as how human communities play significant roles in harnessing the nature`s diversity at all levels of genetic, species, and ecological dimensions. From the above and Federal Ministry of Environment (FMEnv) [7], the benefits of biodiversity have been categorised into four main areas namely ecological, economic, scientific and ethical roles. In the ecological role, species serve varied functions in an ecosystem ranging from energy capture and storage, organic material production, decomposition, water and nutrients circulation, recycling, pests and erosion controls, atmospheric gases fixation as well as climate regulation. Other support services and functions noted are in the areas of production of soil fertility, pollination of plants, maintenance of food web, nitrogen fixation, wastes putrefaction and many others yet to be discovered. The services function includes air and water purification, maintenance of homeostasis and regulation of climatic conditions, control of flood and drought including other environmental mishaps.

On the economic role, Biodiversity is among the enablers and providers of resources for human wellbeing. This is achieved through the richness, uniqueness within and between species. Biodiversity provides feedstock and raw materials in various forms (edible, raw, cooked or processed), pharmaceuticals, cosmetics, and items for production in the industries. Apart from

food, biodiversity supplies other crucial economic commodities such as forestry: shelter, crops, livestock, clothing. Medication: Assorted types of plants have been used for medicinal purposes for a very long time before they were recorded in history. Examples are quinine used to treat malaria which is a derivative of cinchona tree; digitalis to treat heart problems, which is a derivative of foxglove plant, and morphine, a derivative of poppy plant administered for pains. Ethno-botanical studies in Nigeria have exhibited and catalogued many kinds of herbs for treating various sicknesses. Thus, knowledge and merchandising in medicinal plants and animal parts are thriving business in Nigeria. Information on how to use them are also sources of income especially at You-Tube,other social media platforms and news media. Biodiversity is also useful for Industries: For instance, fibers are used to produce clothing, wood to build shelter and warmth when assembled to kindle fire, canoe fabrication, carvings, and home furniture. Likewise, Palm oil processing to derive many products, and basket making. Biodiversity is a source of energy (such as biomass) for cooking. Notable and valuable industrial and consumer goods ranging from oil (palm, groundnut, coconut and others), cream, lubricants, paper, rubber, soap, perfumes, resins, dyes, latexes waxes, are all derived from different parts of plant species. Raw materials derived from animal parts include leather, lubricants, waxes, and crushed bones (for poultry feeds). Donkeys and horses are also used for transportation, beast of burden in semi and large farming in some climes [7].

Tourism and recreation. Biodiversity are sources of income and recreation in places like parks and forests, zoological gardens, scenery; where wild nature of animals and plants are well-regarded for their beauty, thus serving joyous moments, soothing nerves, and giving peace of mind for many people by way of recreation and relaxation. In some parts of northern Nigeria, Horses are decorated and rode on as a symbol of royalty during high-profile occasions and celebrations such as Emir installation, anniversaries receptions/visit of important personalities.

Economic value of a biological resource often increases once its importance or function is discovered. New markets are often created for products developed from biotechnology. It is a common knowledge that the field of biodiversity is full of activities, many are income generating, that are begging for harnessing and adequate management especially in the areas of preservation (e.g., perishable fruits and vegetables) to address resource usage and sustenance.

On Scientific role of biodiversity**,** it is a well-known fact that knowledge on biodiversity provide scientific insight on the evolution of human existence, life functions and respective specie functions towards the sustenance of the ecosystem [6]. Ethical role of biodiversity stem from the notion that humans should champion the right of other species to life, survival and existence. Therefore, unwarranted termination of plant and animal species should be discouraged. Biodiversity richness is a function of the nature of associations and cohesion existing within and between other biotic and abiotic surroundings. It is also part of spiritual heritage in many cultures, with some having totems they revere like python (in some parts of South-South and South-Eastern Nigeria). Yet in some cultures in Nigeria too, the use of animals as propitiatory sacrifices and for atonement and appeasement are common. Many areas have sacred groves, sacred forests, evil forest, revered trees, and many of such that are of significant spiritual and traditional importance to the people [7].

Currently biodiversity and its listed roles above, though interwoven are under immense pressure than ever before as present human needs for food, land and other anthropogenic activities including conflicts/insurgents are distorting habitats and polluting it from various sources through land, air, and water systems. The pressure on biodiversity as noted by United Nations Development Program (UNDP) [8] stem from various immediate and remote sources, including microscopic interactions. As a result, there are habitat fragmentation, degradation, emergence of invasive species, over exploitation of species and genetic resources [9].

As it stands, destruction of biodiversity is happening in different spheres, degrees, sections, and strata, from degenerations in structure and function, loss of wetlands, to heightened species extinction, and waning of genetic diversity of remote organisms. Except intentional efforts are taken to reduce and avert primary and secondary causes of biodiversity loss , this ugly trend will continue to reverberate. [10].

Worried by the above at the global level, the United Nations Organisation (The UN) declared year 2010 – 2020 as decade for the protection of

Biodiversity [11]. Prior to this, The Convention on Biodiversity was initiated by the United Nations at the Earth Summit in1992 held in Brazil, to address the concerns of biodiversity loss. It enjoined parties to the convention to develop and implement biodiversity conservation initiatives. They were required to put in place National Biodiversity Strategic Action Plan (NBSAP) to address biodiversity loss in their respective nations. Nigeria`s first NBSAP (which was between years 2001 to 2010) was poorly prepared and poorly executed. The second NBSAP from 2016 – 2020 had fourteen (14) specific, measurable, achievable, realistic and time bound (SMART) national goals. It also had implementation mechanism and action plans to awaken and improve biodiversity conservation consciousness in the country. The plan included the revision of the national ecosystem spatial database, strengthening of declining ecosystems, mapping of endangered flora and fauna, identification of pollution point sources, management of invasive species. Explore avenues for community support and participation as well as increase in biodiversity endowment. Biodiversity Steering Committee to supervise NBSAP implementation was set up, with membership drawn from scientists, bureaucrats, civil servants, community leaders, civil societies, gender groups, and private sectors. However, there was insufficient collaboration between ministries, rural and indigenous groups, inadequate funding and collaboration with community-based initiatives, and the challenges of bringing various key players together [7].

Regrettably, Environmental Impact assessment (EIA) process which can be used to address biodiversity concerns to achieve sustainable project development was not included amongst technologies for effective implementation of Nigeria`s 2016 – 2020 NBSAP. Ironically, the NBSAP`s Monitoring Matrix had actions which among others were “to reinforce and execute the provisions of EIA”. Performance indicator listed for the above was “to reinforce EIA that will promote and protect the values of biodiversity and ecosystem services”. However, the NBSAP did not specify or reference processes or methodologies to achieve this biodiversity and ecosystems services value strengthening. EIA is widely applied as a method for predicting the effects of a proposed activity/project on biodiversity, thus preserving ecosystem (services/functions) for the wellbeing of the environment and humanity [12].

EIA is a tool for promoting the sustainable use of biodiversity [13] and Biodiversity bodies like Convention of Biodiversity (CBD), and Impact Assessment Associations such as International Association for Impact Assessment (IAIA) issued guidelines for the integration of iodiversity on EIA studies and reports. The essence of biodiversity integration in EIA is to generate biodiversity information that will assist in understanding environmental baseline condition to enable prediction of Project`s impacts and proffering of mitigation hierarchies to address negative ones. The challenge remains the adoption of methodologies that will adequately assess biodiversity as part of impact assessment. For instance, some researchers on biodiversity inclusion in EIA [9-10, 14-18] revealed difficulties and opportunities across the world. In Nigeria, based on the findings of [19-21], EIA has not been able to meet up with the expectations of the founding fathers in terms of protecting biodiversity and influencing project decisions too.

In Nigeria, EIA is governed by Decree No 86 of 1992, with Federal Environmental Agency (FEPA) which metamorphosed to the Federal Ministry of Environment as the main regulating authority. The type of projects envisaged to likely have significant impact on the environment, thus requiring the conduct of EIA prior to their construction commencement/operation incudes: Land Reclamation, Housing, Agriculture, Airport, Drainage and Irrigation, Fisheries, Industry, Forestry, Petroleum, Infrastructure, Power generation, transmission lines, Roads, Pipelines laying, Mining, Ports, Quarries, Railways, Transportation, Wastewater Treatment, Resort, Recreation and water supply projects of specified sizes and capacities [22]. In the same vein, the following list of manufacturing projects requiring the conduct of EIA include: Paints and allied products, Pharmaceuticals, Chemical Plants, Dyes; Iron and Steel production, Textiles, Ink; Cement and non-metallics, Leather and Tannery, Pesticides, Glass production, Plastics and Synthetics, Food and beverages industry, Natural Rubber production, Pulp, Paper Timber/Wood Processing, Non-Ferrous Metals, Fertilizers company [23].

Project EIAs are usually classified into category I, category II or category III based on the approved Terms of Reference for the study by FMEnv. This is usually informed by the extent of project scope, magnitude, risks, duration and frequency, envisaged extenuation actions for the anticipated negative impacts. Sensitive environment is also

key to making decisions on EIA categorisation. FEPA [22] specified types of projects in these three (3) categories. Category II projects proposed to be sited in a sensitive area will be made to undergo full scale EIA study. Proposed projects classified into Category II but not located in an environmentally sensitive location may not be subjected to full scale EIA study. The question remains whether the full-scale EIA following FMEnv guidelines meets international standard?

Realising procedural shortcomings, FMEnv, sponsored Federal Government of Nigeria gazette [24] to emphasized its acceptance of EIA reports written with hindsight of international environmental guidelines such as World Bank, International Finance Corporation (IFC), African Development Bank (AfDB) and Equator-Principle-Banks. The stipulations of these agencies / bodies on EIA and Biodiversity integration need to be treated on case-by-case basis. What this means for Nigeria is that there is a discordant inclusion of biodiversity in EIA processes due to lack of uniformity in approach in this regard. Thus, application is based on knowledge, convenience, resources, and time available for proponents and practitioners to deliver EIA reports and secure approvals. However good the foreign biodiversity application/integration methodologies are, there is need to domesticate them to suit local peculiarities and conditions.

This study therefore is aimed at assessing biodiversity inclusion in EIA reports of development projects in Nigeria. The objectives of this study are one, to examine the extent of biodiversity inclusion in selected EIA reports carried out in Nigeria. Two, determine whether there are sectoral differences in the inclusion of biodiversity in EIA reports in Nigeria. It is hoped that outcome of this research will significantly strengthen EIA process as a means of realising the post 2020 National Biodiversity Strategy Action Plan (NBSAP) for the attainment of the United Nations 2021-2030 decade of ecosystem restoration and 2030 sustainable development goals.

2. MATERIALS AND METHODS

Mixed Research Design of Exploratory and Survey methods were adopted for this assessment, including qualitative and quantitative research methods. One hundred (100) EIA reports across five (5) economic sectors were evaluated to ascertain the extent of inclusion of biodiversity as part of their respective EIA reports.

2.1 Study Area

This integrated study was carried out using sample sectoral EIA reports from the six geo-political zones of Nigeria (Appendix A).

2.2 Selection of Sectoral EIA Reports

EIA reports used for this evaluation study were those supervised and approved by FMEnv in the selected sectors for this research. According to key FMEnv Officials interviewed in course of data collection, on the average, two hundred (200) EIAs are registered annually by proponents as initial expression of interest to kickstart the EIA approval process for projects. However, not all registered EIAs are concluded at the end of the day due to several reasons, including changes in priorities or unavailability of anticipated fund. The Officials revealed that it is government policies and potential subventions/grants (from national or international sources) that upsurge the conduct of EIAs in some sectors, thus when proponents do not meet up with requirements for funding or other requisites, they often abandon the EIA study half way. Yet some EIA Studies may take more than a year to be concluded and secure approvals. Thus, there is no available information on the number of EIA approvals granted by FMEnv annually between 2012 – 2022 as at the time of this study.

2.3 Sample and Sampling Technique for the Sectoral EIA Report Evaluation

Twenty (20) sample EIA reports (Appendix A) were selected from each of the projects in the following sectors of the economy: Power, Petroleum, Infrastructure, Manufacturing, and Agriculture/Roads. For the purpose of this research, the selected sectors represent the different economic units in Nigeria. Agriculture and Road Projects EIA reports were grouped together as they are mostly government sponsored beneficial projects with limited EIA Study. Thus, available EIA reports in the two sectors between 2012 - 2022 were merged to bring up the sample size to 20. Each sample sector had equal number of 20 sample size to ensure homogeneity and normality distribution of datasets. This justified the use of a parametric statistic (Analysis of Variance) to test the level of biodiversity inclusion amongst the sectoral EIA reports used for this research.

2.4 Nature/Sources of Data - Primary and Secondary

Primary data were obtained from Federal Ministry of Environment (FMEnv) approved selected EIA reports. Others were accessed from the worldwide web as hoisted by their proponents and FMEnv accredited environmental consultancy organisations that execute EIA studies on behalf of Proponents. Apart from the above, other information used and referenced in this research are classified as secondary data. They were obtained from various research repositories, worldwide web, textbooks, articles and research journals.

2.5 Methods of Data Collection

The instrument deployed with hindsight from Federal Environmental Protection Agency [22] and FMEnv [23] is an amalgamated worksheet and specifications (with local peculiarities) from the CBD [1] for the inclusion of Biodiversity in EIAs. After assembling the reports, relevant sections were evaluated by scoring them on the Assessment Worksheet. This was a group activity between the researchers to avoid bias.

2.6 Instruments for the EIA Report Evaluation

The instrument which is a predetermined criteria and attributes called Blended criteria and attributes (in this research) were used to evaluate the One Hundred (100) Sample EIA reports. It consists of six (6) criteria and their respective attributes as follows:

1) Detailed baseline study to provide basis for precise and accurate impact prediction, (10 attributes).
2) Impacts of various biodiversity aspects are predicted in the report (6 attributes).
3) Intentional Stakeholders' involvement in decision making (4 attributes).
4) Project scope alternatives with minimum biodiversity impact considered, (2 attributes).
5) Availability of mitigation measures that will largely address predicted impacts (8 attributes).
6) Availability of effective and reliable biodiversity monitoring plan, (4 attributes).

In all, a set of 38 attributes were developed from these 6 criteria (See Appendix B).

2.7 Validity/Reliability of the instruments

The Blended Criteria and Attributes have been validated across the globe [9,15 &17] as a good instrument to access the inclusion of Biodiversity on EIA as stipulations above.

2.8 Methods of Data Analysis

Each question (attribute) had a scale of 0 to 1 selected in the worksheet (Appendix B) with Moderate to detailed inclusion scored as 1, Slight to minor inclusion scored as 0.5 and No inclusion scored as 0. The evaluation of biodiversity inclusion in the relevant sections of the selected EIA reports was a group exercise carried out by the authors to ensure objectivity and avoid bias. Thereafter, Biodiversity Inclusion Index formular (Equation 1.) was deployed to obtain the respective index scores.

Biodiversity Inclusion Index (BII) is depicted as

$$\mathrm{BII} = \frac{\mathrm{A}+0.5\mathrm{B}}{\mathrm{N}} \qquad \text{Equation (1).}$$

Where:
A = Number of attributes fully met, B = Number of attributes partially met (slight to moderate inclusion) and N = Number of attributes (38).

One-way Analysis of Variance (ANOVA) was used to statistically test any significant difference in biodiversity inclusion amongst the sectors with the aid of Statistical Package for Social Sciences (SPSS) Software.

3. RESULTS

The results obtained from the assessment showed varying levels of biodiversity inclusion in all the Sectoral EIA reports as shown in Appendix C. The outcome of the assessment of the reports on the 6 criteria and attributes as pointed out in section 2.6 are detailed below:

3.1 There is a widespread baseline study to provide basis for precise and accurate impact prediction

Analysis of these criteria sequentially followed the respective 10 attributes stated in this section (Appendix C.1). Out of the One Hundred (100) EIA reports examined, 26 representing 26%, succeeded in meeting the criterion of attaching map of project area with biodiversity features by having moderate to full inclusion whilst 36 representing 36% of EIA reports had slight to

minor inclusion. Thirty-eight (38) EIA reports representing 38% of the EIA reports evaluated did not meet this attribute. Results show that the 38% majority of the EIA reports evaluated did not include map of the proposed project area that highlighted urban, industrial, or sensitive biodiversity areas. Rather they had simple map of the proposed project locations often downloaded from Google Earth/Map, ArcGIS Platform, or Satellite Imageries.

With regard to sufficient information and description of biodiversity components likely to be impacted by Projects, 44 EIA reports had sufficient information, 52 had slight to partial inclusion whilst only 4 did not have any biodiversity information (Attribute 2). However, none of the reports evaluated used recent technologies (like Integrated Biodiversity Assessment Tool (IBAT), BioMap or Biodiversity Integrated Assessment and Computation Tool **(**B-INTECT)) in the assessment of secondary data/information. Rather the EIA reports showed evidence of the use of Satellite Imagery or Google map to explain the project area. Better performance in this instance would most likely depend on the knowledge base of the consultants that prepared the EIA reports, as well as advanced technology/tools, adequate time and budget for the EIA activities.

On the catalogue of endemic and endangered species present within the proposed project area, a good EIA report is expected to discuss endemic and endangered species present in a proposed project area of influence to enable impact evaluation of ecosystem services they provide. However, this was lacking in twenty-five (25) EIA reports assessed (Appendix C.1, Attribute 3). Even when such information is provided, they were limited and often concentrated on the description of either higher plant or high animal species. Some reports were very brief with little or no information about ecosystem services the identified species render. Yet some EIA reports only listed species in abundance in the area without indicating their levels of categorization in the IUCN list. For this study, 44 EIA reports evaluated discussed endemic and endangered species. Thirty-one (31) EIA reports only did that partially while 25 EIA reports failed to discuss them (Attribute 3).

Performance evaluation of the 100 EIA reports on attributes 4 and 5 showed positive inclusion responses of 51 and 16, slight to partial inclusion responses of 42 and 19 as well as non-inclusion responses of 7 and 65 respectively (Appendix C.1).

On the assessment and description of important biodiversity elements present in the study area, 51 EIA reports tried to describe prevalent biodiversity elements in the project location in moderate to full details, whereas 39 reports had partial or haphazard description particularly those EIA reports that appeared to be written by one or two persons. Ten (10) EIA reports surprisingly did not give biodiversity information of the project area (Appendix C.1, Attribute 6). Significant number of EIA reports were written by experts, but the level of details depended on information at their disposal including their knowledge and exposure. Out of 100 EIA report evaluated for this study, 58 EIA reports showed list of experts that participated in the EIA study, 32 reports did not give full information about the EIA report preparers whilst 10 EIA reports failed to include list of EIA Preparers at all in the report (Appendix C.1, Attribute 7).

The conduct of EIA in Nigeria is statutorily supervised by FMEnv who also issued sectoral guidelines for the conduct of EIAs. So, it is not surprising to see that 60 out of the 100 EIA reports studied complied with FMEnv guidelines. Even at that, 27 EIA studies only partially complied with the guideline, whereas 13 EIA reports did not follow the FMEnv guideline in the collection of biodiversity data for reasons best known to the report writers. This was noticed in the Agric/Road sector EIA reports (Appendix C.1, Attribute 8).

It is a standard requirement to use both primary and secondary data to complement each other in course of preparing EIA reports. Thus, it is not surprising to see that 60 EIA reports evaluated complied with this fully, though there was no evidence of the use of computer-based tools apart from statistical analysis. Thirty-three (33) EIA reports partially did that whilst this was deficient in 7 EIA reports (Appendix 3.1, Attribute 9). None of the EIA reports evaluated made any form of complain on data gaps yet some had deficiencies in major biodiversity elements (Appendix C.1, Attribute 10). Information is key for the prediction of biodiversity impacts. In a situation where EIA practitioners did not have adequate information of a project area, the baseline section of the EIA report will be very shallow, with no basis for impact prediction, and proffering of mitigation measures. The call for real time access to data as being proposed in

this study will definitely help to address this inadequacy in Nigeria.

3.2 Impacts of Various Biodiversity Aspects are Predicted in the Reports

Evaluation of above criteria and its attributes are shown in numbers 11 to 20 of Appendix C.2. Out of the 100 EIA reports, it was observed that 35 had a section designated for biodiversity, 43 reports had slight and partial section for biodiversity impact prediction while 22 EIA reports did not have separate section on biodiversity impact prediction (Appendix C.2, Attribute 11). In the above group, biodiversity baseline description was neither unavailable, non-specific nor mixed with other biophysical components of the baseline report. Above situations are known to make prediction of biodiversity impacts very difficult.

Twenty-eight (28) EIA reports had good description of biodiversity impacts and prediction especially those EIA reports from Power, Petroleum and in other EIA reports in manufacturing or infrastructure sectors whose proponents requested alternative fund from IFC/Equator Principle-Banks (Appendix C.2, Attribute 12). Sixty (60) EIA reports had partial description of biodiversity impact evaluation whilst in 12 reports neither biodiversity impacts nor its evaluation were featured. Thirty-seven (37) EIA reports included indirect, secondary, and cumulative biodiversity impacts, whereas 43 had partial impact prediction. On the other hand, 20 EIA reports were deficient in the inclusion of indirect, secondary, and cumulative biodiversity impacts prediction. (Appendix C.2, Attribute 13). Impact assessment was carried based on the baseline data without further effort. Impact prediction on ecosystem, species, and genetic biodiversity levels were very poor in the EIA reports evaluated. Only 13 EIA reports demonstrated moderate to full inclusion in this regard whereas 42 EIA reports slightly or partially predicted biodiversity on/from the three ecosystem levels, 45 EIA reports were deficient in impact prediction requirement. Majority of the biodiversity descriptions and impact predictions were mainly at the species levels than genetic and ecosystem levels, forms, and compositions (Appendix C.2, Attribute 16).

Many EIA reports adopted quantitative impact prediction methodology as demonstrated by 74 out of 100 EIA reports that moderately and fully adopted this method. Also results shows that 16 of the 100 reports did not adopt quantitative method which may mean that they either adopted qualitive method or did not deploy any at all. Agriculture related EIA reports featured prominently in this regard. On the other hand, 10 reports slightly used quantitive method based on the evaluation carried out. 84 EIA reports qualitatively predicted impacts mainly in the areas of prevalent, abundant, and endangered species in the study area, 9 reports did that partially while 7 reports failed to use qualitative evaluation opportunities. In the area of impact description and identification approaches as well as the rationale for using them, 79 EIA reports had positive response in terms of usage whereas 17 partially described the approach and rationale for usage. However, 4 EIA reports failed to describe approach(es) adopted nor the rational for using it/them (Appendix C.2, Attribute 19).

3.3 There is a Marked Intention Towards Stakeholders' Involvement in Decision Making

This section analysed attributes 21 - 24 of Appendix C.3. The criterion evaluated the identification and engagement of vulnerable stakeholders/ beneficiaries of notable ecosystem services available in the study areas. Here 40 EIA reports moderately and fully documented stakeholders' involvement/engagement in course of or as part of the EIA. Whilst 51 reports tried to demonstrate this, 9 reports failed to show evidence of effort in this regard (Appendix C.3). On effective stakeholders' mobilizations and participation in the EIA process, 34 EIA reports demonstrated positive regard in this, 54 did this to some extent whereas 12 did not demonstrate stakeholders' mobilization and participation in the EIA processes. Result of the evaluation on appropriate conversation with project impacted community stakeholders on present and future ecosystem services provided by the affected ecosystem to determine the values these services present shows inclusion by 29 EIA reports in this regard, 60 reports slightly or partially achieved this while 16 EIA reports did not record any effort. The last item in this criterion III (Appendix C.3, Attribute 24) is evidence of consensus of stakeholders on the scope of biodiversity study and list of stakeholders to be consulted as part of the study. The result of the evaluation shows 20 moderates to full inclusion, 54 slights to minor inclusion and 26 non-inclusion. Overall responses shows that stakeholder involvement in the 100 EIA reports evaluated have slight to minor

inclusion/involvement than moderate to full inclusion and non-inclusion. In other words, the order of inclusion is Slight to minor > Moderate to full inclusion > Non-inclusion.

3.4 Project Scope Alternative with Minimum Biodiversity Damage Considered

Attributes 25 and 26 of Appendix C.4 addressed this criterion. As observed in attribute 25 in Appendix C.4 below, out of the 100 EIA reports assessed, 18 demonstrated moderate to full evidence of biodiversity consideration as part of/amongst criteria for the evaluation and selection of technical alternatives. 37 showed partial consideration and in 45 EIA reports, biodiversity was not a factor in the selection of project technical alternatives.

Also, in terms of biodiversity consideration in alternative sites being considered for the proposed development and Do-Nothing development option, 21 EIA demonstrated adherence, 33 showed slight consideration whereas 46 EIA report did not reveal any effort.

3.5 Availability of Mitigation Measures that will Largely Address Predicted Impacts

Attributes 27 - 34 of Appendix C.5 addressed this criterion. Assessment whether biodiversity mitigation hierarchies were considered in the project design right from the onset showed the following results: 21 EIA reports moderately/fully captured this consideration. 30 EIA reports were recorded to have partially included this whilst 49 failed to document this or this was not considered in their EIA process. 17 EIA reports moderately/fully exhibited positive response to demonstrate that public concerns on biodiversity impacts were properly addressed in the mitigation plan. 22 reports did not include evidence of the above whereas 61 EIA reports showed partial inclusion of biodiversity as mitigation measures, thus exhibiting lack of EIA integration with other aspects of project maturation and development. In the identification of specific measures for biodiversity conservation /restoration plan, only 19 out of the 100 EIA reports evaluated recommended conservation/restoration plan as part of offset/mitigation measures. Though 48 EIA reports slightly/partially recorded the inclusion, however, 35 reports did not see this as relevant or failed to regard this as good /worthwhile practice towards biodiversity conservation. Following from the above is financial allocation to biodiversity action plan where 24 EIA reports made recommendations for its implementation/adoption whereas 17 EIAs partially included it in their report. Fifty-nine (59) EIA reports did not see the recommendation as viable or failed to consider it (Appendix C.5). This could be as a result of the nature of the project scope, baseline information or poor appreciation of the impact significance.

In the area of mitigation measures for impacts of biodiversity at all levels; including genetic, species, landscape, structures as well as temporal biodiversity, 18 EIA reports recorded moderate/full inclusion in the evaluation, 58 EIA reports partially included these in their compilations whereas 24 reports did not address/include them. Usually and according to regulation, mitigation measures are supposed to be provided to address negative project impacts in EIA reports. In majority of the EIA studies evaluated, biodiversity mitigation measures did not include all three biodiversity levels of species, ecosystem and genetic composition as well as relevant spatial and temporal scales.

3.6 Availability of Effective and Reliable Biodiversity Monitoring Plan

Attributes 35 - 38 of Appendix C.6 addressed this criterion. In the assessment whether biodiversity is integrated into monitoring plan and included in the schedule of the evaluation program, 28 EIA reports showed inclusion of this whereas 55 displayed partial inclusion. 17 EIA reports, however, did not show any record in this regard (Appendix C.6). Evaluation as to whether biodiversity monitoring indicators and criteria were included in the Environmental Monitoring Plan (EMP) chapter of the EIA reports revealed that 31 EIA reports recorded full integration on this. 43 reports demonstrated partial inclusion. 26 reports however did not provide any position on this (Table 1).

Environmental management plan, evaluation, monitoring indicators including sustainability are statutory requirements and as such should be clearly spelt out for implementation in the EIA reports. However, from the evaluation of the 100 EIA reports, 31 included monitoring and evaluation indicators in their compilations. 43 had partial inclusion while 26 did not. In the sustainability of monitoring and evaluation measures, 13 EIA reports demonstrated

moderate to full inclusion, with 54 showing partial/slight inclusion. 33 EIA reports did not provide any sustainability of biodiversity monitoring measures or lacking in specific details. It is important to identify limitation of monitoring effectiveness and seamless use.

To further assess the performance of the 5 sectors on Biodiversity inclusion, Biodiversity Index (See section 2.8) was deployed to arrive at Index Score for each of the sectors. Twenty (20) EIA reports were assessed for each of the 5 sectors studied bringing the total number to 100. Table 1 below shows Biodiversity Index scores of the sectoral evaluated EIA reports.

The sectoral index scores were used to ascertain the extent of biodiversity inclusion amongst the sectors. The results recorded from the Mean Biodiversity inclusion scores of the studied sectors showed that Power sector has the highest biodiversity inclusion followed by Petroleum, Manufacturing, Infrastructure sectors respectively with Agriculture/Road sector being the least (Fig. 1)

Consequently, Table 2 shows percentage Biodiversity Inclusion in EIA across the respective sectors with overall Biodiversity inclusion in EIA reports in Nigeria found to be about 55.7%.

Analysis of Variance (ANOVA) carried out (Table 3) after normality distribution testing of data sets in Table 1 to investigate biodiversity inclusion index difference among the five sectors showed p-value 0.000, lower than 0.05 significance level. This means that there is significant difference in the biodiversity inclusion index among the five-sectors assessed.

Further Post-hoc Analysis to ascertain where the difference lies amongst the sectors on assumption of homogeneity of variance (Table 4) revealed that the difference in means separated the sectors into two groups of assumed similar mean such that biodiversity inclusion index of Agric/Road (BIA), infrastructure (BII) and manufacturing (BIM) are assumed to have similar means and in group one (1). Whereas Infrastructure (BII), Manufacturing (BIM), Petroleum (BIPE) and Power (BIP) are in the second group and also assumed to have similar mean. Since BII and BIM are in both group one and two, it means that the difference in means did not arise from them. Thus, the difference in means lies between BIA and BIPE and also between BIA and BIP.

Table 1. Sectoral EIA reports biodiversity inclusion index scores

S/N	Power (BIP)	Petroleum (BIPE)	Agric/Roads BIA	Infrastructure (BII)	Manufacturing (BIM)
1	0.86	0.71	0.34	0.48	0.34
2	0.75	0.75	0.39	0.71	0.55
3	0.67	0.52	0.29	0.55	0.65
4	0.66	0.72	0.32	0.54	0.76
5	0.62	0.51	0.34	0.59	0.38
6	0.51	0.42	0.14	0.33	0.8
7	0.71	0.79	0.29	0.54	0.62
8	0.38	0.7	0.64	0.37	0.51
9	0.74	0.79	0.63	0.44	0.63
10	0.42	0.84	0.54	0.43	0.25
11	0.63	0.68	0.21	0.54	0.75
12	0.55	0.69	0.53	0.5	0.71
13	0.6	0.66	0.34	0.54	0.43
14	0.96	0.28	0.8	0.82	0.17
15	0.92	0.42	0.4	0.6	0.12
16	0.49	0.33	0.6	0.45	0.7
17	0.45	0.51	0.4	0.6	0.47
18	0.58	0.47	0.29	0.56	0.64
19	0.82	0.7	0.5	0.6	0.62
20	0.82	0.6	0.51	0.42	0.63

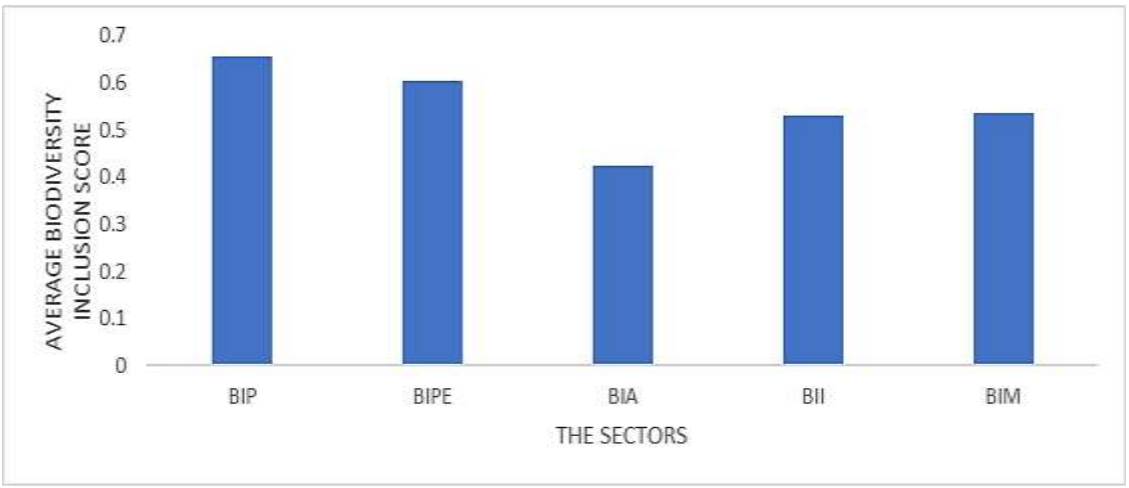

Fig. 1. Mean scores of sectoral biodiversity inclusion on EIA

Table 2. Percentage inclusion of Biodiversity in Nigeria EIA reports

S/N	Sector	% Biodiversity inclusion
1	Power	65.7
2	Petroleum	60.45
3	Manufacturing	53.65
4	Infrastructure	53.05
5	Agric /Roads	42.5
Total		**55.7**

Table 3. ANOVA results of the difference in Biodiversity inclusion Index score among the five sectors

Groups	Sum of Squares	df	Mean Square	F	p-value
Between Groups	0.612	4	00.153	5.768	0.000
Within Groups	2.520	95	.027		
Total	3.132	99			

Table 4. Summary of Tukey statistics result

Sectors	N	Subset for alpha = 0.05	
		1	2
Agric/Roads (BIA)	20	0.4250	
Infrastructure (BII)	20	0.5305	0.5305
Manufacturing (BIM)	20	0.5365	0.5365
Petroleum (BIPE)	20		0.6045
Power (PIP)	20		0.6570

4. DISCUSSION

Based on the outcome of the analysis of the blended criteria and attributes (Appendix B) adopted to evaluate biodiversity inclusion in the sample EIA Reports, the following areas received above average responses: Assessment and description of important biodiversity elements present in the Project area; biodiversity experts being part of team members that carried out the environmental studies; elucidation of short and long-term impacts on biodiversity due to air, noise, or water pollution; assessment of significant biodiversity impact; compliance with FMEnv guidelines in the collection of primary biodiversity data; references to secondary data to augment primary data; description of impact identification methodology/approaches as well as the rationale for using them; quantitative prediction of biodiversity impacts; identification of

project vulnerable stakeholders / beneficiaries of ecosystem services; allocation of responsibilities for managing impacts; biodiversity monitoring indicators and criteria enshrined in the report and Environmental Management Plan

In a similar vein, the following attributes were poorly included in the sample EIA reports evaluated: Map of the project area not highlighting biodiversity sensitive area, urban area and other industrial establishments, proximity distances to coastal area, water bodies and ecologically sensitive areas; identification and explication of biodiversity components likely to be affected by the project to enable impact prediction; Identification and listing of endemic and endangered species present within the proposed project area of influence; Ecosystem interactions and services rendered by endemic species; deployment of IFC Critical Habitat criteria; delineation of project biodiversity impacts into primary, secondary, and cumulative impacts; description of three levels of ecosystem, species, and genetic impact on biodiversity as well as species compositions; identification/discussion on limitations and uncertainties; identification of specific measures for biodiversity conservation /restoration plan; financial allocation for biodiversity related action plan, gaps in mitigation measures and how to fill them and mitigation measures supporting adaptive management over project mitigations plans.

Federal Environmental Protection Agency [22] and FMEnv [23] listed parameters to be included in assessing baseline environmental conditions, risks, and envisaged impacts of various project phases, and management plans. However, the listed mitigating hierarchies for managing biodiversity impacts are not clear. For instance, FMEnv did not specify forms of avoidance such as, design modification and activities scheduling, rather it limited avoidance to only alternative site selection. It is important to note that project sites had already been selected prior to commencement of EIAs, thus prescribing alternative project site may not be easy to comply within Nigeria as lands are not easy to come by. Again, elaborate procedures for the management of residual impacts are lacking. This study (in course of literature and EIA report reviews) did not come across any compilation of project EIA reports rejected in Nigeria on account of location. Thus, it may appear that FMEnv concentrated efforts on impact minimization only without recognizing other mitigation hierarchies. There is also no clarity on habitat assessment in the EIA guidelines despite practice in other climes of the world.

Outcome of the level of biodiversity inclusion across the sample sectors on the Biodiversity Inclusion Index, shows better performance of the Power, Petroleum and Manufacturing Sectors over Infrastructure and Agriculture/Road sectors. This could be attributed to the fact that Power, Petroleum and Manufacturing sectors are more circumspect as they are highly regulated and exposed to public scrutiny more than the rest (infrastructure, Agric/roads sectors). As such the former hire better experienced EIA Practitioners and provide better resources for the conduct of EIAs. Secondly, some Power and Petroleum, even big manufacturing projects seek fund from Equator- Principle -financial- institutions thus are conversant with requisites for fund release which amongst others is environmental and social performance and due diligence. Due diligence follows best practices for sustainable development which amongst others include respect to nature and biodiversity.

Road, Agriculture, and infrastructure projects are mostly government sponsored thus locally biased; at best seen as beneficial projects. Beneficial Projects are mainly in the least category (i.e., Category III) of FMEnv EIA classification. Often times, these beneficial projects obtain EIA approval with the submission of Environmental Management Plan (EMP) without going through the full huge of the EIA process. Level of scrutiny consciously or unconsciously may not be the same with other project EIAs. In the projects above, there has been instances where State Governments flex muscles with FMEnv on EIA related compliance issues.

From the EIA reports evaluated, Agricultural/Road projects are least detailed than others. This could be attributed to the level of EIA follow through and requirements in those areas. Even at that, more investors and stakeholders are encouraged/wooed to come on board. Summary of results obtained from the sectors assessed in this research put the overall national biodiversity inclusion on EIA report at 55.7% based on criteria used for this study. Certainly, this is not where Nigeria will want to be especially with the global strive towards biodiversity conservation in relation to meeting the sustainable development goals. Global review in course of this research

noted improvements and updates in EIA enabling guidelines across the globe that are yet to be given full operational / legal backing in Nigeria for their implementation.

This study found that biodiversity inclusion in EIA report is of average level, thus requires improvement especially in the area of mechanisms for implementation. The legal framework and enforcement of EIA in Nigeria are weak coupled with poor orientation of the citizenry towards them, both in execution, implementation and monitoring. This is consistent with the findings of Ibrahim et al, [19], Akindele et al [20] and Obaji [21].

However, Nigeria is not alone in the above concerns. Some Researchers from / across the world highlighted similar concerns and deficiencies too. Bigard et al [15] in a similar study in France, noted that biodiversity inclusion on EIA has indeed made some progress, though there are still weaknesses especially lack of substitution assessment, poor cumulative impact assessment, inadequate examination of project impacts on abundant species, limited incorporation of ecological network scale, and poor existence/availability and knowledge of/on monitoring and evaluation measures. Above situations are also experienced in Nigeria based on the findings of this study.

This study therefore supports Hardner et al [14] suggestions for improvements in the area of capacity building, allocation of adequate time, and budget, for the delivery of a well-integrated EIA report that will truly address biodiversity concerns of a project area.

5. CONCLUSION

This study established the relationship between biodiversity, ecosystems services, environmental and human wellbeing and the implications for conserving them. It also highlighted the means of achieving that through biodiversity integrated EIA study and reporting. This is crucial in view of the divide between development (industrialization, with its ancillaries) and environmental protection. It confirmed that biodiversity and other ecological features inclusion on EIA process effectively identify and mitigate project impacts on the environment if properly conducted,

This study recorded above average positive responses in the areas of description of key biodiversity features, their importance, compliance with the Federal Ministry of Environment requirements in the conduct of EIA, impact identification methodologies, allocation of responsibilities for managing project impact, to mention but a few. However, there were clear deficiencies regarding proper approach and delineation of known biodiversity rich and ecological sensitive areas. Insufficient identification, description, and categorisation of biodiversity components likely to be impacted by project activities. Whereas Power and Petroleum sectors performed above average on biodiversity Integration on EIA, Agric/road sector performance was dismal, with manufacturing and infrastructure sectors trolling between them. Overall mean inclusion of biodiversity in EIA reports in Nigeria is 55.7% based on the assessment criteria deployed for this study. This shows that more effort is required for Nigeria to buckle up with what is required to be top notch in performance.

Therefore Nigeria`s EIA guidelines and procedures should be reviewed regularly in order to capture and domesticate global advancements for environmental management such as detailed biodiversity inclusion (adopting criteria and attributes used in this research), critical habitat assessment, climate change and full deployment of mitigation hierarchies for overall environmental protection. This will enable adoption by EIA Proponents and Practitioners instead of haphazard integration in the absence of clearly spelt out national guidelines and regulation. Efforts should be made to deploy technology (such as Integrated Assessment Biodiversity Tool (IBAT)) to access and use real time and regularly updated global data) during EIA scoping to provide insight and information for enhanced biodiversity assessment and inclusion in EIA reports.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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LIST OF APPENDICES

Appendix A: List of Sample EIA Reports used for this Study

S/N	Title	Location	Sector	Year	Proponent
1	150 Mega Watts Gas Powered Plant with Expansion option to 500 Mega Watts.	Ogorode, Delta State.	Power	2016	Proton Energy Limited
2	500 Mega Watt Gas Power Plant	Gaube Community, Kuje Area Council, Abuja	Power	2021	Jehata Nigeria Limited
3	Transmission Lines with Associated Substations Project (Lot 2).	Lagos and Ogun States	Power	2018	Transmission Company of Nigeria Limited
4	200km x 330kv DC Transmission Lines, Substations and Facilities Project.	Jos to Kaduna	Power	2017	Transmission company of Nigeria Limited
5	Transmission Lines with Associated Substations Project (Lot 3).	Lagos and Ogun States	Power	2019	Transmission Company of Nigeria Limited
6	Liquefied Natural Gas (Mini) and Compressed Natural Gas Plant.	Ajaokuta, Kogi State.	Power	2019	Axxela Limited and Nigerian Gas Marketing
7	80 Megawatts Solar Photovoltaic Plant.	Duste LGA, Jigawa State.	Power	2016	Nova Scotle Power Development Limited
8	Field Development Project.	Enwhe, Bayelsa State	Petroleum	2018	Shell Petroleum Development Company Ltd
9	EA and EJA Fields Further Oil Development.	OML 79, Shallow Offshore, off the Coast of Bayelsa State	Petroleum	2016	Shell Petroleum Development Company Ltd
10	Modular Refinery Project.	Gbaramatu Kingdom, Delta State	Petroleum	2017	Gbaramatu Oil and Gas Producing Trust Fund
11	Iseni Wells Early Hookup to Domestic Gas Project.	Sagbama and Ekeremor LGA of Bayelsa State as well as Patani LGA of Delta State.	Petroleum	2017	Shell Petroleum Development Company Limited
12	Umuseti and Igbuku Further Field Development.	Umuseti and Igbuku (OML 56), Ndokwa West LGA, of Delta State.	Petroleum	2020	Pillar Oil Nigeria Limited
13	Preowei Field Development Drilling and Production Operations	Oil Mining Lease (OML) 130, Deep Offshore	Petroleum	2020	Total “E” and “P” Nigeria Limited
14	3D Reshoot Seismic Data Acquisition Project	Adibawa - Gbaran in Bayelsa and Rivers States.	Petroleum	2015	Shell Petroleum Development Company Limited
15	Associated Gas Solution (AGS) Project	Otumara, Warri South LGA, Delta	Petroleum	2015	Shell Petroleum Development

S/N	Title	Location	Sector	Year	Proponent
		State.			Company Limited
16	Field Development Project	Uzu, Yenagoa LGA, Bayelsa State	Petroleum	2018	Shell Petroleum Development Company Limited
17	NLGN Train 7 Project	Bonny, Rivers State	Petroleum	2019	NLNG, Limited.
18	Exploration and Appraisal Wells,	Bonny, Rivers State	Petroleum	2019	Shell Petroleum Development Company Limited
19	Fertilizer Blending Plant	Funtua, Katsina State	Agric/Road	2019	Greentide Agro Services Limited.
20	Okomo Palm Oil Mill Expansion Project	Ovia South-West Local Government Area, Edo State.	Agric/Road	2020	Okomo Oil Palm Company Limited
21	Rurum Farms,	Kano, Kano State	Agric/Road	2018	Kano State Government
22	Bifsam Farms	Kano, Kano State	Agric/Road	2019	Bifsam Limited Kano
23	Fertilizer Blending Plant Project	Kalambaina, Wamakko LGA, Sokoto State	Manufacturing	2021	OCP Africa Nigerian Limited
24	Assa North, Ohaji South Gas Development Project (Pipelines).	Ohaji/Egbema, LGA of Imo State and Ogba/Egbema/Ndoni, LGAs of Rivers State.	Petroleum	2016	Shell Petroleum Development Company Limited
25	Soku Gas Plant to San Barth Manifold Pipeline Project.	Akuku Toru LGA, Rivers State	Petroleum	2013	Shell Petroleum Development Company Limited
26	NOPL to Indorama Gas Supply Tie-In Point Project.	Ukwa West LGA of Abia State, Oyigbo and Eleme LGAs of Rivers State,	Power	2020	Total E & P Nigeria Limited
27	Power Plant and Gas Pipeline Project.	Ukanafun – Oma, Akwa-Ibom State.	Power	2016	Accugas Limited
28	Calabar- Adanga Pipeline.	Cross Rivers State	Power	2013	Niger Delta Power Holdings Company/NIPP Calabar
29	Sagamu LDZ Natural Gas Pipeline Network Construction Project.	Ibefun LGA of Ogun State	Power	2020	Transit Gas Nigeria Limited
30	Ebonyi State Ring Road.	Ebonyi State	Agric/Road	2018	Ebonyi State Govt
31	Jakara Rivers Road.	Kano, Kano State	Agric/Road	2013	Kano State Ministry of Works, Transport and Housing
32	Calabar – Ikom – Katsina Ala Superhighway Project,	Cross Rivers and Benue States	Agric/Road	2016	Cross River State Government
33	Abuja Technology Village.	Federal Capital Territory, Abuja.	Infrastructure	2015	Federal Ministry of Industry, Trade & Investment Abuja

S/N	Title	Location	Sector	Year	Proponent
34	Solar Power Plant.	Kankiya LGA, Katsina State.	Power	2015	Nova Solar 5 Farms Limited
35	Steel Manufacturing Plant and Construction of 1.3km x 132kv Power Transmission Line.	Ukwa West L.G.A., of Abia State.	Manufacturing	2016	Inner Galaxy Steel Company Limited.
36	Tyre Recycling Plant.	Km 10, Ibadan-Abeokuta Express Road, Apata, Ibadan, Oyo State.	Manufacturing	2020	Freetown Waste Management & Recycle Limited.
37	Port Facility.	Kirikiri, Amuwo-Odofin LGA, Lagos State	Infrastructure	2020	BESTAF Marine Service Limited.
38	Automotive Biomass Ethanol Project	Okeluse, Ondo State	Manufacturing	2020	NNPC
39	National Information and Communication Technology Infrastructure Backbone (NICTIB) Project.	FCT-South-West States	Infrastructure	2015	Huawei Technologies Co., Nigeria Limited
40	Proposed Steel Pipe Threading and Valve Assembly Facilities and Related Activities.	Lekki Free Zone in Ibeju Lekki LGA of Lagos State.	Manufacturing	2020	Bell and Gas FZE
41	Pipeline Construction	OMLs 56 and 26	Petroleum	2012	Midwestern / Umugini Asset (Nigeria) Company Limited
42	Utapete Field Development by NPDC	Eastern Obollo LGA, Akwa Ibom State	Petroleum	2020	Nigeria Petroleum Development Company
43	HI Field Development	OML 144, Shallow Offshore	Petroleum	2021	Sunlink Nigeria Limited
44	Gas Processing Facility with Liquefied Natural Gas (LNG) Plant	Gilli--Gilli Field, Ovia Northeast LGA, Edo State	Petroleum	2021	VTT LNG West Africa Limited
45	Pipeline, GPU, LPG, IPP, Petrochemical and Lube Plants	OML 143, Delta State	Petroleum	2019	Sterling Oil Exploration and Production Company Limited (SEEPCO)
46	Etopo Refineries	OML 56, Delta State	Petroleum	2019	Etopo Energy Plc
47	Edo Modular Refinery.	Edo State	Petroleum	2015	Edo Refining and Petrochemical Nigeria Limited
48	Construction & Establishment of 18'' X 60km Natural Gas Pipeline Project.	Ogere - Ibadan Tollgate, Oyo State	Power	2022	NIPCO Gas Limited
49	108km Benin to Delta Transmission Line and 330kv Double Circuit Quad Conductors Project	Delta and Edo States	Power	2020	Transmission Company of Nigeria Limited & African Development Bank
50	138 km X 330kv Single Circuit Transmission Line to 330kv Double Circuit Quad Conductors	Alaoji to Onitsha, traversing Abia, Imo and Anambra States	Power	2020	Transmission Company of Nigeria Limited & African Development Bank

S/N	Title	Location	Sector	Year	Proponent
51	100mw Solar Independent Power Plant and 18 KM Transmission Line Project.	Ganjuwa LGA Bauchi State	Power	2017	Nigeria Solar Capital Partners/Globeleq/ARM Harith Consortium
52	Ukanafun - Calabar Gas Pipeline	Akwa Ibom & Cross Rivers States	Power	2016	Nigeria National Petroleum Corporation (NNPC).
53	505 Gas Combined Cycle Power Plant and related infrastructure.	Ikwek Abak LGA, Akwa Ibom State	Power	2016	Thompson and Grace Investment Limited
54	Joint Venture Power Plant	Eket LGA, Akwa Ibom State	Power	2012	Exxon Mobil
55	275 MW Power Generating Plant	Oluyole LGA Along Lagos Ibadan Express Way Oyo State	Power	2012	Entec Power and Utilities Limited Ibadan,
56	Akure - Ilesha Road Rehabilitation Project,	Ondo State	Agric/Road	2012	Federal Ministry of Works
57	CICO- POLO-, Farms, Estate/Life Camp Infrastructure	Ebocha Ogba/Ndoni LGA of Rivers State	Agric/Road	2021	Polo-Cico Farming and Estate Ltd
58	Iyin/Ado/Ekiti Dual Carriageway Project.	Ado Local Government Area, Ekiti State	Agric/Road	2020	Ekiti State Government
59	Agro Processing Productivity Enhancement and Livelihood Improvement Support Project	Enugu State.	Agric/Road	2021	Agro Processing Productivity Enhancement and Livelihood Improvement Support (APPEALS) Project, Enugu State Co-ordination Office.
60	Eganyi - Jakura - Baro Rail Link Project.	Kogi, Niger States and FCT.	Agric/Road	2013	Federal Ministry of Transport
61	Construction of Agro-Cargo Terminal and Warehouse.	Bodinga, Sokoto State	Agric/Road	2022	Sokoto State Government
62	Bodo - Bonny Road Project, Rivers State	Gokana and Bonny LGAs, Rivers State	Agric/Road	2018	Federal Ministry of Works
63	Mafa Rice Mill Limited, Km 11, Hadeja Road, Kano.	Kano State	Agric/Road	2020	Mafa Rice Mill Limited
64	25km Kilometer Sisimbaki to kwara Road/	Nasarawa State	Agric/Road	2021	Nasarawa State Govt
65	Gadon Kaya UnderPass Bridge and Roads.	Kano State	Agric/Road	2013	Kano State Government
66	Second River Niger Bridge across, Asaba and Onitsha.	Across Delta & Anambra States	Agric/Road	2014	NSIA Motorways Investment Company and Julius Berger Nigeria Limited, Abuja.
67	Improved Breeding, Beef, Milk Production, and Pasture Development for Enhanced	Sokoto State	Agric/Road	2021	Sokoto State Government

S/N	Title	Location	Sector	Year	Proponent
	Productivity of Indigenous Cattle.				
68	Priority Value Chains of Rice, Wheat and Tomato.	Kano State	Agric /Road	2021	Agro Processing Productivity Enhancement and Livelihood Improvement Support (APPEALS) Project, Kano State Co-ordination Office.
69	Saipem Fabrication Yard, Workshop and Accommodation.	Rumuolumeni, Obio/Akpor LGA, Rivers State	Infrastructure	2014	Saipem Contracting Nigeria Limited.
70	Obudu Cargo and Passenger Airport.	Obudu Local Govt Area	Infrastructure	2020	Cross River State Governmen.t
71	Afrexim Bank Africa Trade Centre (AATC).	FCT, Abuja	Infrastructure	2020	Afrexim Bank
72	Amfani Industrial Park and Smart City, 1000Ha.	Magama LGA, Niger State	Infrastructure	2021	Hydropolis Investment Limited (HIL) /Mainstream Energy Solutions Limited (MESL).
73	Ondo Deep Sea Port	Ondo State	Infrastructure	2020	Ondo State Development & Investment Promotion Agency.
74	Bonny Deep Sea Port Project.	Bonny Island, Bonny LGA of Rivers State	Infrastructure	2020	Federal Ministry of Transportation.
75	Eko Atlantic Phase 1, Shoreline Protection and Reclamation Project.	Lagos State	Infrastructure	2012	South Energyx Nigeria Ltd (SENL).
76	The Proposed Construction and Establishment of Multipurpose Crusade Ground.	Aseese Community, Ogun State	Infrastructure	2022	BLW Nigeria Limited
77	Lafia Cargo Airport	Gwandere, Lafia LGA, Nasarawa State	Infrastructure	2020	Nasarawa State Govt
78	Ebonyi State International Olympic Stadium	Abakiliki LGA, Ebonyi State	Infrastructure	2020	Ebonyi State Government
79	Lekki Tolaram Port and Power Plant	Lekki, Lagos State	Infrastructure	2012	Lekki Port and the Lagos Free Trade Zone (LFTZ)
80	Naho Dockyard Infrastructure Project,	Takwa Bay, Lagos	Infrastructure	2015	Naho Nigeria Limited/Dee Jones
81	Ebonyi International Airport	Ezza North and South	Infrastructure	2012	Ebonyi State Government
82	ITE Airstrip	Tunga District, Awe, Nasarawa State	Infrastructure	2022	Tungly Nigeria Limited
83	Nestoil Operations Base	Abuloma, Port Harcourt City LGA	Infrastructure	2015	Nestoil PLC
84	Port Harcourt Industrial Park	Ubima, Ikwerre LGA	Infrastructure	2020	Federal Ministry of Transportation
85	Brass Island Shipyard at Brass	Brass LGA, Bayelsa State	Infrastructure	2021	Nigeria Content Development and

S/N	Title	Location	Sector	Year	Proponent
					Monitoring Board
86	Textile and Garments Industrial Park	Lekki, Lagos	Manufacturing	2020	Nigeria Export Processing Zone Authority
87	Lad Group Sheanut Factory Expansion.	Ikenne LGA, Ogun State	Manufacturing	2020	LadGroup Limited
88	400,000 Unites Per Annum Type 3 Composite LPG Cylinder Manufacturing Plant.	Polaku, of Bayelsa State	Manufacturing	2020	RunGas Prime Industries
89	50,000 Liters of Oil Blending Plant	Yenagoa, Bayelsa State	Manufacturing	2021	Eraskon Nigeria Limited
90	Franemm Industries Limited	Plot 9-13 Riverview, Lagos - Ibadan Expressway Isheri in Ifo LGA of Ogun State.	Manufacturing	2020	Franemm Industries Limited.
91	Wood Processing Factory.	Sapele LGA of Delta State.	Manufacturing	2020	Woodland Nigeria Limited.
92	Bua Cement Plant Lines 4 and 5 Expansion.	Sokoto State	Manufacturing	2021	Bua Cement Plc
93	Sugar Mill	Gain Chiroma, Gagarawa, Jigawa State.	Manufacturing	2020	Great Northern Agribusiness (GNA).
94	Nakudu Tinnery Limited,	Kano, Kano State	Manufacturing	2018	Nakudu Tannery
95	Salasar Enterprises Limited, Kano	Kano, Kano State	Manufacturing	2016	Salasar Limited
96	Dangote Cement and Air Strip	Okpella, Etsako East LGA of Edo	Manufacturing	2019	Dangote Cement PLC
97	Vee Oil Resources Limited Oil Blending Plant, Kano	Kano State	Manufacturing	2018	Vee Oil Resources Limited
98	6000 Clinker Cement Plant with Power Plant	Nkalagu, Ebony State	Manufacturing	2016	Ibeto Cememt Company Nigeria Limited
99	Industrial Complex comprising Sugarcane, Sugar, Vegetable Oil, Cassava Tuber Processing	Jamata along Lokoja - Abuja Road, Lokoja in Kogi State	Manufacturing	2016	Unicane Industries Limited
100	Proposed Agrochemical Packaging and formulation Plant.	Ibafo Ogun State	Manufacturing	2016	Harvest field Industries Limited

Appendix B: Instrument of Data Collection

Blended Criteria and Attributes for Evaluating Biodiversity Inclusion in Sample EIA Reports

Criteria	Attributes /Questions	
There is a widespread baseline study to provide basis for precise and accurate impact prediction	1	Was there map of the project area showing known biodiversity area, urban area, other industrial establishments, and projects, including distance to coastal area/surface water bodies/ecologically sensitive areas, etc?
	2	Have there been sufficient identification and description of biodiversity components likely to be affected by the project to enable impact prediction?
	3	Were there listing of endemic and endangered species present within the proposed project area?
	4	Were there identification and enumeration of flora and fauna including their seasonal variations as applicable?
	5	Were other baseline data such as species, migration routes, spawning and breeding grounds described?
	6	Were assessment and description of important biodiversity elements present in the impact area been done?
	7	Were experts on biodiversity part of team members that carried out environmental studies?
	8	Does the method of collection of primary biodiversity data conform to the guidelines of Federal Ministry of Environment?
	9	Have there been references to secondary data to augment primary data?
	10	Are data gaps and limitations of biodiversity baseline highlighted with a description of how to deal with them.
Impacts of various biodiversity aspects are predicted in the report	11	Were diversity impacts described in a separate section in order to effectively address biodiversity impacts? Biodiversity impacts should not be merged with the broader category of ecological impacts, or just as impact on flora and fauna.
	12	Were there thorough and direct description of biodiversity impacts?
	13	Did above description include indirect, secondary, and cumulative biodiversity impacts?
	14	Are there description of short-term/long-term impacts on biodiversity due to air, noise, or water pollution?
	15	Has there been any assessment of significant biodiversity impact?
	16	Were the three levels of ecosystem, species, and genetic impact on biodiversity covered?
	17	Were there quantitative prediction of biodiversity impacts?
	18	Were there qualitative prediction of biodiversity impacts?

Criteria	Attributes /Questions	
	19	Were there description of impact identification methodology/approaches as well as the rationale for using them described?
	20	Were there identification/discussion on limitations and uncertainties including data gaps?
There is a marked intention towards stakeholders' involvement in decision making	21	Were project vulnerable stakeholders / beneficiaries of ecosystem services identified?
	22	Were vulnerable stakeholders effectively mobilised for participation in the discussion?
	23	Were there appropriate conversation with stakeholders on current and potential ecological system services provided by the affected ecosystem to determine the values these services present for society?
	24	Is there evidence of consensus of stakeholders on the scope of biodiversity study and list of stakeholders consulted?
Project scope alternative with minimum biodiversity damage were considered	25	Were biodiversity concerns considered part of/amongst criteria for the evaluation and selection of technical alternatives?
	26	Were biodiversity impacts of the alternative solutions/sites being considered, described, and compared with the proposed development and with the likely future conditions in zero/Do nothing development option?
Availability of mitigation measures that will largely address predicted impacts	27	Were biodiversity mitigation part of the project design right from the onset?
	28	Were public concerns on biodiversity impacts properly addressed in the mitigation plan?
	29	Were there identification of specific measures for biodiversity conservation /restoration plan?
	30	Were there financial allocation biodiversity related action plan?
	31	Were there allocation of responsibilities for integrating impacts
	32	Does Project proposed impact mitigation measures address biodiversity impacts at all levels; including genetic, species, landscape, structures (trees/shrubs/herbs) as well as temporal biodiversity?
	33	Were gaps in mitigation measures identified and how to fill them addressed?
	34	Will mitigation measures support adaptive management over project mitigations plans
Availability of effective and reliable biodiversity monitoring plan	35	Were there a proposed biodiversity monitoring plan, including schedule of the evaluation programme?
	36	Were biodiversity monitoring indicators and criteria enshrined in the report and Environmental Mgt Plan?
	37	Were there definition of the monitoring and evaluation indicators
	38	Were there mention of the sustainability of the monitoring and evaluation measures?

Blended Criteria and Attributes for Evaluating Biodiversity Inclusion Sample EIA Reports

Appendix C

Matrix Of Biodiversity Inclusion Evaluation of the respective sectors

C.1. Evaluation distribution of Criterion 1: Detailed Baseline Study to provide basis for precise and accurate prediction of impacts

Attributes	Sectoral EIA Reports					
	Power	Petroleum	Agric/Roads	Infrastructure	Manufacturing	Total
1	(√) 5	(√) 4	(√) 2	(√) 5	(√) 10	(√) 26
	(X) 6	(X) 13	(X) 9	(X) 7	(X) 3	(X) 38
	(P) 8	(P) 3	(P) 9	(P) 8	(P) 7	(P) 36
2	(√) 16	(√) 11	(√) 4	(√) 3	(√) 10	(√) 44
	(X) 0	(X) 1	(X) 1	(X) 0	(X) 2	(X) 4
	(P) 4	(P) 8	(P) 15	(P) 17	(P) 8	(P) 52
3	(√) 10	(√) 8	(√) 8	(√) 8	(√) 10	(√) 44
	(X) 3	(X) 3	(X) 7	(X) 5	(X) 7	(X) 25
	(P) 7	(P) 9	(P) 5	(P) 7	(P) 3	(P) 31
4	(√) 16	(√) 11	(√) 5	(√) 7	(√) 12	(√) 51
	(X) 0	(X) 1	(X) 2	(X) 1	(X) 3	(X) 7
	(P) 4	(P) 8	(P) 13	(P) 12	(P) 5	(P) 42
5	(√) 6	(√) 3	(√) 3	(√) 2	(√) 2	(√) 16
	(X) 12	(X) 10	(X) 12	(X) 16	(X) 15	(X) 65
	(P) 2	(P) 7	(P) 5	(P) 2	(P) 3	(P) 19
6	(√) 17	(√) 14	(√) 5	(√) 7	(√) 8	(√) 51
	(X) 1	(X) 1	(X) 3	(X) 1	(X) 4	(X) 10
	(P) 2	(P) 5	(P) 12	(P) 12	(P) 8	(P) 39
7	(√) 18	(√) 13	(√) 9	(√) 7	(√) 11	(√) 58
	(X) 0	(X) 0	(X) 6	(X) 2	(X) 2	(X) 10
	(P) 2	(P) 7	(P) 5	(P) 11	(P) 7	(P) 32
8	(√) 17	(√) 17	(√) 5	(√) 12	(√) 9	(√) 60
	(X) 0	(X) 1	(X) 4	(X) 2	(X) 6	(X) 13
	(P) 3	(P) 2	(P) 11	(P) 6	(P) 5	(P) 27
9	(√) 16	(√) 16	(√) 10	(√) 9	(√) 9	(√) 60
	(X) 0	(X) 1	(X) 4	(X) 1	(X) 1	(X) 7
	(P) 4	(P) 3	(P) 6	(P) 10	(P) 10	(P) 33
10	(√) 2	(√) 3	(√) 5	(√) 4	(√) 2	(√) 16
	(X) 14	(X) 12	(X) 8	(X) 6	(X) 8	(X) 48
	(P) 4	(P) 5	(P) 7	(P) 10	(P) 10	(P) 36

Key: No inclusion(X), Sightly to minor inclusion(P) and Moderate to detailed inclusion (√)

C.2. Evaluation Distribution of Criterion 2: All impacts of various biodiversity components are predicted in the Reports

Attributes	Sectoral EIA Reports					
	Power	Petroleum	Agric/Roads	Infrastructure	Manufacturing	Total
11	(√) 8	(√) 12	(√) 6	(√) 4	(√) 5	(√) 35
	(X) 6	(X) 4	(X) 2	(X) 8	(X) 2	(X) 22
	(P) 6	(P) 4	(P) 12	(P) 8	(P) 13	(P) 43
12	(√) 5	(√) 11	(√) 9	(√) 1	(√) 2	(√) 28
	(X) 3	(X) 1	(X) 2	(X) 5	(X) 1	(X) 12
	(P) 12	(P) 8	(P) 9	(P) 14	(P) 17	(P) 60
13	(√) 10	(√) 9	(√) 12	(√) 1	(√) 5	(√) 37
	(X) 5	(X) 3	(X) 3	(X) 5	(X) 4	(X) 20
	(P) 5	(P) 8	(P) 5	(P) 14	(P) 11	(P) 43
14	(√) 7	(√) 11	(√) 14	(√) 2	(√) 8	(√) 42
	(X) 3	(X) 0	(X) 1	(X) 5	(X) 1	(X) 10
	(P) 10	(P) 9	(P) 5	(P) 13	(P) 11	(P) 48
15	(√) 8	(√) 14	(√) 15	(√) 4	(√) 9	(√) 50
	(X) 4	(X) 1	(X) 1	(X) 4	(X) 1	(X) 11
	(P) 8	(P) 5	(P) 4	(P) 12	(P) 10	(P) 39
16	(√) 4	(√) 6	(√) 1	(√) 1	(√) 1	(√) 13
	(X) 8	(X) 11	(X) 9	(X) 8	(X) 9	(X) 45
	(P) 8	(P) 3	(P) 10	(P) 11	(P) 10	(P) 42
17	(√) 14	(√) 15	(√) 19	(√) 9	(√) 17	(√) 74
	(X) 4	(X) 3	(X) 1	(X) 6	(X) 2	(X) 16
	(P) 2	(P) 2	(P) 0	(P) 5	(P) 1	(P) 10
18	(√) 15	(√) 18	(√) 20	(√) 11	(√) 20	(√) 84
	(X) 2	(X) 1	(X) 0	(X) 4	(X) 0	(X) 7
	(P) 3	(P) 1	(P) 0	(P) 5	(P) 0	(P) 9
19	(√) 17	(√) 19	(√) 19	(√) 8	(√) 16	(√) 79
	(X) 2	(X) 0	(X) 0	(X) 2	(X) 0	(X) 4
	(P) 1	(P) 1	(P) 1	(P) 10	(P) 4	(P) 17
20	(√) 5	(√) 5	(√) 2	(√) 3	(√) 4	(√) 19
	(X) 8	(X) 12	(X) 11	(X) 7	(X) 4	(X) 42
	(P) 7	(P) 3	(P) 7	(P) 10	(P) 12	(P) 39

Key: No inclusion(X), Sightly to minor inclusion(P) and Moderate to detailed inclusion (√)

C.3. Evaluation Distribution of Criterion 3. Intentional Stakeholder`s involvement in decision making

Attributes	Sectoral EIA Reports					
	Power	Petroleum	Agric/Roads	Infrastructure	Manufacturing	Total
21	(√) 10	(√) 10	(√) 5	(√) 9	(√) 6	(√) 40
	(X) 3	(X) 1	(X) 2	(X) 1	(X) 2	(X) 9
	(P) 7	(P) 9	(P) 13	(P) 10	(P) 12	(P) 51
22	(√) 10	(√) 7	(√) 5	(√) 9	(√) 3	(√) 34
	(X) 6	(X) 1	(X) 1	(X) 1	(X) 3	(X) 12
	(P) 4	(P) 12	(P) 14	(P) 10	(P) 14	(P) 54
23	(√) 7	(√) 6	(√) 1	(√) 8	(√) 2	(√) 24
	(X) 4	(X) 2	(X) 6	(X) 2	(X) 2	(X) 16
	(P) 9	(P) 12	(P) 13	(P) 10	(P) 16	(P) 60
24	(√) 6	(√) 5	(√) 2	(√) 5	(√) 2	(√) 20
	(X) 8	(X) 2	(X) 8	(X) 4	(X) 4	(X) 26
	(P) 6	(P) 13	(P) 10	(P) 11	(P) 14	(P) 54

Key: No inclusion(X), Sightly to minor inclusion(P) and Moderate to detailed inclusion (√)

C.4. Evaluation Distribution of Criterion 4: Alternative Project scope with least biodiversity impact/damage were considered

Attributes	Sectoral EIA Reports					
	Power	Petroleum	Agric/Roads	Infrastructure	Manufacturing	Total
25	(√) 11	(√) 3	(√) 0	(√) 2	(√) 2	(√) 18
	(X) 2	(X) 8	(X) 13	(X) 12	(X) 10	(X) 45
	(P) 7	(P) 9	(P) 7	(P) 6	(P) 8	(P) 37
26	(√) 9	(√) 9	(√) 0	(√) 1	(√) 2	(√) 21
	(X) 4	(X) 7	(X) 14	(X) 14	(X) 7	(X) 46
	(P) 7	(P) 4	(P) 6	(P) 5	(P) 11	(P) 33

Key: No inclusion(X), Sightly to minor inclusion(P) and Moderate to detailed inclusion (√)

C.5. Evaluation Distribution of Criterion 5: Availability of mitigation measures that are effective to address predicted impacts

Attributes	Sectoral EIA Reports					
	Power	Petroleum	Agric/Roads	Infrastructure	Manufacturing	Total
27	(√) 9	(√) 8	(√) 0	(√) 2	(√) 2	(√) 21
	(X) 2	(X) 7	(X) 15	(X) 13	(X) 12	(X) 49
	(P) 9	(P)5	(P) 5	(P) 5	(P) 6	(P) 30
28	(√) 7	(√) 8	(√) 0	(√) 1	(√)1	(√) 17
	(X) 2	(X) 2	(X) 8	(X) 6	(X) 4	(X) 22
	(P) 11	(P) 10	(P) 12	(P 13	(P) 15	(P) 61
29	(√) 8	(√) 4	(√) 0	(√) 2	(√) 3	(√) 19
	(X) 3	(X) 7	(X) 14	(X) 6	(X) 5	(X) 35
	(P) 9	(P) 9	(P) 6	(P) 12	(P) 12	(P) 48
30	(√) 6	(√) 4	(√) 3	(√) 4	(√) 7	(√) 24
	(X)11	(X) 14	(X) 14	(X) 12	(X) 8	(X) 59
	(P) 3	(P) 2	(P) 3	(P) 4	(P) 5	(P) 17
31	(√) 15	(√) 16	(√) 8	(√) 16	(√) 10	(√) 65
	(X) 2	(X) 2	(X)7	(X 0	(X) 1	(X) 12
	(P 3	(P) 2	(P) 5	(P) 4	(P) 9	(P) 23
32	(√) 8	(√) 1	(√) 0	(√) 4	(√) 5	(√) 18
	(X) 3	(X) 6	(X) 10	(X) 3	(X) 2	(X) 24
	(P) 9	(P) 13	(P)10	(P) 13	(P) 13	(P) 58
33	(√) 3	(√) 0	(√) 0	(√) 3	(√) 1	(√) 9
	(X) 14	(X) 17	(X) 8	(X) 9	(X) 9	(X) 57
	(P) 3	(P) 3	(P) 12	(P) 8	(P) 10	(P) 34
34	(√) 3	(√) 2	(√) 0	(√) 2	(√) 0	(√) 7
	(X) 4	(X) 4	(X) 8	(X) 11	(X) 6	(X)33
	(P) 13	(P) 14	(P) 12	(P) 7	(P) 14	(P) 60

Key: No inclusion(X), Sightly to minor inclusion(P) and Moderate to detailed inclusion (√)

C.6. Evaluation Distribution of Criterion 5. Availability of effective and reliable biodiversity monitoring Plan

Attributes	Sectoral EIA Reports					
	Power	Petroleum	Agric/Roads	Infrastructure	Manufacturing	Total
35	(√) 11	(√) 8	(√) 2	(√) 3	(√) 4	(√) 28
	(X) 3	(X) 3	(X) 4	(X) 7	(X) 0	(X) 17
	(P) 6	(P) 9	(P) 14	(P) 10	(P) 16	(P) 55
36	(√) 10	(√) 8	(√) 3	(√) 3	(√) 7	(√) 31
	(X) 2	(X) 6	(X) 7	(X) 8	(X) 3	(X) 26
	(P) 8	(P) 6	(P) 10	(P) 9	(P) 10	(P) 43
37	(√) 10	(√) 6	(√) 2	(√) 3	(√) 5	(√) 26
	(X) 1	(X) 6	(X) 8	(X) 4	(X) 2	(X) 21
	(P) 9	(P) 8	(P) 10	(P) 13	(P) 13	(P) 53
38	(√) 5	(√) 1	(√) 3	(√) 1	(√) 3	(√) 13
	(X) 2	(X) 8	(X) 8	(X) 7	(X) 8	(X) 33
	(P) 13	(P) 11	(P) 9	(P) 12	(P) 9	(P) 54

Key: No inclusion(X), Sightly to minor inclusion(P) and Moderate to detailed inclusion (√)

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