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A Critical Evaluation of the Environmental Impact Assessment (EIA) Process for Project DRAGON, Port Talbot

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Abstract info

a b s t r a c t

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Environmental Impact Assessment (EIA) is commonly known as one of the most important decision-support tools that aims to incorporate environmental concerns in planning and developing a consent to a development. Nevertheless, its success in providing substantively strong and sustainability-based results is still debatable. The paper is a critical analysis of the process of EIA that was conducted regarding Project DRAGON, a proposed industrial development at Port Talbot Docks in South Wales, onshore infrastructure and related marine works to produce sustainable aviation fuel and renewable diesel. The quality and efficacy of the EIA process is analyzed instead of the acceptability of the development. Basing on a longitudinal review of both EIA Scoping Report and the Final Environmental Statement, this study analyzes the influences of early scoping decisions on the further assessment. The assessment is informed by the Lee and Colley Environmental Statement Review Package, which is used as an analytical instrument to evaluate scoping practice, analysis of reasonable alternatives and implication based on sustainability-oriented decision-making. According to the findings, procedural compliance is attained to a large extent, but the substantive weaknesses are still present, and it restricts the ability of the EIA as a truly decision-making and learning-based instrument.

1. Introduction

Environmental Impact Assessment (EIA) is a formalized and structured process, which aims at identifying, predicting and assessing the probable important environment impact of intended developments, before making a decision (Noble, 2011). In the United Kingdom, the concept of EIA is entrenched in the planning laws as an preventive and decision-support mechanism, which aim at ensuring that environmental concerns are accommodated in project design, consenting processes and

regulatory authorizations (Benson, 2003). Theoretically, EIA finds a central position in stimulating sustainable development by advancing a prioritization of environmental hazards, provoking a disposition of avoiding adverse impacts in terms of alternatives, and ensuring effective mitigation and monitoring responses (Bhatt, 2023).

In spite of its historic place in the planning systems, the usefulness of EIA has been a subject of intense discussion in academic and professional literature. There is a growing amount of evidence that most Environmental Statements comply

procedurally with the legislative requirements but still have systematic flaws in the substantive quality of assessment (Caro-Gonzalez et al., 2023). Such weaknesses are associated with the justification of scoping decisions, the evaluation of reasonable alternatives, the handling of uncertainty, and the degree to which mitigation and follow-up actually have an impact on decision-making. Consequently, it has been argued that EIA practice has been more of a regulatory compliance exercise than an interventive tool that can be used to influence the creation of environmentally sustainable outcomes (Brombal et al., 2025).

This report critically analyzes the EIA process conducted on project DRAGON, an Ethanol-to-Jet Fuel (ATJ) Sustainable Aviation Fuel manufacturing facility that is proposed to be established at Crown Wharf, Port Talbot Docks, South Wales, to which on-shore infrastructure, off-site utility, and marine works are associated (see Figure. 1). The proposed development is a Schedule 1 development under the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 and as such, must undergo a mandatory EIA. The Environmental Statement consists of four volumes, such as the main report, technical appendices, an Environmental Management Plan (EMP), and a Non-Technical Summary (LanzaTech UK Ltd, 2023).

Figure. 1



More importantly, the report does not evaluate the desirability of the development and the acceptability of environmental impacts of the development separately. Rather, emphasis is put directly on the quality, coherence, and effectiveness of the very process of EIA. The analysis is based on the EIA Scoping Report (LanzaTech UK Ltd, 2023b) and the final Environmental Statement, in order to evaluate the process integrity after a certain period of time and be able to evaluate whether the scoping commitments made at the beginning of the scoping process were converted into an objective, transparent, and defensible evaluation.

The analysis is based on the developed EIA theory and best-practice advice with specific references to the Lee and Colley Environmental Statement Review Package (Lee and Colley, 1991). The framework is a common research and professional review method to evaluate the quality of EIA and is particularly appropriate in identifying the extent to which legislative compliance and substantive effectiveness are different.

Using this framework as an analytical tool, the report will establish what strengths, weaknesses and omissions are present

in the Project DRAGON EIA process and how well it meets its objective of being a sustainability-focused decision-support process.

This report has threefold objectives. First, to critically assess the quality of the EIA process of the Project DRAGON against the recognised theoretical, methodological and legislative standards. Second, to define gaps between EIA theory, policy intent and practice as applied, especially in the areas that are known to limit EIA performance. Third, to recommend evidence-based suggestions that can be used to advance EIA practice in similar mega-industrial projects in the future.

2 Legal and Policy Context

2.1 EIA Legislation in the UK and Wales

This in England and Wales, the environmental Impact Assessment is regulated by the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulation 2017 that implement the provision of the Directive 2011/92/EU, amended by Directives 2014/52/EU, into domestic law (The National Archives, 2017). The Regulation provide step-by-step process of EIA including screening, scoping, the preparation of an Environmental Statement, public consultation and the assessment of environmental information before development consent is determined.

Since The updated Directive reinforced the quality of the EIA by emphasizing the quality of assessment, relevance, and scientific soundness. Developers must make sure that Environmental Statements are prepared by experienced specialists and the information contained therein is full, open, and relevant to the magnitude and character of the project. This law transformation is indicative of a wider understanding that procedural conformity is not the sole means to successful environmental protection and sustainable decision-making (Lushaj, 2014).

Project DRAGON is a Schedule 1 development, which implies that EIA must be implemented irrespective of the scale or context. Besides the permission of the projects, they also need a Marine Licence by the Marine and Coastal Access Act 2009, an Environmental Permit by regulated industrial activities, a greenhouse gas permit, a water abstraction licence, and observance of the COMAH Upper-tier regulations (LanzaTech UK Ltd, 2023b). This multi-consent context further attaches significance to the coherence and integration of the EIA process, especially in terms of cumulative impacts, major accident risk, and mitigation securing.

2.2 Scoping and Policy Intent

One of the most effective phases in the EIA process is scoping. It describes the spatial, temporal and thematic limits of evaluation and defines which issues about the environment are discussed in more detail. The competent authority may issue a formal scoping opinion to the developers under the EIA Regulations. Although these views are not law binding, they are very important in defining the content and direction of the Environmental Statement (Snell and Cowell, 2006).

Scoping is always regarded as an important factor in the

quality of EIA according to the academic literature. Efficiency can be achieved through effective scoping, which would help direct resources towards what really matters and enhance relevance of environmental information in decision-making. On the other hand, bad or excessively restrictive scoping can lead to the issue of premature ruling out of significant problems, insufficient attention to cumulative and indirect impacts, and less environmental learning (Wood, Glasson and Becker, 2005).

Policy wise EIA is viewed as a policy contributing to sustainable development by making certain that the environment factors are incorporated in planning. Nevertheless, researchers have pointed out that tension has always existed between this desire and practice. Although EIA is a procedural methodology that allows the identification and alleviation of impacts, it does not necessarily provide sustainable results, especially when analysis focuses on mitigation rather than avoidance or limits the evaluation of options (Zhao et al., 2023). This tension is one of the major issues in the critique of the effectiveness of EIA and it has a direct relationship with the Project DRAGON assessment.

2.3 Implications for the Evaluation of Project DRAGON

The legislative and policy framework outlined above provides the benchmark against which the EIA process for Project DRAGON is evaluated in this report. Compliance with statutory requirements is treated as a necessary but insufficient condition for EIA effectiveness. Instead, the analysis considers whether the EIA demonstrates alignment with the underlying policy intent of the Regulations and Directive, particularly in relation to scoping transparency, assessment of alternatives, cumulative effects, and the securing of mitigation and follow-up.

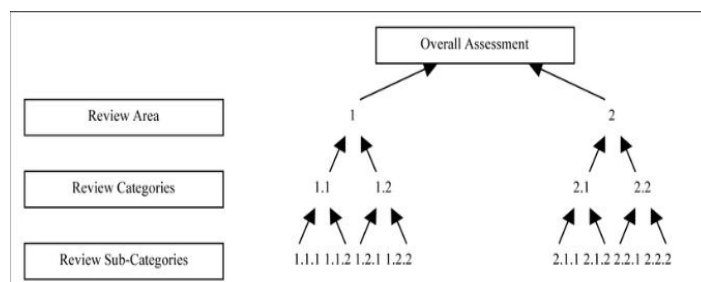
By situating the Project DRAGON EIA within this context, the report is able to assess not only whether regulatory obligations have been met, but also whether the EIA process contributes meaningfully to informed and sustainable decision-making.

3. Methodology

This report has used the Lee and Colley (1991) Environmental Statement Review Package as the main methodological model to measure the quality and efficacy of the EIA process to Project DRAGON. The framework arose as a reaction to the ongoing debate that the practice of EIA tends to be procedurally compliant and not substantially robust and decision-useful in its results (Eitan and Levi-Faur, 2025).

The Lee and Colley (1991) framework structure divides EIA review into a hierarchical system that has four related levels. At the foundation level, individual assessment tasks are reviewed, including the sufficiency of the baseline data, the clarity of methods and explanation of significance criteria. These activities are subsumed into larger review activities and review areas, which eventually leads to a general score of the quality of Environmental Statement, as shown in the Figure. 2. This pyramid form of organization helps minimize the chances of ad hoc or subjective decision-making and offers a clear foundation of criticism.

Figure. 2



The framework is well-known in the field of EIA research and has been used in various jurisdictions, which gives it a high level of methodological credibility. Notably, it is more concerned with the quality of assessment processes as opposed to the acceptability of project impacts hence it is especially appropriate for critique.

The framework used in this report is an analytical and not a mechanical one. Completion or formal grading of collation sheets is not done. Rather, the framework is applied as a theoretical prism to implement a crucial review of the essential EIA phases that are recurrently recognized in the literature as vulnerabilities, such as scoping, impact identification and evaluation, the consideration of alternatives, mitigation and monitoring, and cumulative effects assessment.

4. Critical Evaluation of the EIA Process

4.1 Scoping and Topic Selection

Project DRAGON scoping process is characterized by a high degree of proceduralization and regulatory involvement. The scoping was done in phases starting in June 2022 (LanzaTech UK Ltd, 2023b), and **including** consultation with the statutory bodies, such as the Natural Resources Wales and the local planning authority. The resulting scope explicitly determines the subjects to be evaluated in greater detail and those to be scoped out, with further justification being presented in the Environmental Statement and additional appendices.

This methodology is also in line with regulatory anticipations and is indicative of the concept of proportionality that is being highlighted more in EIA guidance (Iverson and Perrings, 2011). The EIA takes on the form of conservative and worst-case assumptions in the various areas of the topics especially where marine ecology, air quality and noise issues are concerned which goes a long way in assuring that critical effects are not likely to be underestimated.

Nevertheless, looking at it through a Lee and Colley (1991) lens, constraints can be seen in the openness with which uncertainty is managed in scoping decisions. Although scoping out is done based on the low sensitivity, limited pathways or insignificance, the EIA gives comparatively little reflection on the residual uncertainty or how scoping decisions can be reconsidered in case there are changes in assumptions. Sensitivity testing is more implied than expressed and the prudential reasoning which underlies exclusions is not necessarily well defined.

This is a partial weakness in the sub-category level. Despite the presence of justification and evidence-based nature, the scoping process seems rather focused on the management of the scope and efficiency of assessment as opposed to maximising environmental

learning. Uncertainty is not only an excuse to be excluded but rather a reason to dig deeper into the issue in EIA theory (Geneletti et al., 2003). In this regard, the scoping of Project DRAGON indicates a general contradiction in the applied practice of EIA between proportionality and precaution.

Notably, decisions taken in early scoping have long-term effects on the evaluation of alternatives and the cumulative impacts. The setting of boundaries of assessment limits the scope of issues that can be re-opened subsequently during the process. This method is procedurally justifiable although it restricts the adaptive potential of the EIA and supports the apprehensions in the literature that scoping may also inadvertently decrease substantive efficacy (Snell and Cowell, 2006). Table 1 summarises the evaluation of the scoping process, highlighting the tension between procedural efficiency and the treatment of uncertainty.

Table 1: Evaluation of Scoping and Topic Selection

Aspect	Strength	Limitation
Scoping Process	Phased, well-structured; strong regulatory and stakeholder involvement	Procedural focus may limit deeper analytical exploration
Scope Definition	Clear inclusion/exclusion with justification in Environmental Statement	Limited flexibility to revisit decisions if assumptions change
Proportionality Approach	Efficient and aligned with EIA guidance; focuses on key impacts	May prioritise efficiency over comprehensive environmental understanding
Use of Worst-case Assumptions	Reduces risk of underestimating impacts	Tends to mask rather than explicitly address uncertainty
Handling of Uncertainty	Logical scoping-out based on sensitivity and pathways	Weak transparency; limited discussion of residual uncertainty and sensitivity testing
Adaptive Capacity	Ensures manageable scope and procedural clarity	Restricts reconsideration of issues and reduces learning potential
Overall Evaluation	Procedurally robust and compliant	Tension between proportionality and precaution; limits substantive effectiveness

4.2 Identification, Prediction and Evaluation of Impacts

One of the fundamental roles of EIA is the methodical recognition, forecasting and assessment of probable major environmental impacts due to a proposed development. According to Lee and Colley (1991), this step is important to general quality of Environmental Statement, because the flaws in the impact assessment methodology, significance determination or uncertainty

treatment can significantly compromise usefulness of decisions (Lawrence, 2007).

Project DRAGON Environmental Statement is a document that provides a substantial coverage of the environmental issues that are covered within the assessment scope, such as landscape and visual effects, socio-economics and human health, climate change, air quality, noise and vibration, marine ecology and large-scale accidents. The evaluation of each topic is calculated under the established technical guidance and recognised standards, respectively, GLVIA3 landscape and visual assessment, ADMS dispersion modelling of quality in the air, and BS 5228 and BS 4142 noise and greenhouse gas emissions (LCA) methods (LanzaTech UK Ltd, 2023a). This methodological congruence with the industry best practice is a definite strength of the EIA, and it adds up to the validity of the predictions presented.

The identification of impacts tends to be systematic and transparent with a clear distinction between the construction phase and the operational phase and explicit calculation of direct, indirect and recreational impact (Glasson et al., 2013). The fact that non-routine cases like emergency flaring and major accidents issues are included as a part of COMAH regulation adds to the strength of the assessment and is a good practice of industrial EIA.

Impact prediction is however a technical rigorous process whereas the significance determination is dependent on pre-arranged significance matrices based on the sensitivity of receptors and the magnitude of effect. As much as this method is popular in EIA practice, its applicability has been criticised in the literature as it obscures the process of professional judgement behind what appear to be objective classifications (Wood, 2007). Significance thresholds are usually well described in the Project DRAGON EIA, although the reasons behind the need to draw a difference between moderate adverse significant and moderate adverse not significant is not always outlined in detail. This is especially clear when it comes to the category of landscape and visual effects on the users of the Wales Coast Path, where the impacts are recognized to be moderate negative and significant, but done in the context of being acceptable in the wider aspects of industrial land use.

This is a partial weakness on the level of review category considering the framework viewpoint. Although the effects are obvious and their occurrence is foreseeable, the value judgements that are essential in determining the significance can be brought to the forefront. More openness on the nature of interaction between the professional judgement and the policy context, expectations and sustainability goals of the receptor would make findings more clear and defensible (Morrison-Saunders and Bailey, 2000).

The uncertainty handling is usually done by being conservative in their assumptions, especially concerning air quality modelling, marine ecology and noise assessment (Payne et al., 2015). Worst-case scenarios are often used, and they minimise the risk of an underestimation of effects. Nonetheless, the EIA does not elaborate much on residual uncertainty or confidence interval of predictions. One of the determinants of credibility of assessment is uncertainty management, and the overt considerations of uncertainty can build credibility in EIA findings, as opposed to compromising them (Cardenas and Halman, 2016).

In general, the impact assessment phase of the Project DRAGON EIA

may be described as technically sound and well-developed, but limited to some extent by standard significance models, which focus more on regulatory acceptability than on a more thorough consideration of environmental values and trade-offs. The key strengths and limitations of the impact assessment process are summarised in Table 2 below.

Table 2: Impact Assessment Evaluation

Stage	Strength	Limitation
Impact Identification	Systematic; covers multiple topics and phases; includes non-routine risks (COMAH)	Limited exploration of complex indirect interactions
Impact Prediction	Uses recognised standards and models (e.g., ADMS, GLVIA3, BS standards)	Technically complex; limited accessibility and explanation
Significance Evaluation	Structured matrices and defined thresholds	Masks professional judgement; unclear justification of thresholds (e.g., moderate significant vs not significant); influenced by policy context
Handling of Uncertainty	Conservative, worst-case approach reduces underestimation	Minimal discussion of residual uncertainty or confidence levels
Overall Approach	Technically robust and aligned with best practice	Emphasises regulatory acceptability over deeper environmental values and trade-offs

4.3 Consideration of Alternatives, Mitigation and Monitoring

1. Alternatives

The reasonable alternatives consideration is generally considered one of the distinguishing tests of EIA efficiency, as it is the most important mechanism by which environmental evaluation can affect the process of strategic decision-making (Enríquez-De-Salamanca, 2025). Project DRAGON Environmental Statement contains a specific chapter that presents the discussion of alternatives, which comprises site selection, design arrangement, technology choice, and the do-nothing scenario.

These alternatives are clearly described and based on real-life limits such as the availability of infrastructure, security needs, legislative demands and vicinity of base receptors. They can be justified by the choice of Crown Wharf, as it is located within an industrial environment, has existing transport connections and it is less likely to cause serious impacts on vulnerable populations. Procedurally, this meets the demands of the EIA Regulations.

Nevertheless, the evaluation of alternatives is quite qualitative and justificatory in nature (Lindfors, 2021). The performance in the

environment is addressed together with technical feasibility, however, there is a lack of evidence of systematic comparison between options based on explicit environmental criteria. Consequently, the evaluation supports a narrative progression that involves a personality of path dependence where the option of choice becomes unavoidable, instead of proving to be superior based on environmental factors.

This is indicative of a long-known weakness of the practice of EIA where alternatives assessment is commonly used to justify pre-existing decisions instead of exploring alternative development pathways (Steinemann, 2001). This limits impact avoidance opportunities and strengthens a mitigation-based approach in terms of sustainability. This is a weakness at the review area level which is of substantive nature even though legislative provisions are followed.

II. Mitigation and Monitoring

Conversely, Project DRAGON EIA has a major strength in terms of mitigation and monitoring elements. The Environmental Management Plan (EMP) gathers mitigation activities during construction and operation processes together and implements an effective three-level mitigation hierarchy in accordance with the IEMA. Primary mitigation is introduced in the project design, secondary mitigation is ensured in the planning conditions and legal agreements, and tertiary mitigation is realized in the best-practice management plans, i.e. Construction Environmental Management Plan.

The mitigation measures are also well correlated with the identified impacts and they are backed by the regulatory frameworks, such as environmental permits and COMAH compliance. This integration increases the level of confidence that commitments on mitigation will be carried out and enforced.

Nevertheless, mitigation securing is robust, but the EIA is rather limited in discussing adaptive monitoring or feedback processes that are not related to regulatory compliance. Monitoring is seen as the main method of proving the compliance rather than as the chance of learning and continuous improvement. The improved role of the follow-up as a learning tool would increase the impact of the EIA on the long-term sustainability outcomes (Pinto et al., 2019). Table 3 synthesises the evaluation of alternatives, mitigation, and monitoring, highlighting the contrast between procedural compliance and substantive effectiveness.

Table 3: Evaluation of Alternatives, Mitigation and Monitoring

Component	Strength	Limitation
Alternatives Consideration	Includes site, design, technology, and do-nothing option; based on realistic constraints	Largely qualitative; lacks systematic comparison using explicit environmental criteria
Decision-Making Role	Meets EIA regulatory requirements; justified site selection (industrial	Tends to justify pre-selected option; reflects path dependency rather

Component	Strength	Limitation
	location, infrastructure)	than genuine comparison
Mitigation Measures	Strong integration through EMP; clear mitigation hierarchy (primary, secondary, tertiary)	Focused on compliance rather than innovation or impact avoidance
Monitoring Approach	Linked to regulatory frameworks (permits, COMAH); ensures implementation	Limited emphasis on adaptive monitoring and feedback learning
Overall Approach	Robust mitigation and regulatory alignment	Weak alternatives analysis; limited contribution to long-term sustainability learning

4.4 Cumulative Effects Assessment

Assessment of cumulative effects is one such area in which most EIAs fail due to the lack of data and methodological issues (Joseph et al., 2023). The Project DRAGON EIA takes a systematic manner by differentiating intra-project cumulative effects and in-combination with other approved developments under Schedule 4 of the EIA Regulations.

The evaluation establishes cumulative importance mainly in regard to population and human health throughout the building process with the interactions of visual effects and weekend noise influencing Wales Coast Path users. Notably, the EIA does not overstate cumulative effects in cases where interactions are not likely, which is seen to be methodologically restrained.

However, cumulative assessment is rather qualitative, and the lack of assessment of terrestrial ecology at the PAC stage is not solved but postponed. Although such a method can be procedurally satisfactory, it brings out the nature of the limitations inherent in cumulative evaluation within phased consenting settings.

5. Discussion: Theory versus Practice

The Environmental Impact Assessment theory conceives the assessment as a proactive, iterative and learning process, which must impact positively the project design and decision-making (Sánchez and Mitchell, 2016). Ideally, EIA is supposed to detect the potential risks to the environment at a very early stage, investigate viable options, prevent or reduce negative impacts, and strategically incorporate the values of sustainability in the development plan (Cerovšek, 2025). In this view, EIA cannot be considered, simply, as a predictive tool since it is a deliberative mechanism in which environmental values are bargained with economic and technical factors

Nevertheless, studies always find a divide between these hypothetical ambitions and their practical application. According to

Eitan and Levi-Faur (2025), in reality, EIA has been more of a regulatory compliance tool, which is performed to fulfil the legal requirements instead of transforming the developmental paths. The trend is especially noticed in mega industrial projects whereby strategic decisions pertaining to site selection, selection of technology and reasons behind the project, are often made before the EIA process has started, thus limiting the ability to have real alternatives. This usually transforms the EIA practice into mitigation-oriented instead of avoidance-oriented which limits its ability to produce transformative sustainability results (Bond et al., 2024).

The Project DRAGON EIA is one of the examples of this long-term conflict between theory and practice. On the one hand, the evaluation indicates a high level of procedural compliance, technical robustness and the current best practice. The fact that the recognised methodologies of assessment were employed, the assumptions applied in the model are conservative, and the technical side was also presented in detail makes the predictions of the impact more trustworthy (Duncan, 2006). Moreover, a well-organized use of a mitigation hierarchy, backed by a detailed Environmental Management Plan and legally binding regulatory framework, tackles an opportunity of weakness in the EIA practice, which is the application of mitigation measures (Cares, Franco and Bond, 2023).

Conversely, the EIA does not seem to have much impact in strategic decision-making. The alternatives consideration is qualitative and to a large extent procedural and limited by infrastructural, regulatory and safety considerations that are set before assessment. The alternative development pathways are not systematically compared by environmental criteria and there is no substantial evidence that alternatives development pathways were explored or discarded meaningfully based on environmental grounds. This method typifies a critical interposition in the theory of EIA such that the assessment of alternatives is influenced by pre-strategic decisions, which makes it less effective in affecting environmental performance in reality.

In the same vein, where the Project DRAGON EIA assumes the open nature of the significance criteria and the considerable negative impact on some receptors, most notably the landscape and the visual effects on the users of the Wales Coast Path, the articulation of the significance is based on the existing professional judgement and policy framework. This method is justifiable in regulatory practice but brings into sharp relief a structural flaw in EIA, in which significance can be evaluated in terms of acceptability, as opposed to relative to larger sustainability levels or longer-term environmental transformation.

Despite these weaknesses, it is notable that the Project DRAGON EIA exhibits a number of features that are related to the modern best practice. The early and continued consultation with statutory consultants, distinctiveness of the Environmental Statement volumes, good communication using a Non-Technical Summary, and strong mitigation securing mechanisms all lead to a large standard of quality in the procedures. More specifically, the merging of marine licensing and environmental permitting with planning under a coherent evaluation system also increases regulatory coherence and limits the likelihood of decision-making fragmentation.

Collectively, these observations indicate that, although the Project DRAGON EIA might not be as transformative as the EIA is assumed to be in the sustainability theory, it is a relatively strong and successful implementation of EIA in the context of the current regulatory and institutional framework. As it is shown in the case, most constraints defined in the practice of EIA are structural, not project-specific because they are the result of the location of EIA in the planning system and not limitation in the implementation of the assessment. As a result, enhancement of the effectiveness of EIA might imply not only the methodological sophistication but also the introduction of environmental assessment at the earlier stages of strategic planning and conception of the project.

6. Recommendations

Based on the basis of the critical assessment of the Project DRAGON EIA process, a number of recommendations are suggested to improve the performance of future EIAs of large-scale industrial developments.

First, there should be enhanced transparency when it comes to scoping; that is, uncertainty should be explicitly recognized and there should be proper documentation of the assumptions underpinning scoping decisions. Where the exclusion of topics is justified by conservative or worst-case assumptions, the EIA must explain how these assumptions will be revised or updated in case there are changes in design parameters or in the baseline conditions. It would help to increase transparency and minimize the risk of exclusion of issues in advance by introducing mechanisms to work with adaptive scoping.

Second, the reasonable alternatives must be more systematically and comparatively assessed. Environmental performance must be measured on some clear and consistent criteria in comparison with alternative sites, designs or technologies, and not mostly on qualitative justification. By incorporating the environmental aspects into the project conception earlier, one will have a better chance to avoid the impact and make the EIA a better contributor to the strategic choice.

Third, it should be more explicit in the determination of significance. Although sensitivity-magnitude matrices are a standard practice, the EIAs could use a more straightforward explanation of the professional judgements and policy considerations supporting the significance thresholds. A clear discussion regarding the effect that regulatory context, receptor values and sustainability goals have on the determination of significance would enhance the defensibility and transparency of the evaluation results.

Lastly, EIA process should have more adaptive monitoring and follow-up structures incorporated into it. Monitoring needs to be viewed not as a necessary compliance measure, but also a means of learning and improvement. Well established feedback loops, trigger conditions, and reporting systems would allow the monitoring outcomes to guide the operational management and subsequent evaluations, which would enhance the contribution of EIA to sustainable development in the long run.

7. Conclusion

The report has critically analyzed the process of Environmental Impact Assessment of the Project DRAGON and has presented an

evaluation of the quality, coherence and effectiveness of the process as opposed to the acceptability of the development. The review is based on a well-established framework and the evaluation has identified several strengths of the EIA, such as high levels of procedural compliance, technical soundness of assessment methodologies, conservative modelling assumptions and achievement of mitigation through an extensive Environmental Management Plan. These aspects indicate that the EIA has been prepared to a high level of professionalism and generally complies with modern regulations and industry requirements.

However, the evaluation has also highlighted limitations that reflect wider structural challenges within EIA practice. In particular, the constrained assessment of alternatives, limited transparency in significance determination, and the predominantly compliance-oriented framing of monitoring reduce the extent to which the EIA can influence strategic decision-making or deliver transformative sustainability outcomes. As such, while the Project DRAGON EIA may fall short of the proactive and learning-oriented ambitions often attributed to EIA in theory, it represents a robust and defensible application of EIA within existing regulatory and institutional constraints. Addressing the identified gaps through improved scoping transparency, strengthened alternatives assessment and adaptive follow-up would enhance the capacity of future EIAs to function as more effective tools for sustainable development.

References

- Benson, J.F. (2003) 'What is the alternative? Impact assessment tools and sustainable planning,' *Impact Assessment and Project Appraisal*, 21(4), pp. 261–280. <https://doi.org/10.3152/147154603781766185>.
- Bhatt, R.P. (2023) 'Environmental Impact Assessment system and process in developing countries,' *Open Journal of Ecology*, 13(12), pp. 977–1009. <https://doi.org/10.4236/oje.2023.1312059>.
- Bond, A. et al. (2024) 'What would environmental impact assessment look like if we started from scratch today? Designing better EIA for developed neoliberal nations,' *Impact Assessment and Project Appraisal*, 42(5), pp. 410–422. <https://doi.org/10.1080/14615517.2024.2426117>.
- Brombal, D. et al. (2025) 'Life beyond the checklist: Revitalizing the potential of environmental impact assessments through co-creation,' *Environmental Impact Assessment Review*, 118, p. 108219. <https://doi.org/10.1016/j.eiar.2025.108219>.
- Cardenas, I.C. and Halman, J.I.M. (2016) 'Coping with uncertainty in environmental impact assessments: Open techniques,' *Environmental Impact Assessment Review*, 60, pp. 24–39. <https://doi.org/10.1016/j.eiar.2016.02.006>.
- Cares, R.A., Franco, A.M.A. and Bond, A. (2023) 'Investigating the implementation of the mitigation hierarchy approach in environmental impact assessment in relation to biodiversity impacts,' *Environmental Impact Assessment Review*, 102, p. 107214. <https://doi.org/10.1016/j.eiar.2023.107214>.
- Caro-Gonzalez, A.L. et al. (2023) 'From procedural to transformative: A review of the evolution of effectiveness in EIA,' *Environmental Impact Assessment Review*, 103, p. 107256. <https://doi.org/10.1016/j.eiar.2023.107256>.
- Cerovšek, T. (2025) 'Advancing sustainable construction through 5D digital EIA and ecosystem restoration,' *Sustainability*, 17(20), p. 9062. <https://doi.org/10.3390/su17209062>.

Duncan, R. (2006) 'The use of predictive modelling in impact Assessment: Implications for environmental legislation and regulation,' *Australian Journal of Public Administration*, 65(1), pp. 75–88.
<https://doi.org/10.1111/j.1467-8500.2006.00473a.x>.

Eitan, A. and Levi-Faur, D. (2025) 'Environmental impact assessments as a mechanism of regulatory intermediation: the case of Israeli wind energy,' *Policy and Society*, 44(4), pp. 510–534.
<https://doi.org/10.1093/polsoc/puaf006>.

Enríquez-De-Salamanca, Á. (2025) 'Alternatives in environmental impact assessment: a taxonomy,' *Integrated Environmental Assessment and Management* [Preprint]. <https://doi.org/10.1093/inteam/vjaf135>.

Environmental impact assessment and environmental auditing in the pulp and paper industry (no date).
<https://www.fao.org/4/v9933e/v9933e02.htm>.

Geneletti, D. et al. (2003) 'Accounting for uncertainty factors in biodiversity impact assessment: lessons from a case study,' *Environmental Impact Assessment Review*, 23(4), pp. 471–487. [https://doi.org/10.1016/s0195-9255\(03\)00045-3](https://doi.org/10.1016/s0195-9255(03)00045-3).

Glasson, J. et al. (2013) Introduction to environmental impact assessment. <https://doi.org/10.4324/9780203023068>.

Iverson, T. and Perrings, C. (2011) 'Precaution and proportionality in the management of global environmental change,' *Global Environmental Change*, 22(1), pp. 161–177. <https://doi.org/10.1016/j.gloenvcha.2011.09.009>.

J, C.Y. et al. (2020) 'Environmental impact assessment: a tool for sustainable development,' *International Journal of Innovative Research in Computer Science & Technology*, 8(1), pp. 63–65.
<https://doi.org/10.55524/ijrcst.2020.8.1.15>.

Joseph, C. et al. (2023) 'Improving cumulative effects assessment: alternative approaches based upon an expert survey and literature review,' *Impact Assessment and Project Appraisal*, 41(2), pp. 162–174.
<https://doi.org/10.1080/14615517.2023.2170093>.

LanzaTech UK Ltd (2023a) Environmental Statement Project Dragon.
<https://www.lanzadragon.wales/pac-process>.

LanzaTech UK Ltd (2023b) Project DRAGON, Port Talbot Environmental Impact Assessment (EIA) Scoping Report, LanzaTech.
https://static1.squarespace.com/static/642bee683ac3873e80d01c67/t/647db1ce2834a525a84f299d/1685959125024/LANT3006_Project+Dragon_EIA+Scoping+Report_Final+Issue+310523+%28inc+Appendix+1.1%2C+2.1%2C+2.2+and+14.1%29.pdf.

Lawrence, D.P. (2007) 'Impact significance determination—Back to basics,' *Environmental Impact Assessment Review*, 27(8), pp. 755–769.
<https://doi.org/10.1016/j.eiar.2007.02.011>.

Lee, N. and Colley, R. (1991) 'Reviewing the quality of environmental statements: review methods and findings,' *Town Planning Review*, 62(2), p. 239. <https://doi.org/10.3828/tpr.62.2.04751m8q55826090>.

Lindfors, A. (2021) 'Assessing sustainability with multi-criteria methods: A methodologically focused literature review,' *Environmental and Sustainability Indicators*, 12, p. 100149.
<https://doi.org/10.1016/j.indic.2021.100149>.

Lushaj, B.M. (2014) 'DIRECTIVE 2014/52/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment,' *ResearchGate* [Preprint].
<https://doi.org/10.13140/rg.2.1.2589.4162>.

Morrison-Saunders, A. and Bailey, J. (2000) 'Transparency in environment impact assessment decision-making: recent developments in Western

Australia,' *Impact Assessment and Project Appraisal*, 18(4), pp. 260–270.
<https://doi.org/10.3152/147154600781767321>.

Noble, B.F. (2011) 'Environmental impact assessment,' *Encyclopedia of Life Sciences* [Preprint].
<https://doi.org/10.1002/9780470015902.a0003253.pub2>.

Payne, M.R. et al. (2015) 'Uncertainties in projecting climate-change impacts in marine ecosystems,' *ICES Journal of Marine Science*, 73(5), pp. 1272–1282.
<https://doi.org/10.1093/icesjms/fsv231>.

Pinto, E. et al. (2019) 'Distilling and applying Criteria for Best Practice EIA Follow-Up,' *Journal of Environmental Assessment Policy and Management*, 21(02), p. 1950008. <https://doi.org/10.1142/s146433321950008x>.

Sánchez, L.E. and Mitchell, R. (2016) 'Conceptualizing impact assessment as a learning process,' *Environmental Impact Assessment Review*, 62, pp. 195–204. <https://doi.org/10.1016/j.eiar.2016.06.001>.

Snell, T. and Cowell, R. (2006) 'Scoping in environmental impact assessment: Balancing precaution and efficiency?,' *Environmental Impact Assessment Review*, 26(4), pp. 359–376. <https://doi.org/10.1016/j.eiar.2005.06.003>.

Steinemann, A. (2001) 'Improving alternatives for environmental impact assessment,' *Environmental Impact Assessment Review*, 21(1), pp. 3–21.
[https://doi.org/10.1016/s0195-9255\(00\)00075-5](https://doi.org/10.1016/s0195-9255(00)00075-5).

The National Archives (2017) The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017.
<https://www.legislation.gov.uk/uksi/2017/571/contents>.

Wood, G. (2007) 'Thresholds and criteria for evaluating and communicating impact significance in environmental statements: 'See no evil, hear no evil, speak no evil'?', *Environmental Impact Assessment Review*, 28(1), pp. 22–38.
<https://doi.org/10.1016/j.eiar.2007.03.003>.

Wood, G., Glasson, J. and Becker, J. (2005) 'EIA scoping in England and Wales: Practitioner approaches, perspectives and constraints,' *Environmental Impact Assessment Review*, 26(3), pp. 221–241.
<https://doi.org/10.1016/j.eiar.2005.02.001>.

Zhao, Y. et al. (2023) 'How does the environmental impact assessment (EIA) process affect environmental performance? Unveiling EIA effectiveness in China: A practical application within the thermal power industry,' *Environmental Impact Assessment Review*, 101, p. 107120.
<https://doi.org/10.1016/j.eiar.2023.107120>.

