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An evaluation of the Environmental Impact Assessment (EIA) process for the Brynwhilach solar farm development in Wales.

R. Carter

Abstract

An Environmental Impact Assessment (EIA) in the UK can be a useful tool in ensuring that any large development considers and mitigates against any negative impacts on the environment prior to planning permission. The legislation and guidance on how to produce an EIA varies across the UK, but all legislation follows a similar framework. An EIA works best when accompanied by robust planning policy and guidance to the applicants. Brynwhilach solar farm is an example of a renewable energy development that was subject to the EIA process in Wales in 2014. The EIA was critiqued against the relevant 2014 legislation. The EIA was comprehensive and provided the required information but lacked a thorough examination of local conditions and species priorities by not consulting local experts. The subsequent issues encountered illustrate that an EIA process is a complex and multifaceted process, and that compensation sites are not always the best solution to mitigate against loss of habitat.

Keywords

Environmental Impact Assessment
Solar farm
Wales

1 Introduction

In this report, the process of producing an Environmental Impact Assessment (EIA) will be discussed within the context of current legislation in place in Wales and the UK and with reference to the changes that have taken place in Wales since the implementation of the Environment Act (Wales) 2016. The process of producing an EIA and the strength of previous legislation relevant to 2014 and before the UK left the European union will be discussed in the context of a case study. The case study refers to a completed Solar farm project constructed in Swansea, Wales and under the local planning authority (LPA) of Swansea Council.

1.1 The Environmental Impact Assessment (EIA) process.

EIAs have been part of the planning process in the UK since 1988, following a European Community directive in 1985 (Environmental Impact Assessment Directive (85/337/EEC). Implementation was accelerated across Europe and the world and has been a major growth area in planning practice since. (Glasson *et al*, 2012).

The introduction of the EIA into the UK was met with some resistance; developers claimed that they already considered the environmental impacts, and this was just “another costly and time-consuming constraint on development” (Glasson *et al*, 2012:55). In the UK’s initial legislation, the word ‘Impact’ was dropped as it was seen as politically sensitive. Since then, the process has continued to evolve into the legislation in place today at UK level and further into the devolved legislation covering developments taking place in Wales (Glasson *et al*, 2012).

1.2 Current planning legislation in Wales

The relevant legislation in Wales is covered under: -

*The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations
2017*

This sets out the legal requirement that anyone seeking planning permission must first determine whether an EIA is required - this is done through a screening opinion request to the relevant planning authority. This applies to public bodies as well as private enterprises.

The lists of project types requiring an EIA are closely aligned to the EC directive 85/337 list and can be further split into Schedule 1 and 2 developments. Any Schedule 1 developments are required to have an EIA. Schedule 2 projects may need an EIA if it is decided that the development is “likely to have significant effects on the environment by virtue of factors such as its nature, size or location” (The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017:3). This is decided by the Local Planning authority during the ‘screening’ process. In Wales and the UK an EIA is required to be carried out as part of the process of preparing an Environmental Statement (ES). This must be completed by the person who is applying for the planning permission and must include copies of any required consultations, publications, and notifications. The legislation clearly states in Part 10 paragraph 44 that: “A relevant planning authority or the Welsh Ministers or an inspector must not

grant planning permission or subsequent consent for EIA development unless an environmental impact assessment has been carried out in respect of that development". (*The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017*). The relevant Welsh Government legislation is shown in Appendix 1a and describes the scope any ES must take. Significantly, it states in part 1 section 4 of the Act that a planning authority should at least have access to "sufficient expertise to examine the environmental statement" (*The Town and Country Planning (Environmental Impact Assessment) (Wales) 2017:7*). Many planning authorities have employed Planning Ecologists to aid the planning process and the discharge of their duties under this legislation. In Wales, every local planning authority (LPA) has access to a designated Planning Ecologist or Ecology team (Sharp, 2023), whereas in England as many as 26% of local planning authorities in England do not have any access to ecological expertise (Snell and Oxford, 2021). This could severely impact the ability of a planning authority to examine an ES and going forward assesses any mitigation and enhancements named under subsequent conditions attached to the planning permission.

1.3 The relevant planning legislation in place in 2014

The case study discussed in this report was submitted in 2014 under the:

Town and country planning (Environmental impact assessment) England and Wales Regulations 1999

The key part of this legislation shown in Appendix 1b will form the basis of the critique of the Case study in Section 2 of this report.

The 1999 regulations were less detailed than those currently in place and there was less clarity as to the direction of focus that an ES should cover. The direction was expected to come from the scoping document, which must be requested by the

10.— (1) A person who is minded to make an EIA application may ask the relevant planning authority to state in writing their opinion as to the information to be provided in the environmental statement (a "scoping opinion").

(4) An authority shall not adopt a scoping opinion in response to a request under paragraph (1) until they have consulted the person who made the request and the consultation bodies, but shall, subject to paragraph (5), within five weeks beginning with the date of receipt of that request or such longer period as may be agreed in writing with the person making the request, adopt a scoping opinion and send a copy to the person who made the request.

Figure 1 – Guidance to applicants on requesting a scoping opinion. (*The Town and Country planning (environment Impact Assessment) Regulations 1999*).

applicant and provided within 5 weeks by the relevant planning authority as seen in the legislation extract in figure 3 below:

1.4 The development of Solar farms in the context of the decarbonisation of the energy sector.

The publication of the 2012 Climate Change Committee (CCC) 4th Carbon budget stated that by 2030 97% of UK was from low-Carbon sources. It also recommended that the UK power sector should aim to decarbonise completely by 2050 (Climate Change Committee, 2012). Photovoltaic installations were cited as one of the fastest growing green energy technologies and 2013 saw global operating capacity reach the milestone of 100GW. This led to a fairly stable market prior to the planning of this development (REN21, 2013). In the UK, Solar farm developments were bolstered by the *Climate Change Act*, 2008 which committed the UK to reducing its GHG emission by 34% by 2020. This was instigated by EU legislation which bound the UK to commit to ensuring that at least 15% of its Energy would be from renewable sources by 2020 (DECC, 2011).

At the time of the planning permission being sought, the UK had approximately 2.7GW of solar energy production capacity. However, in May 2014 the UK Government announced it was withdrawing the feed-in tariffs and subsidies to large solar farms such as Brynwhilach (Harvey, 2014). The UK government then revised its 2012 target of 20GW by the end of 2020 down to 10-12GW by the end of 2020 (DECC, 2011).

2 The Brynwhilach solar farm

The Brynwhilach solar farm is a Schedule 2 development located north of Swansea and was completed in March 2022. Planning permission was originally sought from the local planning authority, Swansea Council in 2014 and the environmental statement was completed in June 2014. The development was completed by Good Energy, a company based in Cornwall and specialising in green energy projects. The Environmental statement was prepared following a screening report by Swansea Council in 2014. A scoping report was requested by Good Energy but wasn't received prior to the commencement of the ES and its publication in June 2014. Legislation clearly states that Scoping requests should be responded to within 5 weeks by the relevant planning authority (*The Town and Country Planning Environmental Impact*

Assessment) Regulations 1999). In this case the scope of the ES and EIA was determined by the applicant in the absence of the official scoping opinion.

The Solar farm was planned to create a facility that could produce 12.69MW of electricity, consisting of 47,000 solar panels, underground cabling, eight inverter and transformer stations and 2 on site substations, and it was predicted that the facility would supply 2629 - 3061 homes. The location of the site is shown in figure 2 below. The site is on agricultural fields located north of Swansea city centre and within 1 mile of the M4 motorway.

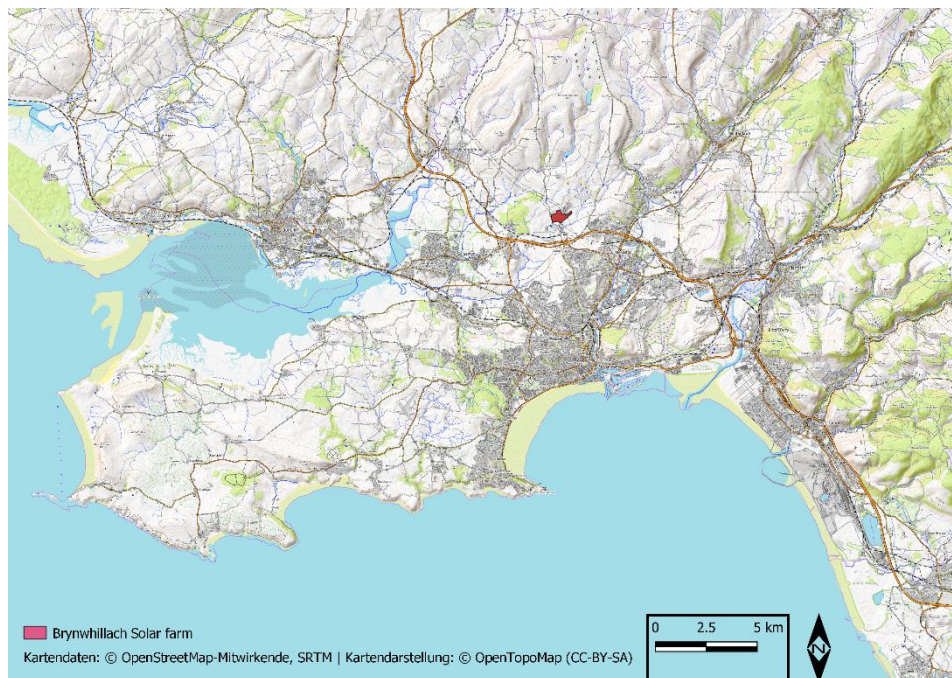


Figure 2 - GIS map showing the location of Brynwhilach solar farm development in relation to the city of Swansea and the Gower peninsular and AONB.

The extent of the solar farm structure is illustrated in figure 3 below. This diagram was included in the ES document and shows the arrangement of the panels, location of footpath and the alterations to hedgerows and trees. The land was used as grazing mainly for cows, sheep, and horses. National grid pylons and substations were located within the vicinity and the intention was to connect the facility directly to the National grid. The plans changed as the development progressed as the site proposed for the substation was not suitable and the local capacity of the grid was not sufficient.



Figure 3- A diagram showing the site layout of the proposed Solar farm at Brynwhilach, Swansea included in the Environmental Statement submitted to Swansea Council planning authority 2014. (Good Energy, 2014)

The extra capacity needed for the development was ‘borrowed’ from another nearby renewable energy project not due to come online until 2020 to allow the project to be finished. There was pressure on the development to be completed before the UK Government withdrew subsidies and buy back schemes in 2015 (Good Energy, 2017). Further developments and delays were overcome and following a grant from Welsh government, the whole project was completed in March 2022. The Welsh Government grant enabled 10,000 panels to be owned and used solely by the Swansea University Health Board. A 2-mile-long cable was laid to connect the solar farm to the nearby Morriston Hospital. In March 2022, it was stated that the Brynwhilach solar farm was now providing Morriston hospital with enough power for all its energy needs as well as surplus energy which it was able to sell back to create extra income (Morris, 2022).

The Environmental Statement was published by Wardwell Armstrong and prepared by Paul Davies BSc (Hons) Environmental protection and Simon Allen BSc Hons. The latter’s expertise was not disclosed. The legislation in place at the time did not stipulate any mandatory qualifications for authors of an EIA.

The Environmental Statement was completed on behalf of Good Energy by Wardell Armstrong working with a project team of specialists shown in figure 4:

Table 1.1: Project Team	
Organisation	Subject area
Good Energy	Public Consultation
Wardell Armstrong	Introduction; Project Description, Flood Consequence Assessment, Planning Policy; Mitigation; Cumulative Impacts.
Pegasus Planning Group	Landscape and Visual Impact Assessment Arboricultural Survey
Cotswold Archaeology	Archaeology and Cultural Heritage
Michael Woods Associates	Ecology
AARDVaRC Ltd	Glint Assessment
Luscombe Maye	Soils and Land Classification

Figure 4 - The project partners listed as part of the project team in compiling the EIA included in the Environmental statement submitted to Swansea council planning authority. (Good Energy, 2014)

None of the contributors to the ES were based within Wales or the local area of Glamorgan. This could impact on the impacts assessment report as a local ecologist or experts may have a greater understanding of local ecology, priority species and habitat as well as culture, history, and community knowledge relevant to the local area.

“Failure to draw on local expertise and energy... represents a potential lost opportunity for making a good project even better...”

(Hughes, 1998, p2).

A guide to Biodiversity for the private sector recommends that consultation with local experts is usually required to obtain a full picture of an area and that consultation with conservation organisations and local communities is important to help identify key biodiversity impacts (IFC, 2004).

2.1 Summary of the survey methodology.

Table 1 shows a summary of the types of survey carried out as part of the EIA process. The majority of the surveys were carried out at a sub optimal time and following heavy rain which could remove any evidence of habitat or commuting such as faeces. (BSG Ecology, 2017). Several priority species are noted as having been recorded close to

the site including *Bufo bufo* (Common toad), *Sturnus vulgaris* (Starling), and *Euphydryas aurinia* (Marsh fritillary butterfly).

Table 1 - A summary of the Ecological surveys carried out as part of the EIA.

Type of survey		Date of Survey	Optimal time for survey (BSG Ecology, 2023)
Reptile survey		January 2014 June 2014	April/May or September
Tree survey		January 2014	Year round
Dormice (pre-commencement)		December 2016	Apr – Nov (using nesting tubes)
Ecological survey	Phase 1	January 2014 (1 day)	April – October
	Hedgerow		April – October
	Badgers		April – October
	Bats		October – April
	Bats		May – September (Jan + Feb roosts)
	Dormice		April – November
	Amphibians – habitat suitability index		Habitat suitability index used
	Water vole		April – September
	Otter		All year
	Birds Evidence of nesting		April – July (breeding) October – March (Wintering)

2.2 Analysis of the Environmental Impact Assessment – Brynwhilach Solar farm LTD.

Table 2 - Table showing the analysis and critique of the EIA for Brynwhillach solar farm 2014

Analysis of the Environmental Impact Assessment		
Relevant legislation (1999)	EIA dated 2014	Critique
1. Description of the development, including in particular—		
(a) a description of the physical characteristics of the whole development and the land-use requirements during the construction and operational phases;	This is well set out. The individual structures are described but the size and model of solar panels are not defined. The use of a LEMP and CEMP are described, and annual maintenance visits are predicted. A 30 year period of operation is designed with the land being returned to its previous condition following decommission and removal of all construction. The supports for the solar panels will be pile driven and the buildings are prefabricated reducing emissions and noise on site. The report quotes LANDMAP as describing the area as: “rolling farmland mosaic” but states that introduction of hedgerows would diminish any effects negligible or not significant. Animals will be given access for grazing underneath the panels and the public footpath will remain unchanged with enhanced hedgerows to create visual shielding.	The design had to be changed after planning was granted as the National grid did not have the capacity to take the power generated. The angle of the solar panels was altered from 25 degrees to 30 degrees without commissioning an updated Glint and glare assessment. This change in angle may have also affected the height, and planning was subsequently granted for this change. The effect of the local wet climate was not considered during construction thoroughly enough, with mud and unstable ground becoming an issue during construction. This could have caused increased soil erosion and surface water run off not considered in the EIA. The project was not completed until 2022 due to changes in construction and operation. This included the addition of a 3Km cable to directly connect the Solar farm to Morriston hospital.

(b) a description of the main characteristics of the production processes, for instance, nature and quantity of the materials used;	This was well set out however, the actual solar panels being used was not stated in the EIA. Use of local work force and local services used where possible. Local accommodation services used by any outside staff.	The panels used during construction should have been the panels used for the calculations in the Glint and Glare assessment to ensure that this was an accurate assessment of the possible effects on the local population and aircraft. The main contractor for the installation of the panels was a local South Wales company.
(c) an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed development.	Water – surface water run off was identified. Plans state only 2.25% of surfaces will be impermeable and no use of concrete so water can run freely off and away from Solar panels. Where there are impermeable surfaces, pipe culverts will be installed to permit passage of surface water and the plans to establish a diverse grass and sward use it for grazing around the panels to reduce surface water run-off. The flood risk assessment was compiled using Welsh government guidance and the Swansea Council strategic Flood consequences assessment, which showed no record of flooding at the site.	Whilst the plans seem thorough and the construction of the solar panels and associated buildings was considered with a reduction of surface run-off in mind, subsequent information during the construction phase shows that the amount of rainfall that the site experiences was not fully considered - this may have led to increased surface run-off into local watercourses, but there is no evidence that this has been detrimental to the environment. No reference to any noise or air pollution is included in the EIA. Vibration and noise from the pile driving was not included.
2. An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.	The consideration of alternatives was limited to the equipment and design used and not siting the project elsewhere. The site was described as ideal for a solar farm project.	The site was chosen due to its low value agricultural land and access to both the National grid and M4 access road. There is also reference to the visual impact being minimal due to the presence of sub stations and pylons in the immediate surroundings as well as existing noise for the M4.

		Follow pre application consultation 1 field was removed from the plan due to potential adverse visual impact on residents. One area of the site is designated SINC due to its Marshy grassland characteristics. This area was planned to be 'recreated' in the mitigation and enhancement plan. Enhancement wasn't required under the 1999 legislation however it was considered in the plans and in the LEMP.
3. A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.	Impacts identified were: Construction phase: Loss and fragmentation of habitat. Disturbance Incidental mortality Degradation/damage by dust Operational phase: Loss of habitat and modification of habitat. An Ecological survey Dormouse survey Bat survey Recognition and consideration of the inclusion and proximity of several important ecological site such as Llety Morfil SINC were mentioned. The solar panels are to be arranged to provide gaps between the structures and hedgerows to "allow space for ecology... to provide for access for on-going maintenance" and to reduce shading of panels. The EIA states that "numerous layouts of the panels have been considered and the final	A full ecological survey was carried out during the winter prior to the environmental statement - this was noted as a sub optimal time to carry out such a survey. The regional records centre was consulted, and priority species and priority habitats considered in this survey. Phase 1 Habitat survey was completed and identified important areas of marshy grassland. Individual hedge assessments were carried out and individual surveys of species such as bats, reptiles, birds, migratory birds and badgers were considered. It was recommended in the survey that a repeat survey was conducted in the summer, and it also stated that should construction work be delayed more than three years the full ecological survey would need to be repeated. The actual construction of the solar fan was delayed significantly for over three years and no further ecological surveys were carried out.

	design has been selected to preserve the ecological diversity of the site” and the layout of the panels in each field was provided in the EIA.	Following the granting of planning permission one of the conditions of planning condition 12 stated that dormouse survey should be carried out prior to commencement of works. This was carried out in December 2016 and no evidence of dormice were found. This survey notes that dormice are not active in December, and it would be unlikely for them to find any evidence of dormice so the value of this survey may be brought into question, and it is possible that hibernating dormice could have been disturbed during the construction works. The most important feature of the site is the marshy grassland area which is part of a SINC. There are no plans to enhance this marshy grassland with planting of priority species such as <i>Molinia caerulea</i>, purple moor grass, <i>succisa pratensis</i>, devils bit scabious, or other appropriate species. They do note that the SINC is not currently managed for priority species and that this would be part of their LEMP. In the subsequent planting plan, there is no reference to enhancing the marshy grassland and this represents a significant loss of habitat. Mitigation is planned elsewhere on the site however subsequently this area proved inappropriate to create marshy grassland most notably during the consultation phase with the public one field was removed from the planning application due to a complaint of visual impact yet the potential loss of a marshy grassland habitat within a designated sink was not considered for removal and the subsequent
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	An archaeological survey was carried out by 'Cotswold archaeology'	mitigation was not successful and this represents a permanent loss of habitat. An extensive fence was planned at the perimeter at the site to keep out Deer but there was no mention of the effect this may have on the Deer population as this represented a habitat loss. There was no mention of mitigation of the fence to allow for movement of other mammals such as Hedgehogs, Rabbits, fox and Badgers. The archaeological survey was carried out by a non-local consultation service which may have not been as familiar with the local culture and history as a local archaeological service. No significant findings were reported on site.
4. A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development, resulting from:		
(a) the existence of the development;	A visual impact assessment and comprehensive Zones of Theoretical Visibility (ZTVs) were included.	These reports were shared as part of the public consultation and appear thorough and comprehensive considering all aspects from different areas of the locality. The photographic evidence was taken in the winter to show true visibility. This information led to concerns and subsequent modification of the planning application during the pre-application phase.
(b) the use of natural resources;	The designated improved grassland was used for grazing and was not considered valuable to local agricultural use. The forestry section is used by a local paintballing business which will remain unaffected.	The loss of agricultural land was not considered a significant impact. The plan was to allow sheep grazing to return to the site once construction was completed. There was no reference to the loss of a cattle grazing resource or effect on local deer.

(c) the emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the applicant of the forecasting methods used to assess the effects on the environment.	The environmental statement claimed this would be kept to a minimum.	No detailed consideration of land take for the construction of the permanent transformer buildings was noted in the environmental statement and the impact of such clearance on the ecology. The ES was compiled by an Ecological consultancy using specialist partners (Figure 4). The individual contributions include details of the methodologies employed.
5. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.	Mitigation and enhancement were considered throughout the environmental statement. The effect on the local ecology was recognised.	The subsequent land ecological management plan and construction ecological management plan detailed mitigation policies. Areas of mitigation and enhancement e.g., to the hedgerows which were noted as being species poor were included following initial planning permission. Plans to train construction workers in the mitigation of ecological damage was set out. Construction was planned to minimise disruption to nesting birds and hibernating mammals.
6. A non-technical summary of the information provided under paragraphs 1 to 5 of this Part.	This was produced as part of the ES on July 2014.	The non-technical summary was quite vague in relation to mitigation and enhancement of the existing ecology.
7. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information.	The ES was compiled with the use of expert external consultants.	No recognition of the lack of local consultants was noted or the date the sub optimal dates of the ecological surveys
PART II		
1. A description of the development comprising information on the site, design and size of the development.	A full description of the site, the site layout the and the location of hedgerows and trees were all detailed in the environmental statement.	A thorough description and measurements were provided at time of application.

2. A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects.	This was included in the ES, but it was not detailed.	As a condition of planning a full CEMP and a LEMP were requested. Mitigation/compensation sites were planned but subsequent surveys of the soil hydrology reduced the area of the rush pasture compensation site. These compensatory sites are difficult to establish and the quality of the biodiversity loss and or gain must be measured for them to be effective (Maron et al. 2012). The failure to properly assess the compensation site for suitability to replace the lost rush pasture was a weak point in the EIA. The later survey (April 2018) however suggested that the Rush pasture underneath the solar panels would thrive and had increased due to disturbance allowing for a possible biodiversity gain.
3. The data required to identify and assess the main effects which the development is likely to have on the environment.	Expert consultants working used in the compilation of the ES this included visual impact statements and glinting glare assessment as well as full ecological survey using local data.	The visual impact statement was very thorough looking at the impact from various viewpoints and this led to a change in the planning permission application following community consultation. The ecological survey consulted with the local record centre but not with local ecologists.
4. An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.	There was no reference to consideration of alternative sites in the environmental statement.	There were other sites nearby which are classed as brownfield sites that may have been more suitable and would have resulted in no loss of habitat fragmentation however these areas were classified under the local development plan for residential development and were therefore not available. The site was classed as low value agricultural land as semi improved grassland and was adjacent to existing powerline substations and residential areas.

		Although consultation was carried out with the nearby Llangyfelach Community Council no consultation with the nearby Felindre village appears to have been carried out. Access to the village is past the construction site and increased vehicles, soil erosion and mud on the highway may have adversely affected residents but they were not considered during the pre-application phase.
5. A non-technical summary of the information provided under paragraphs 1 to 4 of this Part.	This was produced as part of the ES on July 2014.	

2.3 *Suggested improvements to the EIA*

The legislation in place at the time of planning permission, set out information for inclusion in environmental statements under schedule four of the Town & Country planning act 1999. The information to be included is quite vague and repetitive and could allow for the omission of information and the consideration of different types of impact such as noise air and radiation pollution. Part II of the information for inclusion is very broad ranging, and does not focus on priority species, priority habitats, the importance of local biodiversity and priorities with relation to local designated sites. Following the Environment Act (Wales) 2016 the information to be included in the EIA was clearly set out and emphasised the importance of priority species and habitat as shown in figure 1. The most important development in the legislation around planning and the ES was the stipulation of including enhancements of biodiversity as a consequence of any planning permission being granted. In this case study, enhancement was considered, and this is largely due to the environmentally sympathetic nature of the development. The fulfilment of enhancement requirements are required under Welsh Planning Policy edition 11 (Welsh Government, 2021) and should be subject to monitoring by the local planning authority/Ecologists and guidance is available (Welsh Government, 2019). There are case studies of compensation sites that have been more successful than the original existing habitats - for example the compensation site at Gwent levels created to mitigate Biodiversity loss from the development of the Cardiff Bay barrage where Dunlin and Redshank populations increased and were more successful at the compensation site than the original site (Murata and Feest, 2015).

Although the requirement for an EIA and ES for all schedule 2 developments is mandatory, there is no method of official sanctions and monitoring due to a lack of resources at the local planning authorities (Snell and Oxford, 2021).

The 2017 legislation does specify that the ES should be assessed by a qualified ecologist, or the planning authority should have access to a qualified ecologist to consult on the quality of the completed environmental statement. To fully assess an environmental statement and the potential impacts on ecology and the environment, the environment impact assessment needs to be assessed by a fully qualified and trained ecologist who is able to recognise the potential biodiversity net loss and gain in any development. Currently there is a lack of resources in the majority of county

councils in England (Snell and Oxford, 2021). Overall, the ES shown in this case study was a good example of an EIA, especially given the less prescriptive legislation in place at the time.

3 Conclusion

3.1 Improvements to legislation

The legislation in place currently in Wales has robust procedures in place to ensure that environmental impacts and biodiversity impacts are considered thoroughly as part of the planning process. The current legislation complements the Environment Act Wales (2016) and the addition of the requirement for enhancement biodiversity is an important step. As shown in the case study referred to in this report, the legislation is now more detailed and includes a requirement for enhancement biodiversity to be provided with specific reference to priority species and habitat and that information is freely available to planners. There is a possibility that the identified lack of resources in the local planning authorities could allow Environmental Statements to be insufficiently assessed for biodiversity enhancements and mitigation to be substandard and not appropriate due to a lack of rigorous assessment (Snell and Oxford, 2021).

3.2 Conflicts of interest

A vital part of the planning process is the Screening and Scoping stages which are decided by the LPA. There could be a potential conflict of interest within local authorities when deciding if a development requires an EIA even when following the guidelines set out in legislation.

3.3 Compensation, mitigation, and enhancement

The creation of compensation sites is not always adequate to mitigate against the loss of established habitat in particular priority habitat such as the marshy grassland at the case study site has been shown to be ineffective at times and measuring net loss and gain of biodiversity is difficult (Maron et al. 2012). It is also shown in the case study that it is important to legislate that ecological surveys should be relevant and appropriate i.e. carried out at the correct time of year and have an appropriate expiry date. These ecological surveys and land ecological management plans should be scrutinised by an appropriately trained and qualified ecologist and the resources to follow up the implementation of such plans provided to allow the legislation to be most

effective. It is also important to note that approved plans may not be carried out in the agreed way and there are often a lack of resources to check this.

3.4 *The practicalities of scrutiny.*

The size and scope of Environmental Statements are considerable with many documents exceeding 500 pages and available as multiple download files. The non-technical summary is an important document that must be made available to the public. As shown in the case study, this document can be too vague and important information excluded with an element of bias by the authors.

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Brynrhyd Solar P.V. Farm Development Proposal: Environmental Impact Assessment Evaluation.

L Zanoni

Abstract

As part of carrying out a nationally agreed target to secure 1 GW of 'locally owned' renewable electricity capacity by 2030, Welsh Government has identified a number of areas across Wales, suitable for solar energy development. A large proportion of these lie within agricultural settings, resulting in the occurrence of growing numbers of ground mounted Solar Photovoltaic (P.V.) array 'farms, sited on grazing pasture.

Brynrhyd Solar Farm, presented below, is a typical example, which has been evaluated through the lens of the Environmental Impact Assessment (E.I.A) process, revealing common environmental 'benefits' and 'disbenefits' associated with ground mounted solar farm development; these commonly perceived impacts reflect those highlighted in the literature, mainly affecting landscape character, visual amenity, biodiversity and the socioeconomic profile of surrounding communities.

The case study also allows observation of a competent and iterative approach to E.I.A., providing a solid framework in which to assess impact magnitude and effectiveness of mitigation proposals. Weaknesses in the process are also identified in this example, especially regarding the non-mandatory scope stage status for D.N.S. developments, and assurance of continuous monitoring and follow-up, in the context of the relative longevity of the operational and decommissioning stages of these developments.

Keywords

Ground Mounted Solar Photovoltaic Farm
Environmental Impact Assessment
Monitoring and follow up

1 Introduction

The purpose of this report is to evaluate the efficacy of the 'Environmental Impact Assessment' process (E.I.A.) using an example development (Brynrhyd Solar Farm) and to briefly assess the potential impacts arising from a large-scale Solar Photovoltaic

(PV) Plant renewable proposal from 'Island Green Power '(IGP); an international developer who focussing on developing large scale "Utility Size" solar plants and battery storage. In total they have completed to date '900MW' of solar projects worldwide and are 'owned by some of the largest solar investors in the world' (Island Green Power,2022).

Brynrhyd Solar Farm' is a ground mounted photovoltaic solar array facility, proposed to cover 72 hectares of agricultural land near Llanedi, Carmarthenshire, Southeast Wales, UK. IGP has set up a company specific to the proposed solar plant called 'Brynrhyd Solar Farm Limited' which will be responsible for the solar farm during its 6-month construction phase, operational lifespan of 40 years and decommissioning phases. Possessing a potential export capacity, of 30MW, for which I.G.P. has already secured a grid permit with National Grid Electricity Distribution *the* scheme has been assessed by the existing 'Planning Inspectorate Wales' as a Development of National Significance (DNS)

Planning permission will not therefore be sought from the Local Planning Authority (LPA), in this example Carmarthenshire County Council (C.C.C.) but directly from the Welsh Government (W.G.). The Planning Inspectorate Wales has also identified the development requires an (E.I.A.) governed by the legislation (The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (SI 2017/567(W136)).

Since that initial assessment it should be noted that The Planning Inspectorate Wales has now transitioned to a new service division in Welsh Government known as 'Planning and Environment Decision Wales (P.E.D.W.) and that any planning decisions concerning this development post October 2022 will be handled by P.D.E.W. (however as much of what will be assessed here was undertaken by the Planning Inspectorate, the former will be referenced where appropriate)

The Pegasus Group (The Pegasus Group,2022) is the main management consultant involved with co-ordination technical consultants and stakeholder consultation process) and production of planning documentation. They also maintain a dedicated stakeholder website, entitled 'Welcome to the Brynrhyd Solar Farm Community Consultation Website' (The Pegasus Group,2022)

To date the E.I.A. process for this DNS example, has been made predominantly in reference to a framework of devolved Welsh Government policy and legislation; a brief description of the most relevant together with an overview of the E.I.A. and DNS development proposals in Wales will be presented below in Section 3 following on with the overall evaluation of the EIA process for Brynryd Solar Farm in Section Four.

Before that a brief synopsis will be presented in Sections One and Two regarding Solar energy within the Climate Change context, and its perceived benefits and disbenefits, to be considered in the context of E.I.A. evaluation.

1.1 Background to expansion of increased use of solar power in Wales

Climate change and Geopolitical pressures drivers to increased use of renewable energy:

In the IPCC Sixth Assessment Report 'The Physical Science Basis' (International Panel for Climate Change, 2022) it is stated it is 'unequivocal that human influence has warmed the atmosphere, ocean and land', resulting in increased extreme weather events. The report further warns of an upward trend for 'concurrent and multiple changes in climatic impact-drivers', becoming more prevalent at 2°C in comparison to reducing the maximum global warming level to 1.5°C or less, advocated by the historic 'Paris Agreement' at COP21 (UN, 2022). The report concludes that only limiting 'cumulative' CO₂ emissions, to obtain 'net-zero', in conjunction with other greenhouse gases (GHGS) could lead to 'discernible effects' on atmospheric warming and air quality. Additionally, the World Economic Forum perceives Russia's invasion of Ukraine in February 2022, has contributed to the global energy crisis creating 'seismic' changes to the energy not surprisingly many countries are seeking to increase their capacity in the arena of renewable energy production, not only, to meet 'net zero' targets but to obtain secure, independent energy supplies.

1.2 Welsh Government and renewable energy development

The Welsh Government (WG), as an example, in a bid to move to a low carbon economy has produced a strong framework of supporting planning policies (summarised in Table (1) below), with 'Future Wales: The National Plan 2040', (FW, 2019) and 'Planning Policy Wales, 11th Edition' (PPW, 2021) underpinning the current government commitment to identify opportunities to develop renewable energy

sources and from which to generate 70% of all electricity consumption, with 1 gigawatt(GW) capacity to be in local ownership by 2030.

Currently WG is aiming to generate 70% of its electricity consumption from renewable energy by 2030; for one Gigawatt of renewable electricity capacity in Wales to be locally owned by 2030 and thereby secure. Regarding a DNS project such as Brynrhyd Solar farm, policies (17) & (18) in 'FW,2019' currently favours presumption in favour of such 'sustainable developments', in order to acquire 'an appropriate mix of energy provision' this is balanced however by 'PPW,2021' , together with supporting environmental (*Environment (Wales) Act 2016*) and social legislation(*Well-being of Future Generations (Wales) Act 2015*) providing the means to evaluate consideration of potential 'material considerations' that could be disruptive to the integration and balance of social, economic, cultural and environmental issues and economic growth and prosperity in Wales.

Summary Table 1: Main Framework Policy and Legislation governing Climate Change, impacts of from Renewable Developments.

POLICY	DESCRIPTION OF SPHERE OF ACTION RE: ES	ADDITIONAL COMMENTS:
CLIMATE CHANGE ACT 2008 (2050 TARGET AMENDMENT) ORDER 2019, SI 2019/1056(THE ORDER)	Came into force 27/12/2019 amended legally binding target to reduce greenhouse gases GHG's emissions aet in section 1 Climate Change Act 2008(CCA2008) from 80% to 100%- 'net zero	Overarching UK legislation pertaining to Climate Change measures.
THE CARMARTHENSHIRE LOCAL DEVELOPMENT PLAN	The Carmarthenshire Local Development Plan was adopted on 10 December 2014 and is important to material considerations regarding Brynrhyd Solar Farm E.I.A. & Planning application	Key policies pertinent to the development proposal are (Incorporating Inspectors recommended changes where relevant).

- Policy SP12
Climate Change
- Policy SP14
Protection and
Enhancement of
Natural
Environment;
- Policy GP1
Sustainability and
High-Quality
Design;
- Policy GP4
Infrastructure and
New Development;
- Policy EMP5
Farm
Diversification;
- Policy EQ1
Protection of
Buildings,
Landscape and
Features of
Historical
Importance;
- Policy EQ4
Biodiversity;
- Policy RE3 Non-
Wind Renewable
Energy
Installations;(ES)

Note: Policy RE3
of the
Carmarthenshire
Local Development
Plan identifies how
'large-scale
schemes in open
countryside would
be permitted' if
overriding need for
the scheme can be
satisfactorily

		justified and the development would not cause harm to the landscape.
‘PLANNING POLICY WALES, 11TH EDITION’(PPW,2021)	Set out the land use planning policies of the Welsh Government and is supplemented by a series of Technical Advice Notes (TANs), MTANs ,Welsh Government Circulars, and policy clarification letters, & with PPW,2021 comprise the national planning policy framework for Wales.	Planning: guidance on environmental impact assessments (circular 11/99) (cite) Pertinent circular for the E.I.A. process
FUTURE WALES: THE NATIONAL PLAN 2040’, (FW,2019)	National Development Framework, setting the direction for development in Wales to 2040.	
ENV WALES 2016	The Act provides an ‘iterative framework’ to manage Welsh natural resources sustainably and to be a core consideration in decision-making. Key Associated Documents: The State of Natural Resources Report – Natural Resources Wales (NRW) must produce a report that gives an assessment of management of natural National Natural Resources Policy – authored by the Welsh Government State of reference to Natural Resources report. and Area statements (Produced by NRW &	Other pertinent legislation to be considered in conjunction with the for Brynryhd <i>The Wildlife and Countryside Act 1981</i> (Regarding special and endangered species protections) <i>The Hedgerows Regulations 1997</i> (Regarding hedgerow habitat on site and protections)

	provides a local evidence base, to help implement the priorities, risks and opportunities identified in the National <i>Technical advice note (TAN) 10: tree preservation orders</i> (Regarding protections for trees under preservation orders) <i>The Conservation of Habitats and Species Regulations 2017</i> (& 2019 amendment) To consider protections of habitat and species subject to special protections
FGWB ACT 2016	The Act ensures a legally-binding consideration of the seven wellbeing goals – for national government, local government, local health boards and other specified public bodies, detailing the ways in which specified public bodies must work, and work together to improve the well-being of Wales. Especially important when assessing the Community Benefits and overall Social, Environmental, Cultural impacts of the Solar farm scheme.

1.3 Solar Farm: overview of recognised benefits and disbenefits.

What are Solar Farms?

In essence Photovoltaic (PV) plants: use solar (PV) panels convert light to electrical energy via the photovoltaic effect. They can be small scale i.e., residential projects typically installed on the rooftops of individual buildings, 'floating' systems installed typically on reservoirs and canals, or, as in Brynrhyd Solar Farm, be 'utility-scale' projects installed on large areas of land (I.U.C.N. (2022))

The literature points to studies showing the net gain benefits (C.I.E.E.M.,2022) and positive biodiversity impacts created when compared to other types of intensive land use e.g. UK solar plants utilising agricultural were found to have a greater diversity of plant species and birds when managed through grazing (Montang, Parker & Clarkson,2016)

1.4 Environmental Impact of Solar Farms: Benefits & Disbenefits (agricultural land)

Ecology and Nature Conservation:

Despite the obvious benefits of using solar energy there are some relevant studies, regarding our example case, which cite potential environmental and community impacts arising from the presence of solar farm PV arrays and associated development. Conversely, there is a relatively small research body on solar farm impacts with respect to impacts on animal and plant populations as noted by (Chock, Clucas, Peterson, et al, 2021) also noting 'studies of wildlife behavioural response to solar facilities have been called for, including bird interactions with solar facilities'. Migrating and ground breeding birds and raptors could be vulnerable to the effects of changes in landscape/habitat effected by solar developments, presenting barriers to preferred food sources, shelter, and availability of breeding sites presently largely undocumented in depth with regards to solar farm development.(Montang,Parker & Clarkson,2016) also suggest , with particular reference solar farms in agricultural that further studies to be made with respect to nocturnal raptors(i.e. owls) ,skylarks, small mammals, bats and brown hares. They also recommend research into their effects on amphibians, reptiles and other invertebrate species. (Lovich & Ennen,2011) corroborate the findings above with their original studies on reptile and tortoise populations in the Southwestern United States highlighting a key question regarding the cumulative impacts on wildlife from solar farm technologies, as regards wildlife betterment if development was concentrated or small, scattered over larger areas. (Armstrong et al,2016) also describe, seasonal and diurnal variation in the 'ground-

level microclimate' having an effect on levels of carbon present in soil and conclude that the effects of solar PV developments on plant- soil processes merit further in-depth investigation. A comprehensive paper from Hernandez et al (2014) also evaluates the general beneficial and adverse effects of solar technology on biodiversity, land use and land cover change, soil, water and human health impact. Fig (1) below taken from this study summarises the key potential effects on environment and ecological responses, that may arise from the construction, operation and decommissioning of a solar farm.

Brynryd Solar farm, being in close proximity to 3 other Solar Farms(One existing, two approved recently), set on agricultural pasture land , surrounded by extensive woodland and hedgerow habitat and near to Special Areas of Conservation(SAC) provides a perfect opportunity for conducting long term monitoring /data collation to enable better understanding for the solar renewables research and industry professionals regarding cumulative effects of grouped developments and the efficacy of potential mitigation measures.

Community Benefits:

(Kerr Person, Johnson & Weir et al ,2017) note the common practice for renewable energy projects to make financial, or in kind, payments to local communities described as 'benefits payments' or 'compensation schemes and has the potential to mitigate opposition from local communities to developments. In Wales the current situation is towards light touch guidance regarding such benefits, however the paper also notes that there is potential for policy makers to mandate such benefits using existing legislation and policies.

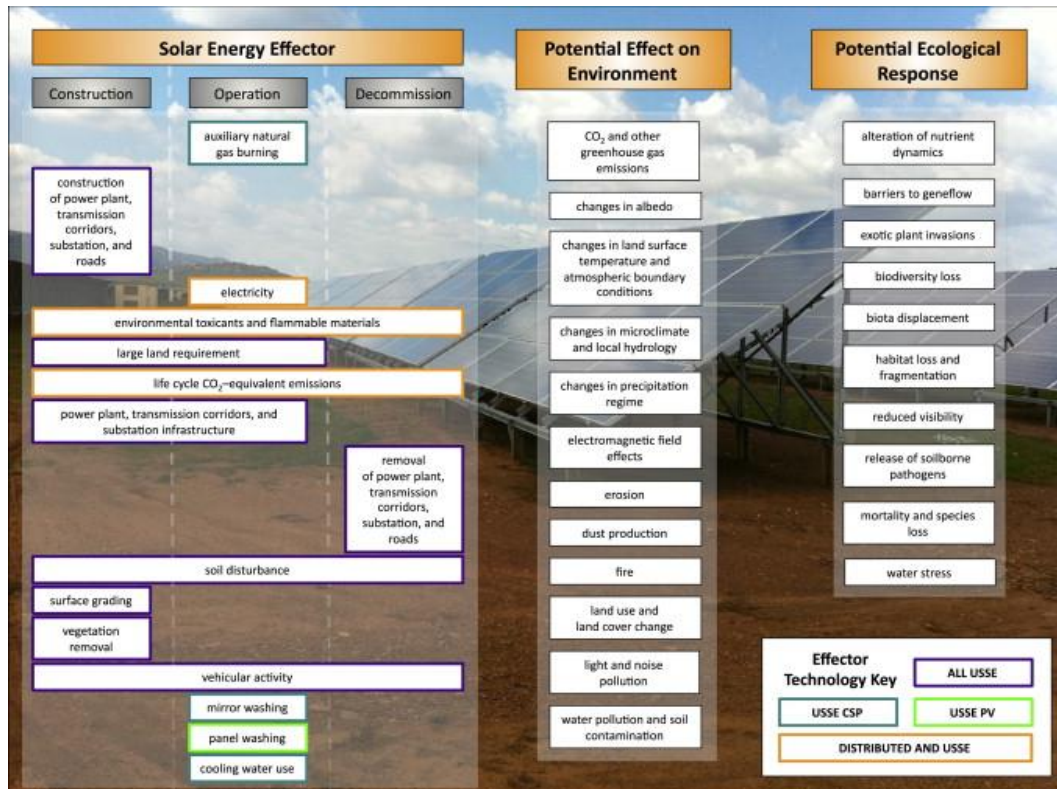


Fig 1: Diagram to show Environmental Disbenefits associated with Solar Farms (Hernandez et al (2014))

1.5 Brief description of requirements for EIA process of a (DNS) & associated policy and legislation.

The core of the E.I.A. Process:

In essence EIA is a regulated decision-making tool, supported by international, national and local policy and legislation.

It should guarantee environmental protection and transparency with regard to the decision-making process regarding public and private development whilst ensuring that environmental concerns are considered on inception or during subsequent changes or extensions. Existing UK statutory legislation governing the E.I.A. process is derived from the EU directive (*Directive of the 2014/52/EU of the European Parliament and the Council ,2014*) summarised in Summary Table (2) below.

Summary table 2: Core EU Directives behind E.I.A. Regulations and Action

EU's Environmental Impact Assessment (EIA) Directive	Origin Legislation:	Sphere of Action	Focus of E.I.A. Assessment
Main Law: 2011/92/EU Amended by by <u>2014/52/EU</u>	The first Environmental Impact Assessment Directive (85/337/EEC) came into force in 1985 The Directive has been updated four times to bring it in line with the EU's international commitments and other legal developments. In 2011, Directive 85/337/EEC and its subsequent amendments was codified into a single new act (Directive 2011/92/EU) that is currently in force	Major building or development projects in the EU must first be assessed for their impact on the environment. This is done before the project can start. An EIA is required for the various projects such as Nuclear power stations long-distance railways motorways express roads waste disposal installations for hazardous waste dams of a certain capacity For other projects, including urban or industrial development projects, roads, tourism development and canalisation and	The EIA assesses the direct and indirect significant impact of a project based on a wide range of environmental factors, including •population and human health •biodiversity •land •soil •water •air •climate - landscape •material assets •cultural heritage project developer must provide the approval authority with a report containing the following information •description of the project (location, design, size)

		flood relief works, decided by individual EU Member States case by case to decide if there will be an EIA by setting specific criteria (such as the location, size or type of project).	•potential significant effects •reasonable alternatives •features of the project and/or measures to avoid, prevent, reduce or offset likely significant impacts on the environment. There are also strict rules about how the public is informed of the project and the fact that it is subject to an EIA procedure and how those affected can participate in the decision-making process. The public is also informed of the decision afterwards and can then challenge before the courts.
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Summary Table (3) below summarises the main stages in the process described by the Regulations facilitating the developer to operate the E.I.A process in conjunction with public consultation and input from all statutory and non-statutory stakeholders to assess all the potential ‘significant’ environmental impacts present by a proposed development.

Emerging out of this consultation will be information usually consultation responses, stakeholder correspondence / recommendations, technical reports and development scheme details. These are enshrined in the Environmental Statement (ES) (or Environmental written statement for perusal of the approved body decision maker, usually the Local Planning Authority (LPA) or Welsh Government (W.G.) for DNS: a brief overview of the EIA process is carried out for DNS is described below.

Summary table 3: Overview of the Environmental Impact Assessment Process

(Adapted from 'Environmental Impact Assessment' (Gov..UK,2022))

<i>E.I.A.Stage</i>	<i>Description of stage- reword</i>	<i>EIA Regs / Process Consideration/Follow on process</i>
<i>Screening</i>	Determining whether a proposed project falls within the remit of the Regulations, whether it is likely to have a significant effect on the environment and therefore requires an assessment.	Must be adopted within 21 days of receiving screening request (reg 8(8_ of regs 2017 LPA/Planning Inspectorate must notify Consultation bodies to whom applicant intends to supply ES- under duty imposed on them under reg 11(3) Under Reg 11(1) LPA/Planning Inspectorate will give applicant list of notified consultation bodies and any Reg 11(1)c- consultees, considered likely to be affected or have an

		interest in proposed development
<i>Scoping</i>	Determining the extent of issues to be considered in the assessment and reported in the Environmental Statement. The applicant can ask the local planning authority/Planning Inspectorate for its opinion on what information needs to be included (which is called a 'scoping opinion').	Reg 10(1) allows applicant to ask Pins in this case on opinion written on scope and level of information to be provided in the ES. Scoping opinion Pins must adopt within 42 days of receiving scoping opinion. 'An effective scoping process should enable the refinement of the assessment and ultimately the information required to form the ES. If done well it allows for an early identification of

		the likely significant effects applicable to the EIA Regulations'	Not a statutory requirement to seek a scoping opinion-pertinent here but is the most important document and EIA regulations require the ES to be based on the most recent one (Reg 14(3)-Advice note 7
<i>Preparing an Environmental Statement</i>	an	Where it is decided that an assessment is required, the applicant must prepare and submit an Environmental Statement. The Environmental Statement must include at least the information reasonably required to assess the likely significant environmental effects of the development To	listed in regulation 18(3) and comply with regulation 18(4). Reg 11-procedure to facilitate prep of ES Reg 14: establishes info for ES inclusion.

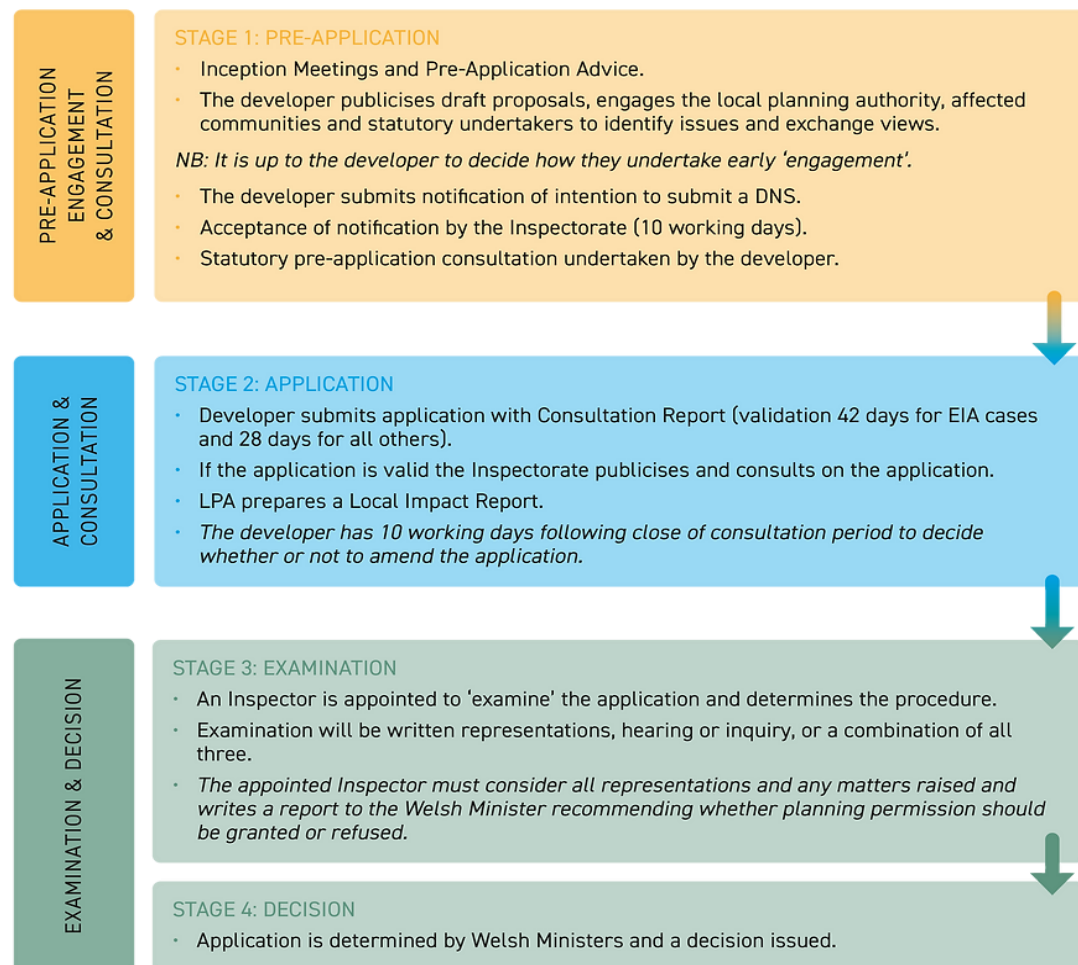
	ensure the completeness and quality of the Environmental Statement, the developer must ensure that it is prepared by competent experts. accompanied by a statement from the developer outlining the relevant expertise or qualifications of such experts.	
<i>Making a planning application and consultation</i>	The Environmental Statement (and the application for development to which it relates) must be publicised electronically and by public notice. The statutory ‘consultation bodies and the public must be given an opportunity to give their views about the proposed development and the Environmental Statement	EIA Regulations 13, 16, 19, 20, 22 and 24 also refer to notification requirements with regard to Regulation 11 (1) (c) persons.) 3. Non-prescribed consultation bodies

<i>Decision making</i>	The Environmental Statement, together with any other information which is relevant to the decision, and any comments and representations made on it, must be taken into account by the local planning authority and/or the Secretary of State in deciding whether or not to grant consent for the development. The public must be informed of the decision and the main reasons for it both electronically and by public notice	As part of reviewing the Environmental statement, decision makers will review mitigation, management and monitoring measures proposed by the developer in response to identified impacts, with the aim to avoid, reduce, restore or offset effects on immediate environment, animal and human populations: effects on combatting climate change Impact in reference to relevant national and local policies and consideration of accident risk are also now primary considerations during the process and should be covered in the ES documentation during the E.I.A. process.
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1.6 Developments of National Significance DNS

A new category of development, known as ‘Development of National Significance’(DNS) was created via Welsh Government legislation (*The Planning (Wales) Act 2015*) mandating Welsh Ministers to be the final determinant for DNS projects, Developers of DNS projects are therefore required to submit planning applications to be directly to Welsh Government to determine DNS projects,

Fig 2: A Summary flowchart of the DNS Consultation and Decision-making process from the ‘Brynrhyd Solar Farm Community Consultation Site’ (The Pegasus Group,2022)



application criteria for which is set out by (*The Development of National Significance (Procedure) (Wales) Order 2016*) with minimum consultation requirements of the procedure set out in Articles 7, 8 & 9. A summary of the consultation process is shown in Fig 2, above.:

2 Brynrhyd Solar Farm

2.1 Brief Overview Brynrhyd Solar Farm Development Proposal

In section two the basic fundamentals of Solar PV photovoltaic ground arrays and perceived benefits and disbenefits were described; placing the Brynrhyd Solar Farm Development proposal into this context, it is not 'atypical' in terms of component elements and proposed benefits and disbenefits; it is also comparable in both benefits and disbenefits with Clawd Ddu and Ty Croes and Penderi Solar farms (the latter have recently gained consent from Welsh Government, with Ty Croes not requiring an E.I.A. and Penderi requiring an E.I.A. assessment respectively)

Summary Table (4) below provides a synopsis of the main element proposal and key components, followed by an overview of essential aspects of the scheme, regarding, 'Access and Routing', 'Site Selection' and consideration of 'Alternate' design, in addition to additional information concerning the key components of the scheme.

Summary Table (4): Main Element Description and Key Components of the Brynrhyd Solar Farm Development Proposal.

Main Element Description	Key Components
Ground Mounted Solar Park, with maximum export capacity of 30 MW:	1.Solar photovoltaic arrays: ground mounted: south facing.
Operational Life of 40 years: exporting renewable energy to the grid for the duration.	Max top height of solar panel to framework :3.0m
<i>'Design Alternatives considered: To do nothing.'</i>	Min height of solar panel to framework: 0.7 m
<i>Renewable energy/Carbon Displacement:</i>	Colour: Dark blue/grey/black
	PV Frame: anodised aluminium alloy

Anticipated to produce in total energy to power@ 10,600 homes/annum. CO2 displacement is around 15,000 tonnes per annum. (Adapted from descriptions in Section two and Section Three of the Environmental Written Statement Sept 2021 (Pegasus Group, 2021))	Slope of Solar PV from horizontal 15 degrees. Internal access track: permeable construction Minimum distance between edge of panes and the perimeter stock fencing @ 2 M Galvanised Steel Mounting to support PV module frame, which supports PV arrays. CCTV's will be positioned along perimeter: housed on 3M poles.
	2. Ecological and Biodiversity Management Strategy: Creation of new grassland habitats, seeding existing arable with native, appropriate species mix. Hedgerow Planting. Manage grassland outside arrays, in 'swards' for wildlife. Manage areas to provide suitable conditions for 'arable flora' Manage hedgerows existing and new for habitat creation for range of species. Manage aquatic habitats appropriately and to prevent pollution form construction/operational /decommissioning phases of scheme.

	Provide shelter features around the site for nearby populations of bats, birds and other identified 'important species', i.e. dormice, reptiles, amphibians. Assess need/implementation for additional required along outer edge of development resulting from any woodland clearance on site boundary. Monitor site and assess success of management and adherence to management measures described in LEMP/EPP/Aboricultural Report (and CeMP/CTMP)
	3.Substation To take power from development, to utilise underground cable to Ammanford substation, on Heol Ddu, south of Ty Croes. Consisting of: Gated compound and switch room/meter room and Single communications tower: Two alternatives have been proposed, 25M or 15M lattice tower, (to be informed by National Grid requirements)

	Third option to the former, could be an underground cable, instead of tower. Cable trench to DCO to be dug along local roads to connect Ammanford Primary Substation- could include third option for communications cable)
	4. Temporary Construction and Decommissioning Compound: One main compound to serve construction phase, located off main entrance, reducing delivery distance for vehicles. CEMP/LEMP/CTMP – outline plans to be finalised /approved and submitted to LPA, conditioned on development consent. Solar farm to be constructed in one phase. Time period@ 6 months and @ 844 vehicle movements for plant and machinery deliveries. This would equate to about 5 deliveries per day- largest vehicle to be 15.4 m articulated. Construction Activities to be carried out Monday- Friday 07:00-20:00 Saturdays 08:00-13:30

	Construction Deliveries to be carried out Monday- Friday 10:00-16:00 Saturdays 10:00-13:00
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Development Site:

A map depicting the scope and boundary (marked in red) for the overall site can be found in Appendix 2a (however, a full set of drawings for the scheme is located in the introduction of the final Environmental Written Statement (E.S). and on the website (The Pegasus Group,2022)

The development site is centrally located at Bryn-y rhyd Farm Llaendi, Pontarddulais, surrounded by ‘pastoral’ farmland from Bryn-y Rhyd Farm, Bryn Arwel Farm, Tirgwaid and Gelli Organ Farm. Situated on the west side of the LLwchwr/Loughor valley between Tycroes and Llanedi. It is also bisected by Heol Troeon Bach which runs from Tycroes to Llaendi, between the existing Clawd Ddu Solar Farm, Penrhiw Cottage, the Old School Yard, Gelli Organ Farm, Sychnant Farm, Pentre Hardd and Llaendi. The eastern part of the site extends downwards to Erw-wastad-fawr Farm. Cllawd Ddu is located 0.18 km from the north eastern portion of the site.

The cable route is proposed to utilise the local road network to the northeast of the site and will connect to the existing DNO substation node at Tycroes (site for newly consented solar farm) Llwwchwr Valley Special Landscape Area (SLA) also covers part of the site, which is also near to a total of 22 ‘Important Ecological features’(IEFs) listed below in Summary table (5) below:

Summary Table 5: Important Ecological Features for Brynrhyd Solar Farm Site Proposal

(Adapted from Section Four of the Environmental Non-Technical Statement (Pegasus Group,2021))

IEF Description: Area	IEF Description: Species
Caeau Mynydd Mawr Special Area of conservation,	Badgers
Caeau Ffos Fach SSSI,	Bats
Caeau Afon Gwilli SSSI,	Otters
Caeau Blaenae – Mawr SSSI	Water voles
Caeau Lotwen SSSI,	Dormice
River Loughor SINC	Birds
NRW Priority area- Heathland and Grassland	Widespread Amphibians
Hedgerows and woodland edges	Reptiles
Ancient Woodland	Invertebrates
Ditches	Invasive species (Japanese Knot Weed, Himalayan Balsam)
Watercourses	

Biodiversity Enhancements:

In addition to the measures outlined in summary Table 4 above favourable conditions are to be created on the tip of the North-western portion of the scheme for Marsh Fritillary Butterfly larvae (coinciding with the NRW Priority area).No larvae have been found on the site, it is presumed conditions may arise in this area providing habitat for the marsh fritillary butterfly meta population, over the lifetime of the development.

Access and routing:

Access to the site will utilise the Heol Troeon Bach Lane and an existing farm junction serving Gelli Organ Farm, which provides agricultural access for large vehicles.

Routing for heavy goods vehicles to access the site during construction will be by the B4297 Ebenezer Road, all traffic will be following a designated route utilising the

M4/A48 junction/A482 gyratory roundabout to the west and the A48, B4297 Ebenezer Road and access track as described.

Vehicles will exit north using the Ebenezer Road and slip road onto the A483 to route vehicles back to the designated route above. An Outline Construction Traffic Management plan has been produced regarding the above and can be found in the Environmental Statement Technical Appendices (ESTA), along with the Outline Landscape and Ecological Management Plan, (LEMP) Construction environmental Management Plan (CEMP), outline decommissioning strategy, Flood Risk Assessment and Design and Access Statement. Other supporting reports and surveys, e.g. Preliminary Ecological Assessment, additional species surveys are also located here.

Site Selection:

Positioning of this development proposal was dependant on constraints in finding a viable point to access utilities network (served by an existing National Grid connection based at the Ammanford Substation to the north of the main site) the developer has accepted the grid offer from National Grid and obtained the required 30 MW export capacity, which can only be utilised for the Brynryd Development and is non-transferable to another scheme.

Alternatives:

In considering alternatives to the current scheme proposal, the option would be the 'do nothing' approach, which would be to leave the pastureland in use for open grazing (effectively not contributing to additional cropping and or energy production) That said, the developer has had an Agricultural Land Classification Report prepared by Rob Askew Soils which can be found in Appendix 3.1 of the Environmental Statement Technical Appendices (Pegasus Group, 2022). The report confirms that the scheme would be using 'subgrade 3b' land '.

Considering the potential land take implications of the development it can be confirmed it would not be capable of comprising "best and most versatile" agricultural land'. Summary Table (6) compares other potential agricultural uses of the land, in terms of energy output of MWh per acre to energy generated from solar power: the comparison demonstrates that using the land for the solar farm development would be more efficient with regards to energy production from the land.

Summary Table (6) To illustrate Energy Source/Crop MWh per acre, per annum(Adapted from table 4.2 in the Brynrhyd Solar Farm Environmental Written Statement: Sept 2021 (Pegasus Group,2022)

Energy Source	MWh/Crop per acre per annum (approx. values)
Ground Mounted Arrays	186 MWh per acre per annum
Short rotation coppice	19 MWh per acre per annum
Miscanthus	26 MWh per acre per annum
Wheat Straw	5 MWh per acre per annum
Rapeseed oil diesel	5 MWh per acre per annum
Bioethanol (from wheat)	7 MWh per acre per annum
Bioethanol (from sugar beet)	13 MWh per acre per annum

2.2 Overview and evaluation of ES Documentation and E.I.A. consultation process: Overview of ES Documentation:

The Environmental Statement (ES (citation)) submitted in September 2021 is a logically set out document, with most accompanying technical reports set out in a separate Environmental Statement Technical Appendices (ESTA) The Environmental Non-Technical Statement (ENT) also accurately reflects the main ES document and is not a mere overview of the EIA assessment process conducted for the scheme.

The ES submitted in September 2021, presents as the product robust consultation progress: comprising of technical topic reports, pre/post consultation surveys and addendum material supplied by competent and appropriately qualified experts, satisfying a fundamental requisite of the E.I.A; an overview of the main consultants are presented in Summary Table (7) below)

Summary Table (7) Summary of E.I.A. Consultants (Brynryd Solar Farm E.I.A. Assessment)

Consultant	Topic Area
Pegasus Group	E.I.A. Co-ordinator and consultants for E.I.A. process on behalf of Voltaia Uk and Island Green Power (IGP)- parent company to the developers 'BrynRhyd Solar Farm Ltd': Co-ordinated E.I.A. General chapters, Technical topics: Landscape and visual Cultural heritage and archaeology Socio-economic miscellaneous matters
Clarkson and Woods	Ecological Consultant: Responsible for Ecological Chapter, introduction and main statement, surveys, LEMP, CeMP and co-ordinating Aboricultural Survey Consultant
Integral	Ground Conditions Consultant
Ion Acoustics	Noise and Vibration Consultant

The ES contains a clear site description of the development, environs, referencing a complete set of annotated scheme drawings, flood risk assessment, Design and Access statement and an Outline Construction Environmental Management Plan (CEMP) to manage all impacts identified as a consequence of the construction phase, (including clear guidance for the appointed Ecological Clerk of Works (ECoW) and site manager for the Construction phase)

A comprehensive Construction Traffic Management plan (CTMP) is also included, to manage any impacts anticipated during the construction phase. For some species groups it is concluded there could still be 'long term adverse effect' of some species persisting into the operational phase, due to modification of habitat via the presence

of solar PV arrays and infrastructure. However, the measures outlined in the CEMP, CMTP and extensive Landscape and ecological Management Plan (LEMP) are anticipated to reduce impacts for the majority of species and habitats to a reduced or non-significant level.

Additionally, the planned biodiversity enhancements for the operational phase of the development are anticipated to provide an overall 'beneficial' impact.

It should be noted that there is also a comprehensive Arboriculture report (to inform a condition survey of all trees affected by the development and a root protection schedule for all existing trees, inclusive of those lining proposed scheme access routes).

A (Habitat Regulation's Assessment (HRA) was also carried out to screen out impacts on the nearby Caeau Mynedd Mawr SAC. Additional Badger, Bat and Dormouse species surveys have also been conducted to verify the efficacy of proposed impact mitigation and monitoring measures; to summarise we can conclude a satisfactory case has been presented to justify the assessment that , construction/operational impacts due to potential fragmentation, loss, modification of habitats, disturbance of species via noise and vibration, degradation of habitats via pollution or dust and incident mortality of species through construction of the scheme has been comprehensively assessed. Furthermore, impact mitigation and monitoring measures, especially concerning Ecology and Nature Conservation, have been informed through assiduous technical assessment, in addition to feedback from statutory and non-statutory consultation (assessed below)

A concise Climate Change and Policy section also demonstrates the developer's awareness and understanding of international, national and local policies regarding the Climate Emergency and local/national government strategies aimed at reducing carbon emission reductions via adoption of a low carbon economy, inclusive of the energy sector. Throughout the report, there is a clear framing and assessment of all impacts and mitigation proposals, with regard to Welsh National policy, e.g., 'Future Wales the National Plan 2040(Gov.Wales,2019) and supporting planning legislation. This approach is also consistent with making considered assessments of climate change resilience and adaptation laid out in a recent guideline (IEMA,2020)

Evaluation of Consultation Process:

From summary table (8) below we can see that the developer has complied fully with the consultation process as per the E.I.A. process and the policy in accordance with minimum consultation requirements are set out in The Developments of National Significance (Procedure) (Wales) Order 2016 (as amended); Articles 7, 8 & 9.

Moreover, as required under article 8(1)(a)(ii) and 9(2) and 9(3), the developer confirms in a separate consultation report (available on the community consultation website, Brynryd Solar Farm (2022)) that letters and notices were sent to all owners or occupiers of land adjoining the development land, nearby community councils, relevant persons and specialist consultees.

The consultation packs were released on 19th March 2021, coinciding with the consultation website launch, The developer also continued to engage with stakeholders after the post statutory engagement consultation, resulting in 'stakeholders having a clear influence on the development'

'In line with the Planning (Wales) Act 2015, they have also considered the Welsh language during this process adopting specific steps during the planning application process such as publishing advertisements and public notices bilingually. They also facilitated the community to communicate directly in Welsh, by email or telephone, directly to a key member of the main project team without the need for any translation service'

Reported responses range from concerns with regards to the visual impacts of the development, impacts regarding loss of agricultural land impacts on Biodiversity and concerns over decommissioning of the scheme. Additionally concerns over Community benefits, the consultation strategy project impacts on the Welsh Language were also raised.

Furthermore, despite not being able to hold in person community consultation sessions (due to Covid restrictions) there is substantial evidence that that, overall, the developer went above and beyond to include stakeholders and acted appropriately on feedback received i.e., by incorporating design changes and/or undertaking further survey work e.g. Residents raised concern over cumulative impacts of the

development in conjunction with other nearby existing (or proposed) schemes on visual amenity and requested enhanced review of the impacts. This was carried out and the array scheme altered as a consequence.

Llanedi Community Council (LLCC) also raised questions over the form and magnitude of community benefit available (it should be noted here that the developer had carried out a reasonable prior assessment of Socio-Economic Impacts)

In response the developer revisited this as a separate discussion with all potentially affected local community councils, in addition to (LLCC). The developer reports in their Consultation response that ‘The Community Council has expressed a preference for the community benefit being given in the form of financial contributions towards the development of a community centre. The applicant has therefore suggested an amount to contribute and is awaiting a definitive response from the Community Council in this regard ‘

In summary it can be concluded that all potentially affected stakeholders, have been consulted in line with E.I.A. process and that their feedback/recommendations have been regarded, or translated into follow up actions (or extra investigations). This has enabled further refinement of scheme design and efficacy of proposed impact mitigation methodologies.

Summary Table (8): Timeline of Consultation for Statutory/ Informal and Formal Pre-application and Post Application Advice:

Adapted from Brynrhyd Solar Farm (ES) Consultation Report (Pegasus Group,2022)

Consultation Timeline	Key Dates	Description
Environmental Impact Assessment Screening Direction	2 October 2020 to 4 November 2020	Applicant submitted request for a Screening Direction under Regulation 6 (1) of the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 on 2 October 2020. The Planning Inspectorate issued their Screening Direction on 4 November 2020.
Informal pre application advice	17 th November 2020	Applicant submitted a request to Carmarthenshire County Council for pre-application advice.
Notification	February 2021	In February 2021, the applicant gave formal notification to the Planning Inspectorate of its intention to submit a planning application
	From 9 March 2021 to 8 March 2022	From 9 March 2021 to 8 March 2022 Notice of Acceptance provided by Planning Inspectorate on 9 March 2021. Notice of acceptance is

		valid for 12 months and the statutory consultation and submission of application must be made by 8 March 2021.
Statutory pre- application consultation	From 19 March 2021 to 30 April 2021	The statutory pre-application consultation was carried out for more days than the minimum 42 days. A draft Environmental Statement accompanied the pre-application consultation, and this was made available to all specialist consultees. In line with Planning Inspectorate guidance, the Habitats Regulation Assessment process were considered early on in the development of project a draft HRA assessment accompanied the draft Environmental Statement. ¹
Post Statutory Consultation	10 th April 2021	Consultation and continued engagement undertaken between April 2021 and July 2021 to keep stakeholders informed of progress and to keep consultees informed on final minor refinements to scheme. This

		included continued discussion and agreements with specialist consultees, as topic specific competent experts, over the scope of works for the Environmental Statement in response to the Assessment of Environmental Statement issued by the Planning Inspectorate dated 13 July 2021 and 18 August 2021.
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2.3 ES Documentation and Consultation: Weaknesses:

The final scoped in ES technical sections include Landscape and Visual, Ecology and Nature Conservation, Socio Economics, Cultural Heritage and Archaeology, Ground Conditions, Noise and Vibration, Miscellaneous Matters. These Technical Chapters show evidence of following a logical sequence of assessment methodology (i.e., baseline assessments, impact identification and mitigation measures) inclusive of all relevant technical reports were included: the LIVA technical report being most comprehensive, in addition to the LEMP.

However, it should be noted that the main ES document reviewed, formed part of the planning application submission for September 2021, this followed on from applying addendums undertaken by the developer's co-ordination team, under direction of the Planning Inspectorate, post evaluation of the ES documentation in June 2021, initially turned away in July and August 2021 respectively.

On completion of recommendation steps by the Planning Inspectorate, the developer resubmitted the ES documentation as part a planning application submission in September 2021, subsequently validated in October 2021. A formal public hearing with consultees and the planning, completed the process in December 2021, with the decision for consent still pending on production of the final report from the PEDW to be submitted to Welsh Government for granting final consent.

In the next section we will briefly examine the report recommendations made by the Planning Officer, which illustrates that, far from being a flawed assessment tool, the EIA process can be used to effectively identify and mitigate complex. assessment shortcomings.

In this case the developer (and E.I.A. co-ordination team) despite, numerous years of experience in assessing similar proposals had failed to appreciate the required level of scope for this scheme. Additionally, they had not always followed guidelines regarding fundamental document layout, and how to define clearly, within the text, the relationship between core assessment terms and inferred impact outcomes.

Although not mandatory, it is considered best practice to seek a scoping opinion of the approved decision maker (Planning Inspectorate), via a scoping report. Unnecessary time delays occurred by assuming the initial screening opinion sought from the Planning inspectorate, formed the basis of defined technical scope to be assessed. This is not a failure of the E.I.A. process perse, but rather an error of judgement on the part of the developer.

2.4 Overview of Planning Inspectorate Pre-Application Consultation Process for Brynrhyd Solar Farm:

Screening:

On October 2nd, 2021, the developer submitted a request to the Planning Inspectorate (on behalf of the Welsh Government) a request, to make a screening direction on E.I.A. status of development, via interpretation of regulation31(1) of the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulation 2017(as amended) [“the Regulations”]

On November 4th 2020, the Planning Inspectorate confirmed the development was an EIA based on the fact that the scheme would be in an area ‘where there may be cumulative impacts with other solar developments’ based on information supplied, they noted that the north western fields were NRW priority habitat comprising ‘species rich grassland which may support marsh fritillary butterfly, breeding skylark and meadow pipit’ The screening opinion was summarised as being due to there being the possibility of “likely significant effects in regards to cumulative landscape and visual impacts and ecology(Pegasus Group,2021)

As discussed in previous section ES documentation made in June 2021 was based on the screening opinion, and no further scope report was submitted or opinion sought thereafter. The technical scope contents of the ES June Submission 2021 report are summarised in Summary Table (9) below, together with comments from the initial evaluations in July 2021 and August 2021 issued from the Planning Inspectorate, with recommendations to turn the documentation away on grounds due to incompleteness on both occasions.

Summary Table (9): Planning Inspectorate Initial Evaluation of ES: Brynrhyd Solar Farm, June Submission.

(Adapted from Environmental Statement Technical Appendices (Pegasus Group, 2021))

Submission Documents to Planning Inspectorate: June 2021	Technical Subjects Scoped -Out by Developer	Technical Subjects Scoped -in by Developer
The Environmental Statement (Written Statement)	Agriculture, Air Quality, Hydrology and Ground Conditions, Archaeological and Cultural Heritage, Accidents	Landscape and Visual Impact Assessment (LIVA), Ecology and Nature Conservation, Socio- Economic Impact.
The Environmental Statement Technical Appendices		
The Non-Technical Summary (NTS)		
Additional Reports Submitted with the ES Documentation:		

**The Agricultural Land
Classification submission**

**The Heritage Desk-Based
Assessment**

**The Operational Noise
Assessment**

The Geophysical Survey Report

The Badger confidential Report

**The Coal Mining Risk
Assessment**

Planning Officer:

**Key Comments and
Observations following June
Submission 2021 of the Brynrhyd
Solar Farm Development
Proposal:**

1." I note that the Applicant has decided not to request an EIA Scoping Direction but has regarded the EIA Screening Direction as the base for the Environmental Statement's (ES)scope. In many instances I found that this choice was not supported by robust evidence and sufficient reasoning and as a result I consider the ES to be deficient."

2. Overall, the information included in the ES is not presented in an organised manner, in particular with regards to the description of the development. Elements of the project are not presented at the beginning of the document but randomly placed in the technical assessments, making the review difficult"

3. Important information on the project which would have been relevant in the ES is instead presented in separate stand-alone reports which are not part of the EIA process, and thus are not prepared in accordance with the EIA Regulations. The rationale behind this choice

is not explained. Nevertheless, I have reviewed the stand-alone technical reports as part of this review.”

The reiterative mechanism of the EIA process is well illustrated here and provides prior scrutiny, to assess the quality of presented decision making documentation. Without it there would be a paucity of data, precluding the ability for stakeholders to clearly evaluate, corroborate or reject the significance of presented impacts and mitigation strategies (especially important regarding mitigation measures which could therefore be based on faulty premise)

In either case the incompleteness of the documentation (e.g., either in the form of missing baseline data, survey or report data) present a barrier to stakeholders and the Planning Inspectorate to make informed responses during consultation, and for the latter to decide ultimate recommendation to recommend rejection or consent for the scheme.

To sum up, it is clear that technical data, surveys and compliance with E.I.A. regulations and (in accordance with overarching national and local policies) had been carried out before this first submission, as evidenced by initial ES Document contents and the accompanying assessments. However, unnecessary time was lost as the developer made the assumption that the screening opinion was complete enough to serve as a scoping opinion. This assumption would have may have been reassessed if the developer had gone through the process of preparing a scoping report.

Despite a decade of experience, the E.I.A. coordinating team had forgotten that the E.I.A. process is not generic and though two developments may be essentially similar in type, their assessment criteria/scope may regardless, differ considerably, i.e., as per the example of nearby Tycroes (non E.I.A. development) and Penderi (E.I.A. Development) solar farm schemes respectively)

Summary table (10) below, sets out the Planning Officer assessments responses for ES Documentation submissions in June 2021 and July 2021 respectively. Post evaluation the Planning officer makes a report to the developer, outlining deficiencies

and puts forward recommendations for correction. Her initial assessment in the main was incorrect presentation and inclusion of information in the ES document as a whole, incompleteness in site description and incorrect choices regarding scope range of technical topics (and subsequent impact assessment).

In summary, the E.I.A. process provided a means for the Planning Officer to provide a necessary check and balance for the developer, despite time taken to make the necessary addendum changes (and to carry out other related actions, i.e., undertake new surveys, consult back with key stakeholders).

Summary Table (10) Planning Inspectorate Evaluation Report Recommendations for Brynrhyd Solar Farm, June & July 2021 Submissions.

(Adapted from Environmental Statement Technical Appendices (Pegasus Group,2021)

d in Element	PO Annex I recommendation	PO Annex I recommendation
	After13/07/21	After evaluation of Addendum Submission:21/07/21
Ecology and nature Conservation	A revised Ecology chapters. Surveys for protected and notable species should be conducted during the correct time of the year and not simply assumed that such species are present on site. The conservation value of the Site should be reviewed in light of the results of the surveys to inform the correct identification of the potential impacts and adequate mitigation measures. The assessment should also include a statement outlining the limitation of the	Protected species surveys (bats, water voles, otters and breeding birds) should be completed at the correct time. The ecological assessment should be amended following the results of the surveys, where necessary.

	assessment and a cumulative impact assessment.	
Landscape and Visual	A revised LVIA chapter should be included. The LVIA should present a consistent methodology in accordance with the GLVIA 3rd edition, taking into account the comments included in this ES review, including but not limited to: the limitations encountered during the assessment, how the viewpoints were selected, the temporal extent considered in the assessment within the lifespan of the development, the rationale behind the identification of the significance of the impacts and details of how visualisations were produced and the selection criteria. The cumulative impact assessment should also be reviewed. A full review of the methodology may have a knock-on effect on the significance of the impact identified in the original chapter. This may lead to a review of the conclusions of the assessment, including mitigation measures and residual impact	An amendment to the LVIA chapter including the definition of technical terminology used in the assessment is included. Where the assessment of the impact of the proposed development on landscape has been separated into two assessments (landscape elements and landscape character), the chapter should explain what the two assessments are considering as part of the same resource: landscape. Additionally, an explanation is sought as to why the magnitude of change of the landscape character is considered low beyond the site boundaries P.O notes: Clarification is still required in terms of the

LVIA methodology
although

some points raised in the
previous ES
completeness report
have been addressed:

- The LVIA should clarify which paragraphs assess the landscape cumulative

impacts and which
assess the visual
cumulative impact.

- The LVIA should justify the assessment of the single viewpoints, in

particular where
professional judgement is
applied.

Archaeology and Cultural Heritage

- An Archaeological impact assessment to be included in the ES and compiled in

accordance with the
requirements of the EIA
Regulations: i.e. the
limitations

encountered during the
assessment, the
presentation of baseline, the
identification

of the potential impacts and
their significance and the
inclusion of enough detail of

- Table 2.1 has been expanded in line with the original ES completeness report.

An Archaeological and
Cultural Heritage chapter
has been prepared. The
assessment concluded
that the proposed
development will not
have

significant effects on the
identified receptors but
mitigation measures are

proposed but not
described. If mitigation

	the mitigation measures to ensure a full understanding of the significance of the residual impact	measures are deemed necessary, draft scheme of investigation should be included to support the mitigation measures proposed. P.O. notes: ‘A draft scheme of investigation should be provided as part of the archaeological mitigation measure’
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Other ES Chapters and previously ‘Scoped Out’ Technical Elements Assessments

Site Description and Cumulative Impacts with neighbouring solar farms	The Description of the development needs to be expanded. It should cover all the elements (buildings, substations, internal roads, masts, infrastructures, etc.) that will form the proposed development. Size, aspect and location should be included in the description. Cumulative Impacts: Description needs to be expanded and choices clarified:	The description of the development has been expanded in Chapter 4. It includes details of the proposed structures, construction methods, vegetation clearance, traffic generation during construction and predicted waste generation. The information has been drawn from other supporting documents which were not previously part of the ES but are now included. P.O. Notes: ‘I find that the description of the development is complete.’
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	Paragraph 2.10.2 states that” The identification of sites draws upon the information provided by the statutory consultees as part of the consultation process and information in the public domain relating to other known major developments that are proposed in the locality.” P.O notes the ES First Addendum does not clarify why only solar schemes are considered and the Applicant’s response (comment No.20) redirects to Carmarthenshire County Council’s (CCC) letter dated 29 April 2021. PO checked the consultation response though not part of the ES, and noted that CCC states that a significant adverse cumulative impact with other solar schemes is considered likely, but no other developments are reported.	The consideration of cumulative impacts is clear and complete: Section 2.10 of the ES First Addendum has been expanded and includes a list of solar farm developments considered as part of the assessment of cumulative and in combination effects. And agreed that the ES First Addendum provides justification for which projects are selected (as per request of additional information dated 13 July 2021).
Ground Conditions	Construction methods, vegetation clearance, waste generation to be	Addendum now includes a Ground Conditions

	included.	chapter, a Noise and Vibration chapter and an additional chapter titled “Miscellaneous
Noise and Vibration	Measures necessary to reduce risk during construction, including risk	Matters” which include considerations on climate change, waste and risk of major
Miscellaneous (Accidents)	prevention due to surface mining activity should be explained. If public footpaths	are affected by the proposed development, this should be included in the
	description of the development. If the panels will be installed using pile-driving	P.O Notes:
	methods, any measure to prevent noise and vibration affecting nearby properties	A Ground Condition Chapter has been prepared.
	should be included.	P.O Notes:
		A description of potential mitigation measures required should further
		ground investigation prove that design charges/specific measures will be
		required during construction within areas identified at risk. The worst case
		scenario should be clearly identified and considered throughout the ES.
		Noise and Vibration:

		A Noise Chapter have been prepared and it is considered satisfactory
		I have no comments on this chapter.
		Miscellaneous Matters
		I have no comments on this chapter.
Related Documentation	A revised ENT in line with changes above.	The new Non-Technical Summary has been amended to include the ES First Addendum and it is satisfactory.

3 Conclusion

3.1 EIA Process of Brynrhyd Solar Farm

In the case of the Brynrhyd Solar Farm proposal, the EIA process has in my opinion worked well within its current form, ensuring inclusive consultation was achieved with all affected stakeholders resulting in a more robust, scheme, leading of modified mitigation measures and an amended design. It also enabled Planning Inspectorate to use the process as a tool to hold the developer more accountable for the quality of their impact assessment and provided a clear mechanism to mandate recommendations/changes to render the ES documentation complete. In summary a decisive body document has been produced, from which impacts and mitigation of the scheme can be adequately assessed by all stakeholders.

This particular proposal also illustrated the reiterative mechanism of the E.I.A. process, enabling a representative set of technical topics to be scoped in and, allowing for a greater level of understanding of the efficacy of short- and long-term impact mitigations e.g., Enabled Residents request to review glint and glare within the Residential Visual Amenity Assessment (RVAA)resulting in the developer to reduce the numbers of arrays in affected areas. It also enabled closer scrutiny of Community Benefits e.g., in

response to feedback from Llanedi Community Council the Planning inspectorate has raised the form of community benefit due as a material consideration, within the formal hearing process

3.2 E.I.A. Policy Gaps:

Regarding monitoring and follow up, current literature perceives this as weakness in E.I.A.: (Thakur, U.J. & Fischer, T.B.,2016) and (Morrison-Saunders, A. et al, 2021) comment respectively that they advocate for mandatory data collection standards and post evaluation of development schemes to be included in national policy/guidance.

In this example the LEMP for Brynrhyd allows for significant biological enhancements and mitigation of construction impacts and incorporates a monitoring program, during the operational phase and data collation prior to decommissioning. However, regarding the latter it does not *tacitly describe any form of ongoing management responsibility or succession management strategy*.

This leaves an open-ended process, whereby the long-term effects of impact mitigation in the ES cannot be effectively assessed, providing no ability to review and correct ineffective measures. It would also contribute to a lack of scientific data for assessing the effects solar farm technology on animal and plant populations.

The next logical evolution for E.I.A, in my opinion should include long-term monitoring and follow up for E.I.A. to be folded into existing planning and environmental policy /legislation at all levels, and to strengthen this aspect in the current UK. E.I.A Regulations.

This would effectively closing the current open-ended loop regarding monitoring and follow up currently reported.

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EIA/ESA Evaluation of Longfield solar farm

J. Omar

Abstract

The Longfield Solar Energy Farm asked for this Environmental Impact Assessment (EIA) Scope Report for the Longfield Solar Farm. (Longfield solar farm , 2020)The Plan calls for the building of grid connection infrastructure as well as the installation of solar photovoltaic (PV) panels and on-site energy storage facilities on a certain site in Essex. The plan would make it possible to generate, store, and export as much as 500 megawatts of electricity (MW).Even though there are risks to people and the local environment during construction and operation of the solar farm, the report finds that the benefits of the project outweigh the risks in terms of meeting the goals of the United Kingdom's plans to fight climate change. The person who wrote the report found that the EIA was in line with what was needed in England.This EIA was written extremely well and follows all of the rules set by the English government.

Keywords

Environmental Impact Assessment
Longfield
Solar farm

1 Introduction

The purpose of this report is to investigation the underlying legislation relating to the process of creating an EIA from various levels of governance such as United Nations, European Union (EU), and the various interpretations of the devolved nations within the UK.

This will be supported with an investigation into a specific case study of the environmental impact assessment scoping report of the Longfield solar farm.

The chief aim of the report is to briefly to explore the concept of EIA and to look into this particular project; but more importantly to analyse the provided documentation and

critique and structure and findings of the EIA provided in order to establish whether the existing artifact is compliant with current legislation and whether there would be any lesser or additional factors that would require consideration is this project would need to be conducted in a different region of the UK (e.g. Wales, Scotland, or Northern Ireland).

In addition to this report the group as a whole will conglomerate their findings by critiquing various other EIAs to form the basis of a conference document supported by a presentation from each individual in the group.

2 Investigation

This research examines environmental impact assessment (EIA) laws from the UN, EU, and UK devolved states. A case study of the environmental impact assessment scoping report of the Longfield solar project will assist this.

2.1 What is an EIA?

An instrument used to evaluate the significant environmental impacts of a project or development proposal is the environmental impact assessment (EIA).

EIAs ensure that project decision-makers consider the environment's likely effects as early as feasible and work to avoid, mitigate, or counteract those effects. This guarantees that ideas are adequately grasped before decisions are taken.

An Environmental Impact Assessment (often abbreviated as EIA) is a procedure that assesses the possible consequences that a proposed project or development may have on the surrounding environment. EIAs are normally necessary for significant infrastructure projects like the building of a new road or the expansion of an existing port. Before making a decision to go forward with a project, it is important to conduct an environmental impact assessment (EIA) to ensure that any possible adverse effects on the surrounding environment are recognised and taken into consideration. In most cases, an EIA procedure will consist of the following steps:

(United Nations Environment Programme, 2022)

- **Determining the Scope of the Assessment:** This step involves defining the goal of the EIA as well as its boundaries and deciding on the overall scope of the assessment.

- Prediction and analysis of the impact the project's possible adverse effects on the surrounding environment are uncovered and evaluated.
- Consultation and participation: During the Environmental Impact Assessment process, interested parties are contacted, and opportunities for public engagement are made available.
- The EIA report is subjected to evaluation by the appropriate authorities as well as the general public.
- The findings of the EIA and any other relevant information are taken into account before a decision is made about whether or not the project will go forward.
- As a follow-up, the environmental consequences of the project are being monitored and controlled both during the building of the project and after it has been completed.

(Scottish Government , 2022)

Environmental Impact Assessments (also known as EIAs) are very important for the following reasons: first, they help to ensure that the potential environmental impacts of a proposed project or development are identified and taken into account before a decision is made to move forward with the project; and second, they help to ensure that the potential environmental impacts of the proposed project or development are taken into account. EIAs are an essential instrument for reducing the adverse effects that development has on the surrounding environment and for fostering sustainable development.

EIAs are significant for many different reasons, including the following:

- EIAs contribute to the protection of the environment by helping to ensure that the possible environmental implications of a project are recognised and evaluated, and that steps are made to mitigate or prevent any negative impacts that may be caused by the project.

- Legal requirements: Environmental Impact Assessments (EIAs) are obligatory for certain kinds of construction projects in a number of nations throughout the world. Therefore, if a project does not go through an environmental impact assessment, it may not be legally authorised to continue with its development.
- Participation of the public Environmental impact assessments (EIAs) provide chances for members of the public to have their voices heard and be considered throughout the decision-making process. This helps to guarantee that the needs and concerns of the community are taken into consideration by the development initiatives that are undertaken.
- EIAs offer a full evaluation of the possible environmental implications of a project, which helps decision-makers make educated judgements about whether or not to go forward with a project. This results in improved decision-making.
- EIAs have the potential to contribute to the advancement of sustainable development by ensuring that a project's potential long-term effects on the environment are taken into consideration.

(UK Government , 2021)

EU/UK EIAs in devolved government

Both the UK and the EU have laws and policies in place to regulate the Environmental Impact Assessment (EIA) process. However, there are some differences between the two in terms of the specific requirements and procedures for EIAs.

One key difference is that the EU has a more comprehensive and harmonized system for EIAs, covering a wider range of development projects and activities. The EU EIA Directive requires that EIAs be carried out for certain types of projects that are likely to have significant environmental impacts, such as large infrastructure projects and certain industrial developments. In contrast, the UK has a more sectoral approach to EIAs, with different regulations covering different sectors, such as planning, energy, and transport.

(European Commision, 2022)

Another difference is that the EU has more stringent rules on the content and quality of EIA reports, as well as on the consultation and participation of interested parties in the EIA process. The EU also has specific provisions for transboundary EIAs, which apply when a proposed project is likely to have significant environmental impacts in another member state. (European Commision, 2022)

In summary, while both the UK and the EU have laws and policies in place to regulate EIAs, the EU has a more comprehensive and harmonized system that applies to a wider range of projects and includes more stringent requirements for the content and quality of EIA reports, as well as for consultation and participation.

The environmental impact assessment (EIA) process in the United Kingdom is regulated by national laws and policies; however, there are some differences between the EIA systems in the devolved governments of Scotland, Wales, and Northern Ireland. In the United States, the EIA process is referred to as the Environmental Assessment.

One of the most significant distinctions is that devolved governments have considerable leeway to develop their own policies and processes for environmental impact assessments (EIAs), all while adhering to the national laws and regulations. This indicates that there is potential for there to be some differences in the manner in which EIAs are carried out across the various devolved administrations.

(Northern Irish Goverment, 2022; Scottish Goverment , 2022; Welsh Goverment , 2017; UK Goverment , 2021)

For instance, the Environmental Impact Assessment (Scotland) Act of 2005 and the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 oversee the EIA process in Scotland. Both of these pieces of legislation were enacted in 2005. These laws detail the different kinds of construction projects that are required to undergo an environmental impact assessment (EIA), the steps that must be taken in order to carry out EIAs, and the mandated levels of consultation and involvement.

(Scottish Goverment , 2022)

The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 and the Planning (Wales) Act 2015 are the two pieces of legislation that control how the EIA process is carried out in Wales. These rules establish standards that are comparable to those in Scotland; however, there are some changes in the particular kinds of projects that are required to have an EIA and the processes that must be followed in order to carry out EIAs.

(Welsh Government , 2017)

Both the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 1999 and the Town and Country Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2010 control the EIA process in Northern Ireland. These regulations were passed in 1999 and 2010 respectively. These rules also establish standards that are comparable to those in Scotland and Wales; however, there are some changes in the precise kinds of projects that are subject to EIA as well as the methods for carrying out EIAs. (Northern Irish Government, 2022)

In general, although there are some distinctions between the EIA systems used by the various devolved governments in the UK, the purpose of the EIA process remains the same: to ensure that the potential environmental impacts of a proposed project or development are identified and taken into consideration before a decision is made regarding whether or not to move forward with the project. This occurs before a decision is made regarding whether or not to go ahead with the project.

(UK Government , 2021)

2.2 The case study Longfield solar farm

As a case study the author has decided to focus on the Longfield case study (reference). As this example will allow the critique given proposal for the final evaluation chapter

Background

This Environmental Impact Assessment (EIA) Scoping Report for the Longfield Solar Farm was commissioned by the Longfield Solar Energy Farm. [Citation needed] The Plan calls for the construction of grid connection infrastructure in addition to the installation of solar photovoltaic (PV) producing panels and on-site energy storage

facilities throughout a designated site in Essex. The Scheme would make it possible to generate, store, and export electrical generating capacity of up to 500 megawatts (MW).

(Longfield solar farm , 2020)

The Site may be found somewhere in the neighbourhood of six kilometres (km) to the north-west of Chelmsford. The plan for this report on the scope of the project.

It is important to note that this is the expected maximum extent based on all of the alternatives for components that have been and will be the subject of consultation. However, it is likely that this will be modified as the Scheme design continues to evolve.

(Longfield solar farm , 2020)

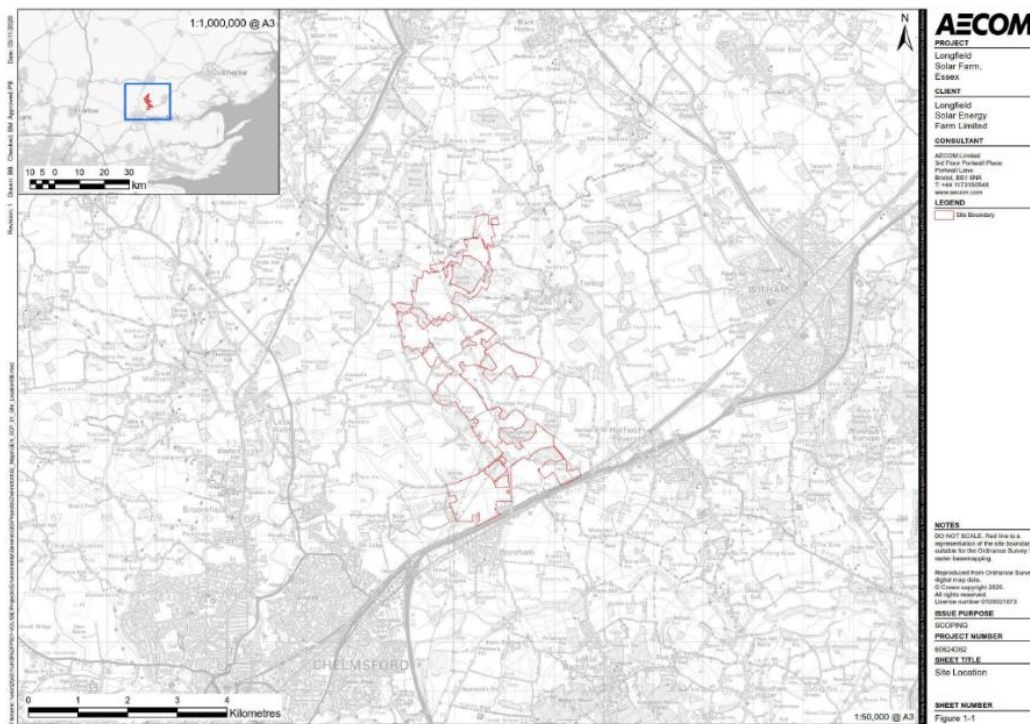


Figure 5 map of site (Longfield solar farm , 2020)



Figure 6 map of site (Longfield solar farm , 2020)

EDF Renewables is looking for academic partners to help it run a programme of ecological research to learn more about how solar farms help the environment.

In a new partnership between EDF Renewables and Nature Positive, academic partners wanted to find out how solar farms help protect biodiversity.

It will be the first study to look at how the Longfield Solar Farm affects biodiversity, soil health and carbon, wildlife habitats, and the way farmland is managed.

Potential academic partners are asked to show interest and send in short proposals by July 29, 2022, to be considered.

Together with environmental consultants Nature Positive, EDF Renewables is looking for academic partners to work with on a programme of ecological research to learn more about how solar farms help the environment.

The study would be the first to look at the positive effects large-scale solar farms can have on biodiversity, soil health and carbon, wildlife habitats, and farmland management in the UK. It would focus on Longfield Solar Farm, a new solar farm proposed by EDF Renewables and Padero Solar on about 380 hectares of intensive arable farmland near Chelmsford in Essex.

The research programme will link up with the plans and commitments that are already in place for the proposed Longfield Solar Farm, which aims to improve biodiversity by restoring and managing habitats in a big way. As well as having a say in these plans and keeping an eye on how they work out, about 50 hectares of the solar farm will be set aside as a place to try out new ideas while getting the most solar energy possible.

Specifically, it is hoped that studies at Longfield Solar Farm will help us learn more about how solar arrays might affect wildlife and biodiversity in habitats under and next to arrays, as well as the health of the soil and how much carbon it can store.

Researchers have until July 29, 2022, to say if they are interested in doing three work packages that will look at the effects of solar farms on biodiversity, habitats on solar farmland, and how solar farmland management affects the soil. By going to the Nature Positive website, potential academic partners can show interest and submit short proposals.

(EDF, 2022)

Mark Lang from Nature Positive said, Solar farms are becoming more important in meeting the nation's need for renewable energy, but we don't know much about how they might help improve biodiversity and provide other ecosystem services. It is hoped that the research will help people figure out how to run solar farms in a way that improves biodiversity. This could change the best practises in the rapidly growing solar industry.

(EDF, 2022)

Effective engagement with and consultation of stakeholders is a core part of the Planning Act of 2008 and a key part of the success of the Scheme. Consultation is a key part of making an ES that is both complete and well-balanced. The opinions of

both statutory and non-statutory consultees help to narrow the focus of environmental studies and find specific issues that need more research. Consultation is a continuous process that allows mitigation measures to be built into the design of the project. This reduces negative effects and improves environmental benefits. There are a lot of different people who have an interest in the Scheme, such as landowners, statutory consultees, local communities, and specialist interest groups. These people have different needs and will need different levels of consultation. So, different communication activities need to be geared toward the needs of different people and groups. To do this, you need to know who the stakeholders are and what they want from the Scheme. Stakeholder engagement for the Scheme is based on the following principles:

Stakeholder engagement for the Scheme is based on the following principles:

- Early and ongoing engagement to inform and influence the design process.
- Seeking an appropriate level of feedback during the iterative design process and making sure that comments received are taken into account.
- Building long-term relationships with key stakeholders throughout the different stages of the Scheme to help better understand their views;
- Where possible and practical, enlisting the help of key stakeholders in the design process.

(UK Government , 2008)

(Longfield solar farm , 2020)

Why make a solar farm?

A solar farm is a large area covered with photovoltaic panels that are used to generate electricity from sunlight. Solar farms can be used to generate electricity for a single home, a small community, or even a large utility company. They can be located on rooftops, in fields, or on other large open areas. Solar farms are a clean and renewable source of energy that can help reduce our reliance on fossil fuels.

(Gill, 2022)

The technology behind solar energy has made tremendous strides in advancement during the last several years. Solar energy sources have never before offered such an ecologically beneficial and cost-efficient solution as they do now. The following is a small selection of the many advantages that solar farms offer:

Solar farms make use of a dependable and environmentally friendly kind of electricity. The sun won't be going away in the near future, that much can be said with absolute certainty on that particular topic. On the other hand, the same cannot be stated for other types of energy sources, such as coal and fossil fuels.

Solar farms do not produce pollution. Even if there are some emissions involved with the building of a solar farm, in compared to the vast majority of traditional energy sources, these emissions amount to almost nothing at all.

(Innovative solar systems, 2022)

Solar farms are a viable option in any region of the planet. Even in Iceland, which has the world's lowest daylight at less than five hours on the winter solstice, the sun shines for at least a few hours every day somewhere on the planet. In spite of what you would expect, Germany is now the country that generates the most electricity from solar sources. Countries that are located closer to the equator tend to be cloudier.

The cultivation of crops and grazing of cattle are both viable uses for solar farms. A method known as "agrovoltatics" has been proved to be helpful according to research conducted in 2018 and 2019 and it involves the co-location of croplands and solar farms.

(Innovative solar systems, 2022)

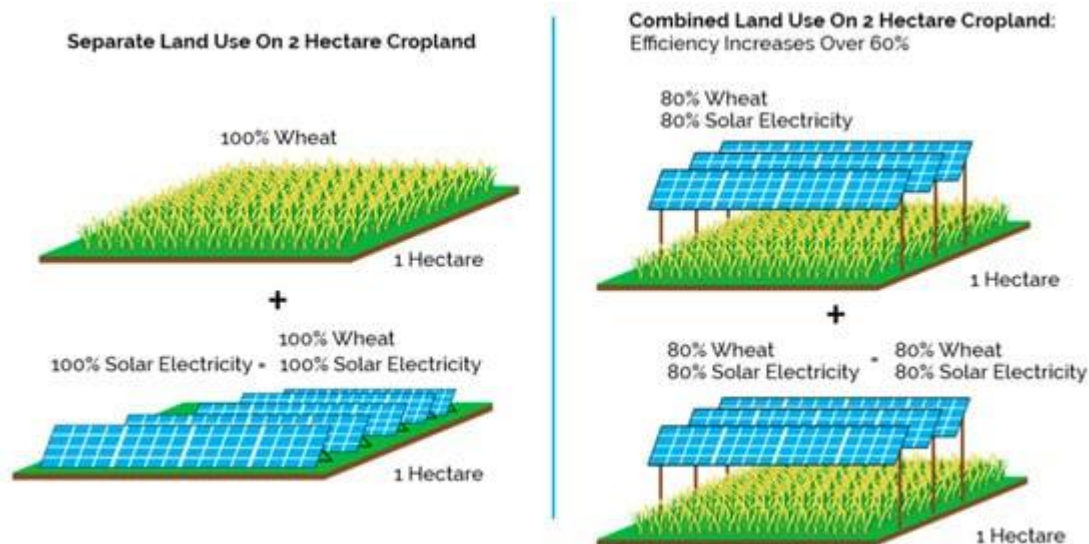


Figure 7 Demonstration of agrovoltaics

(Mohd Ashraf Zainol Abidin, 2021)

It is not difficult for a landowner to return their property to its previous usage of agriculture in the event that they change their minds in the future. Land that was not utilised for agricultural production while it was operating as a solar farm may "keep soil quality and contribute to the biodiversity of the land."

Solar farms generate electricity for everyone. Perhaps you've given some consideration to installing solar panels on the roof of your house. This is a wonderful concept; unfortunately, around 20% of houses in the United States are not suitable for the installation of solar panels. This might be because of a shortage of space or even the angle of the roof. Solar farms, on the other hand, have the potential to provide a whole town or perhaps an entire metropolis with clean electricity.

(Innovative solar systems, 2022)

Before being given the green light for construction, every solar park has to go through an exhaustive planning process first. When it comes to the development of high-quality, large-scale solar projects, Low Carbon employs a method that is both well-defined and organised. This method considers a variety of considerations, including the appropriateness of the location in question, the possibility of adverse effects on the surrounding region, and any applicable renewable energy objectives.

The full process of product development may be completed in no more than one to three years, depending on how long it takes Low Carbon to manage the process.

- An evaluation of the property We collaborate with landowners to determine the viability of available land for solar development, in addition to conducting an evaluation of the probable availability of the grid.
- Grid connection: After receiving permission from the landowner, we will submit an application for a grid connection on the property that has been designated.
- Planning: Once an option-to-lease agreement has been reached with the landowner, Low Carbon will begin the process of submitting a complete planning application for the site that has been agreed upon.
- Building: Once all of the planning for the solar park has been finished, and a verified connection to the grid has been made, Low Carbon will begin construction on the solar park.
- Operational asset management: the solar park will become fully operational after it has been built, completely tested, and successfully commissioned once all of these steps have been completed. The specialised asset management team of Low Carbon is in charge of managing all asset management responsibilities.

(Low Carbon, 2022)

- Examples of existing solar farms and the +/- of their existence

There are a significant number of solar farms dispersed around the territory of the United Kingdom. The following are some examples:

- Clayhill Solar Farm is a photovoltaic installation that can generate up to 15 megawatts of power and may be found in Bedfordshire.

(Power technologies , 2022)

- The Westfield Solar Farm is a photovoltaic installation that can generate 12.5 MW of power and may be found in Wiltshire.

(Power technologies , 2022)

- The Cleve Hill Solar Farm is a solar farm that can be found in Kent and is in the process of being constructed right now. It is expected to have a capacity of 350 MW once it is finished.

(Cleve hill solar park, 2022)

- The Northwick Solar Farm is a photovoltaic installation that can generate 7.5 megawatts of power and may be found in Worcestershire.

(UK Electricity Production, 2022)

These are only some of the solar farms that are now operating in the UK. There are a great number of others spread out around the nation.

Solar farms are a relatively recent phenomenon in the UK, but their prevalence is expanding as an increasing number of businesses make investments in solar power as a form of sustainable energy. There are numerous benefits and drawbacks associated with solar energy, but the ramifications of investing on a massive scale might be very different.

The development of solar farms, similar to the development of other forms of energy in the past, has both good and bad features. The following is a list of some of the advantages and disadvantages of solar farms:

Positives

Solar farms use the sun's energy to create electricity, which is then fed into the grid that supplies the area's electrical needs.

They are a kind of land use that may be reversed when a certain period of time has passed, and they provide landowners an enhanced, varied, and consistent source of revenue.

Because there are no moving components, there is very little that has to be done in terms of assembly and maintenance.

Except for during the manufacturing or disassembly process, there is neither a by-product nor trash that is produced.

In comparison to other methods of electricity production, they have a less effect both on the environment and the visual landscape.

Renewables provide consumers the option of purchasing environmentally friendly power while also reducing dependence on finite fossil fuel supplies.

Negatives

Solar farms need the usage of thousands of panels in order to generate enough electricity to supply the majority of power grids. This has the potential to harm both wildlife and agricultural areas, as well as take up a large portion of available land space.

The quantity of energy generated is impacted when there is less sunlight available as a result of factors such as dense cloud cover or excessive shadow. In the United Kingdom, where the weather is notoriously unpredictable, this may be a significant effect in the efficiency of solar panels.

The general public has the impression that solar energy fields are ugly and have the potential to detract from the natural appearance of the surrounding area.

The initial investment required for a solar farm is significant. However, there are various incentive programmes that might help offset these expenses, such as government subsidies. For instance, the government of the United Kingdom has provided subsidies to farmers in that country who are prepared to convert their property into solar farms.

(Greenmatch, 2022)

Health impact of the project

The construction phase is expected to account for the majority of the significant impacts, including habitat loss and fragmentation as a result of the removal of some sections of the local ecosystem to allow access, disturbance, and mortality as a result of construction activities, and degradation of habitats as a result of pollution and dust generated by construction activities. During the operating period, it is anticipated that the affects would be limited; nonetheless, there is still some degree of ambiguity about the impact of the arrays on ground-nesting birds.

The Environmental Specialist came to the conclusion, after following the mitigation measures described in the Construction Ecological Management Plan, that the adverse impacts of the development are largely non-significant and that, starting from a baseline of relatively low existing ecological value, the solar farm would actually enhance biodiversity on the site and in the surrounding area. This conclusion was reached after following the mitigation measures described in the Construction Ecological Management Plan. Research has revealed that solar farms may adopt a hybrid approach by also utilising the area for crop farming. This might assist in terms of decreasing carbon emissions via the photosynthesis of the crops, but it would still be destructive to the local environment.

(Longfield solar farm , 2020)

Several meetings with statutory consultees, such as The Planning Inspectorate, Chelmsford City Council, Braintree District Council, Highways England, Historic England, Natural England, and Essex County Council, have already taken place to explain the plans.

A project website, <https://www.longfieldsolarfarm.co.uk>, has also been set up to keep people up to date on the project. Before this Scoping Report was turned in, information was shared with local residents and community groups.

(Longfield solar farm , 2020)

2.3 Evaluation of the EIA

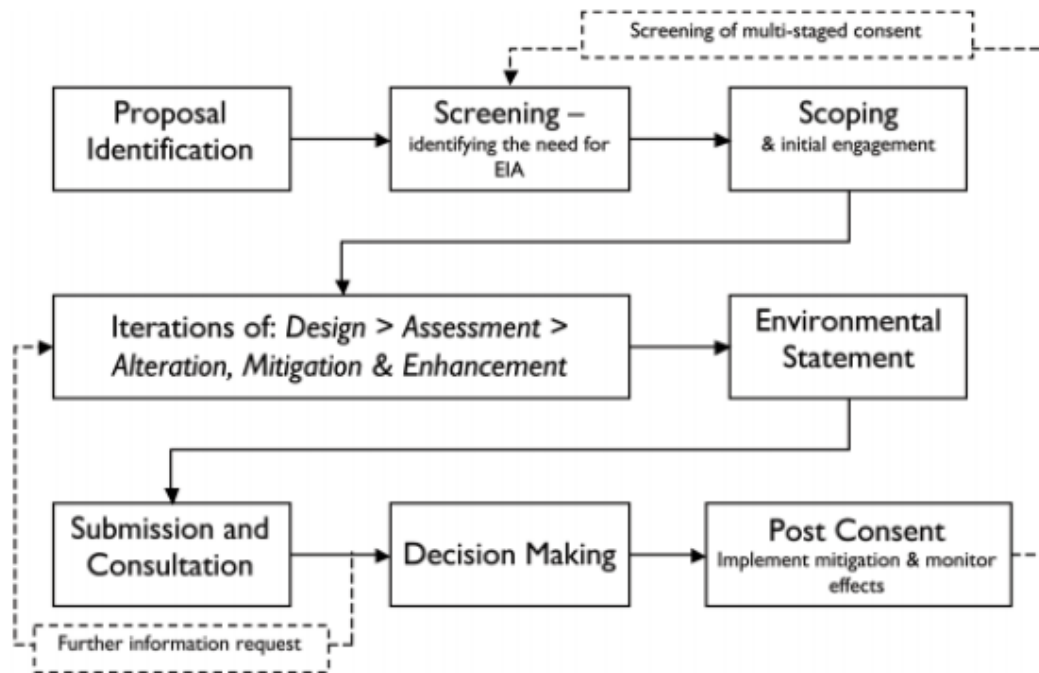


Figure 8 The EIA Process (IEMA, 2011)

flood- Both the vulnerability of the Scheme to flooding and its potential to exacerbate flooding will be covered in the Flood Risk Assessment, and also reported in the Environmental Statement (ES). flood- Both the vulnerability of the Scheme to flooding and its potential to exacerbate flooding will be covered in the Flood Risk Assessment.

fire - As a consequence of the battery storage component of the Scheme, there is a remote possibility that a fire might break out. On the other hand, the battery energy storage system will have cooling systems integrated into it. These cooling systems are intended to manage temperatures to within safe levels so as to reduce the danger of fire. In addition, the design of the Scheme would include appropriate isolation amongst the various battery banks to guarantee that a solitary fire will not spread across the facility and result in a significant issue. Fire detection and suppression features would be built to detect (for example, multispectral infrared flame detectors) and suppress fire (for example, water base suppression systems) in order to minimise the impact of any fire that could occur.

damn failure - The course of the River Ter and the immediate riparian margin as it travels through the Scheme area are both within the region that is at danger of flooding as a result of a breach in the reservoir. The reservoir does not pose a threat of flooding to the other parts of the Site. This will be included in the Flood Risk Assessment, and it will be documented in the ES, both in terms of the hazards that the Scheme poses, as well as the increased risks that the Scheme poses to third parties as a result of the Scheme.

Desired points

This EIA was incredibly well written and conforms to all of the guidelines in place by the English government, it included the following information in addition to a Non-Technical Summary and appendices: -

(UK Government , 2021)

1. Introduction - this made clear the plan and its aim
2. The Range of the Evaluation and Its Methods
3. The Construction Site and the Areas Surrounding It
4. The Course of Events intended to be followed
5. Policy and Guidance with Regards to Climate Change, Energy, and Planning from the relevant government (England)
6. The Terrain and the Visual Using Geographical Information Systems Data
7. Environmentalism and the Preservation of Natural Areas discussed in detail including the impacts

Negative points

If this scheme would take place in Wales, it would have to follow more stringent guidelines with the regards to displacement of wildlife and ecosystems as discussed earlier in this report.

(Welsh Government , 2017)

3 Conclusion

With regards to the Scope Report, it is a notice required by Regulation of the EIA Regulations that the Applicant must conduct an EIA in regard to the Scheme and prepare an ES to report the results of the EIA.

In addition to this, it constitutes a formal application for a "Scoping Opinion" in accordance with EIA Regulations.

The environmental consequences that are thought to have the potential to be substantial have been identified in the report, and the method that will be utilised in the assessments that will be carried out for the EIA to characterise and comprehend the magnitude of these effects has been proposed.

The required consultees were given the opportunity to review the information included in this report.

Even though there are risks involved in the construction and the and running of the solar farm to individuals and to the local environment, the report finds that that the benefits of the project in achieving the aims of meeting the plans of the United Kingdom to target climate change. The author found that the EIA generated was in line with the requirements for England.

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Barry Biomass Facility EIA Assessment and analysis

J. Allwood

Abstract

Barry biomass facility has a long history of problems as it has been approved and rejected over a span of a couple of years. This means that multiple environmental checks and assessment would have been done to clear the construction. There were proposals in both 2008 and in 2015 which had major differences and were proposed during a different set of EIA regulations. The first proposal was rejected through council, but the Welsh government felt that the reasons were not justified. Therefore, a more specific and informative proposal was created. However, after the construction in 2019 it has been closed forced to close due to a significant opposition from the local community.

Keywords

Biomass
Facility/Plant
EIA

1 Introduction

1.1 Background to Barry Biomass Facility

Barry biomass facility has been proposed multiple times over a span of over 10 years. Therefore, it has been subject to many Environmental Impact Assessments which have occurred throughout the proposals. The biomass facility was introduced in a planning application back in 2008, where it was rejected by the Welsh Government and local councils. The facility would have been situated on the Barry docks, which has seen an increase in industrial building actions recently. Therefore, the location of the biomass facility seemed to be a good choice. However, the council believed that it would ruin the landscape of the docks. A biomass facility would be very good for the local energy as the Vale of Glamorgan is looking into new ways of finding renewable energy. They have also put-up solar farms around the area and are closing down the Aberthaw coal power station, which is showing that they are heading in the renewable energy route. Therefore, a renewable energy plant appeared to be the perfect option for the council, but there were some problems that needed to be solved before

construction. These problems did start in the planning phases but continued until after it was constructed. The biomass facility would be using recycled or reclaimed wood to be used as fuel to power the facility. Also, the wood would be chipped in the plant, which would increase the power. The main issue with the biomass facility would be the waste process as the woodchip would be seen as a waste product. Therefore, the report would need to give full proof that the waste products would either be used as a feedback fuel or deposited in a place so it would be exposed into the docks water.

Biomass is an important renewable energy for the UK as it is able to be created in most areas. This is due the fact that biomass is crated through burning of wood, plants, and other household waste. Barry would therefore have had a large renewable plant which could be used and developed to create electricity and power for a lot of the local area. Biomass is increasing in most countries due to the availability of the product and how useful that it can become for creating power. However, there are still some queries on whether it is one of the more prominent renewable energies as it produces some pollution and waste.

1.2 EIA regulation differences

The EIA regulations, which were in place during the first planning application, were from the regulation laws set in 1999. Whereas, the second application, proposed in 2014/2015, would be looked at by the regulation laws which were placed in 2014. This showed that changes may not have needed to be made, despite the regulations changing. These EIA regulation changes allowed it to be easier for the plant to be built as the regulations were clearer and were stated so there would be full understanding from the companies. The major stakeholders in the planning of the plant were the Welsh Government, local council, planning case officer, local community, Aviva investment and Minister of Climate Change for Wales, Julie James. They all played different roles to do with the planning control and actions of the biomass facility. Also, a major stakeholder was Sunrise Renewables Limited, who were the main company trying to push for the biomass facility to be put up in Barry (Welsh Government 2022).

There are parts of both applications where EIAs were very necessary due to there being an environmental impact or potential for an environmental impact. There were some, which were undertaken during the 2aa010 application, but not during the 2015. The main assessments were looking into the conditions for the building and the

surrounding area. The assessments looked into the geological conditions of the area and whether it would be eroded due to the water be close. This meant that the biomass facility would not be in danger of falling into a nearby water source in the future. It also looked into the soils and minerals nearby to see if they were to be impacted and how. The potential of contamination was another important impact as the waste product could have ended into the nearby dock. The original layout did not include the external plan for the stack with regards to noise pollution and the air quality from the stack. This included outside the red line boundary of the construction of the facility. The 2015 application included the use of the 2019 Environment Statement. The main issue was the BioGen development of the facility as the consented time had already lapsed by the time the ES was issued. This meant a new Landscape and Visual Impact Assessment (LVIA) would have to be made. There was a concern with the use of the flue gas as if the width of the pipes and systems changed, it can affect the whole process with the concentrations of each of the gases causing there to be a risk of danger. There was no updated assessment of future flood risks from the 2008 application, even though climate change and flood management are progressing (Welsh Government 2022).

	2008 application	2015 application
Flood risk	Flood risk undertaken	No update on flood risk
Geological location	Geological areas shown to be viable	No update on geological changes
Main issues	No inclusion of noise pollution or air quality	No development plan of facility as time has lapsed
Processes within	Policy permits Types of waste being produced	Concern over pipes width which could change the outcome of result

2 Investigation into both EIAs

2.1 2008 Planning Application

The first planning application was formed in 2008, and as previously stated, it was under the EIA regulations of 1999. This meant that a lot of the regulations were outdated as there had been other plans, which would be heavily debated nowadays, but were accepted during these regulations. The overall plan from 2009 included a

green travel plan, which meant that when construction is being completed and during the time it the plant open the travel of the lorries will be as sustainable as they can be. As well as this, they will keep up to date on the transport links to keep them as sustainable as possible. They also stated that they would be doing more and conducting multiple sustainability statements within the process and life of the plant to keep everything green. They also mention the management of the noise pollution where the transport will be at times, which shouldn't affect the local community and the plant will not be affecting the local dock workers or any of buildings nearby. With it being near the coast and the docks of Barry, they had to focus on a flood risk assessment and water management at the plant. This showed that there wasn't a huge risk of a flood as the walls and the location of the docks were at low risk. This gave it a huge upside to the location. The last main point that they stated was in regard to the ecology report, which included the air quality around the plant and whether the botanical and biodiversity would be impacted. This was seen to be accepted as there was no real damage that the plant would affect, even after the location was scoped out for any rare biology or important biodiversity. The ecology mentioned in the report fails to acknowledge the waste products that will not be useful as a fuel. This includes the char and ash, which would be a waste product of the burning. Therefore, as it would have a negative impact on the environment, they should have explained what they were going to do with it. This could be through the construction or taken to a landfill. However, they failed to mention this. Therefore, it is unknown to the council and the construction company.

2.1.1 How the facility would work

The main way that they were creating energy was through the process of pyrolysis. This meant heating the wood chippings up to a temperature of over 500 degrees Celsius, which would have created a waste product of char, which could have been cleaned and fed back into the cycle. It would then be thermally decomposed and condensed into a liquid. This is then distilled and extracted into creating advanced biofuels. The main point of pyrolysis is that it is able to turn plastics into

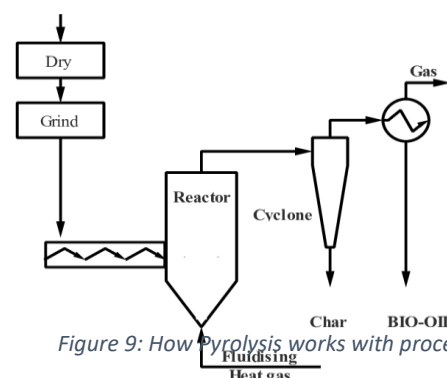


Figure 9: How Pyrolysis works with process.

renewable energy. However, for the process to begin, it would need certain types of waste to use as certain waste would not allow it to meet environmental standards. Also, the facility would need a project permit, which accounted for the policies in 2008. Therefore, if the policies change the plant will need to get a new project permit (What is Pyrolysis? n.d).

2.1.2 Environmental Statements

These assessments and reports were released in September 2008 and they were rejected by the Welsh Assembly Government in June 2009. This was due to them believing that it fell short of the EIA regulations. This decision was also helped by the Vale of Glamorgan council stating that they thought the facility would not help the council's ideology of the waterfront alongside the Barry Waterfront Development Principle Supplementary Planning Guidance. However, when it was reviewed by Welsh Ministers, they believed that there was not a viable reason for the rejection. They also hired a planning case officer, who looked into the application to see if it was worthy of being built. The planning case officer then reviewed the EIA regulations and said that the application had no negative affect on the environment around the location. This was shown by the disposal of the waste being incinerated and not placed anywhere. The area in which the location was decided did not surpass the area that was agreed upon. Also, the site location was not within 100m of any water. This means that they were able to prove that the Vale of Glamorgan council had no clear means for the rejection. Therefore, the government wanted the council to pay all costs as there was viable reason.

2.1.3 Location and viability

Many considerations were put in place for the facility to meet lots of different criteria. Many of these criteria are to do with transport links and location of the facility. They had to make sure that the wood could be transported through the docks to avoid creating more roads and causing more traffic. They also had to make



Figure 10: Location of biomass facility

sure that it was within an industrial location, and it was near to an existing energy building to heat and waste could be used effectively and sustainably. The plant needed to be close to the national power grid, so it was easy for the energy to be

transported and used. There were multiple areas which were considered, but none of them met the criteria that was needed. However, as stated in the Environmental Statements (ES), the council did consider the marine environment that it would be located but deemed it viable. The ES had stated that a further scope out at the location would be necessary, but the location did agree with the EIA regulations.

2.2 2015 Planning Application

The 2015 proposal was designed after the EIA regulations had changed in 2014. This meant that it would have been more up to date on laws set for facilities becoming green and not damaging the environment surrounding the facility. This new proposal had some major changes as it was to introduce gasification and a layout change of the plant, but in the same location. This planning proposal was accepted by the Welsh Government, who deemed it unnecessary that there would need to be more information about the construction of the plant. Even though the application was developed in 2015, it took 4 more years to get an ES on the planning application. This meant that there was no statement that indicted whether or not it would be fully sustainable. This meant that there was no clear evidence that the facility would need up sustainable. Therefore, the systems which point to sustainable cannot be fully understood as it does not show how it create a sustainable facility. The ES was not meant to go against the decision to build the facility before making sure that all the environmental issues would be approved.

2.2.1 How the facility was changed in new proposal

The way in which the new gasification technology would work is that it would still use wood chips but would be transported into the gasification system and turned into a gas. The temperature of the wood chippings would reach above 950 degrees Celsius until it produces a product known as syngas. The syngas is then transported and burned to create a flue gas. The heat from this process is used to help superheated steam and then this steam is used to create electricity through a turbine. This means that the waste product of heat is still being used to create a different renewable energy. This flue gas is then cleaned of any pollutants it may have created and is filtered through many systems to create clean emissions. However, the main pollutants that this process creates are nitrogen dioxide, sulphur dioxide, carbon monoxide and acid gases. This is then filtered out through a different system aimed to collect all tiny dust particles of the polluted gases. The waste from the wood such as the ash, is to be

mainly fed back into the construction of the facility. However, some will be treated and collected to be taken back to the landfill, which isn't too far away from the plant. The negative point of this method is that there is such a concentrated heat and a focus on the gas transportation that some internal components are eroded, so will need maintenance or replacements much quicker than other processes. The other concern is the lack of understanding of the process long term and if it can be sustainable. This was the main concern from the local community at multiple consultations that took place online through their website and emails. With the consultation, the local community felt that they didn't have much of a say, as a lot of the responses took place during 2021. This meant that the biomass plant had already been given the green light to go ahead. Therefore, even though they had some consultations about the facility, they had already started to use the facility and had fully constructed the building (Welsh Government. (2022)).

2.2.2 Change in information through Environmental Statements

A lot more information about the plant was agreed in 2018 and 2019. This was after the green light in 2018 and the Environment Statement that was released in 2019. This allowed there to be independent review made from council officers and monitoring officers. The main thing that the 2019 ES stated was the major changes to the 2008 application. These included the layout changes; new technology being used and the use of pure heat rather than a mix of heat and power. It also stated new things that were not mentioned in previous statements, such as new drainage systems and the use of the ash being fed back into the cycle of the plant rather than not knowing what to do with it. It also stated that the Outotec equipment, which would be used for the processes, were more efficient than the ones originally designed in 2008. There were some issues, that were identified during the ES. These included the air quality, noise pollution, landscape visual and justification on the new designs for the process. The air quality was deemed acceptable as the new technology had developed new ways of containing the pollutants. The noise pollution was similar to the air quality as due to the new changes that were being made that had identified how to contain the noise. The landscape seemed to be an important part for the local council, so in the new application, the facility had a new layout of several buildings. However, the chimney stack and height were at a higher point than in 2015. There was a lot of justification on why the new gasification addition would be more beneficial for the facility and they

agreed with that when the ES came through as it seemed to clear up some of the unknown part from the 2008 application. There were parts of the application that stayed the same as the previous application. The transport links stayed the same as before as there was a 2010 consent form created to show it would work retrieving the wood chips from boat. Also, the ecology and biodiversity would stay the same as the location would not change. Also, there was no addition to the ground to create a new agreement. In relation to the ground conditions, there was not sufficient time for there to be change as the ground would have stayed the same. The planning policy created in 2008 stayed the same as it was agreed with the Welsh Government that they could build on the area.

One of the main independent reviews was through the Vale of Glamorgan Council where they looked to see if the facility was within the Planning and Environmental Law and to see if it any issues would arise. Some of the issues which were brought up were regarding the noise pollution, which in the 2015 planning application, stated that there would be little to none whilst it was being built. There were several complaints, which implied that the construction site was producing more noise pollution and contaminating the air quality in the docks area. This led on to the disagreements on the planned schemes, which included the building layouts and the area in which it should have been built (Welsh Government. (2022).

2.3 Environmental Statement 2019

The main reason for the 2019 ES was to make sure that statement filled gaps would have been created in 2008 and 2015 planning application. As previously stated, the ecology was one of the main points which changed due to new technology that was implemented. However, due to the community concerns, there were worries that the use of the flue gas could cause issues, but there was no additional research into the flue gas. Due to there being several buildings approved for the facility rather than one large building, this meant that the average height of the building needed to be higher but would conform to the council's dock landscape scheme. There was no clear assessment about the landscape in the ES, so it is assumed that it was all agreed in 2015 with the building application and it should not change drastically to fit the agenda. The ground conditions have not changed but they did mention that there was no historical building or characteristic that meant it was available for the build. Even

though climate change was increasing the flood risks in most places in the area, they deemed the area viable to be built. Although, there were gaps in the data for the future, which meant it could be flooding in the future. The ES indicated that the planning committee had not considered the cumulative effects of the facility as the planning consent had not been implemented in time. There were actions to find out how the plant will be working as the lack of knowledge was a concern due to the ES report being 4 years later. This meant that it was hard to look back at the results. Also, as the ES came out, the construction was taking place. Therefore, they would struggle to find out how it would be used within the facility (Welsh Government 2022).

The ES concluded by saying that there are still significant gaps which aren't answered within the planning application. They would need further assessment to judge whether or not the impacts of these gaps have a negative effect on the facility usage. The gaps that they deemed to still being unknown are human health risks, impact on climate change, the vulnerability to changing climate change and availability of light and resources. This would mean that more precautions would have to be taken in order to maintain the health of workers and nearby areas.

2.3.1 Outlines of major changes to the two proposals

	2008 Planning Application	2015 Planning Application
Generation Output	9MW	10MW
Building Footprint	2700 sqm One Building	2497sqm Wood Storage Buildings Turbine Buildings ACC Unit
Building Height	14m	23m
Syngas production	Pyrolysis	Fluidised bed
Combined Heat and Power	Yes	No

Operational Days	7 days a week	5 days a week Plant Self-operational
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This table shows the contents of the how the facility would be used and how it would affect the environment around the facility. As shown above, the new planning application is to produce more energy in a smaller location and a more spread layout. This minimises the risk of condensing the whole process and creating space for different purposes, such as storage. The building height is increased in the more recent application, as due to the facility being more condensed, it would be easier to build above rather than next to the other buildings. Both syngas productions have upsides and downsides. However, fluidised bed process is more prone to being able to reduce the pollutants that it produces and recycles more of the waste products into creating more energy. This is seen from the heat being turned into steam for wind turbine energy. The combination of heat and power means that there will be lots of energy being transported across the whole plant, whereas with no power energy it allows the focus of the plant to be directed onto the heat concentration. The 2015 planning application only runs 5 days a week and still produces more energy than the 2008 application. However, it is self-operational, which indicates that there wouldn't be as many jobs going for the local community (2022).

2.4 Competition against biomass plant

The main issue now with the biomass plant is that there are lots of campaigners who have fought for the plant to be shut down. This was due to the concern of the pollution it would be causing within the docks. However, despite these protests and petitions, the private company went ahead with Aviva investment (BBC NEWS. 2021, September 1). In 2021, there was a letter sent from the minister for climate change, which indicated that there was need for more Environmental Impact Assessments. This letter questioned whether or not an EIA was even discussed in the planning permission back in 2008, due to the large gaps which would have been filled from the assessment. They seemed to believe that even though the disposal of waste was not going to affect the environment significantly that they did not need to conduct an EIA. In 2008, the waste disposal regulation was that non-hazardous waste cannot exceed

100 tonnes per day which would have fallen within the facility. However, they failed to detail the proposal and indicated that it would be incinerated, which would mean it would lose weight so more waste would have been disposed per day. The minister also felt that the feedback process, could be added to the waste disposal which increases the amount even more. In 2015 the fluidised bed process would have exceeded the amount of waste disposed. Therefore, would have needed an extra EIA, which was not present at the time of the planning application. With climate change, there would have been some CO₂ that would have been created. The positive is that this would have saved CO₂ in term of exports of electricity, but the amount that the plant would emit is continuous. Furthermore, most of the process can create more CO₂ emission. However, it was conducted that the amount is not as significant as other facilities creating electricity. Fire hazards were not mentioned in great detail in either application. However, as there will be polluted water within the facility, they believe that this could spill into a larger issue. This is due to the polluted water that could be used to stop the fire and could leak into a water spillage out of the facility. However, the risk of fire is relatively low if concentrations do not change that much, so the environmental impact will be low (James. 2021, September).

2.5 Impact of biomass proposals

The impact of the biomass facility in Barry had a positive ideology as it would be useful for the local community. However, with the planning applications, there were always some flaws or some gaps which made it hard to approve. In the 2008 application, there were parts of the application that were unknown. The application was rejected as it was not deemed fit enough. This was not a valid reason, there were some speculations about the proposal. The 2015 application was an improved version of the 2008 application. However, there were even more unknown gaps, like flood management that could cause an environmental impact. There were some things that could have been looked into further with an EIA to create a more sustainable and green facility (Thomas. 2017, November). This application was approved, which is quite surprising given the number of environmental issues that have been raised looking through the application. The plant has been ordered to close down as they look into more EIAs that can help it and control the amount of pollution it is causing. This was due to water tanks, machinery, and a substation (Griffiths. 2022, July 4). Therefore, the plant has

not progressed with the environmental impacts that were the original causes for the rejection.

3 Conclusion

The biomass facility should have been rejected the second time due to the lack of knowledge of the use of syngas in the fluidised bed process. In addition to the lack of knowledge, the impact on climate change may be small in comparison to other methods which are elsewhere in the Vale of Glamorgan, such as wind farms and solar farms that are not as close to industrial and urban areas. There is more lack of knowledge of how the plant is able to continuously grow as there is no long-term plan of how it will affect surrounding areas. The risk of flood management was an important impact as there were no plans to control the more frequent and more vigorous flooding that has occurred in the area. Furthermore, the first proposal may have had the wrong reasoning in order to be rejected. The decision was correct for long term as there were parts of the facility such as, the process occurring and the layout of the structure. These would have caused major issues in the future from pollution to endangering the surroundings if there was a problem.

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An analysis and critique of the Environmental Impact Assessment (EIA) process in context of the Swansea Bay Tidal Lagoon project

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Abstract

The process of Environmental Impact Assessments (EIAs) are used globally to identify and manage environmental risks created by development projects. Within the UK, legislation has been adapted from the 1985 EU directive, and has been updated since. The Swansea Bay Tidal Lagoon project had its first EIA published in 2014, with revisions in 2016, and the project being denied shortly after. The EIA identifies impacts onshore and offshore, as well as identifying possible impacts to nearby Sites of Special Scientific Interest (SSSIs). The project offered readily available information on possible impacts but omits detail, due to gaps in legislation and ineffective practices of the team involved.

Keywords

Environmental Impact Assessment
Tidal Lagoon Swansea Bay
UK and Wales legislation

1 Introduction

Over the past 30 years, there has been growing worldwide interest in environmental impact assessments concerning anthropogenic impacts due to land use changes (Fischer and Onyango, 2012; Gonzalez and Enríquez-De-Salamanca, 2018). As a result there has been an increase in demand for empirical data and policies to regulate the process (Glasson and Bellanger, 2003; Fischer and Onyango, 2012). Policy change has been further encouraged by the public, governments, and international associations taking further interest in environmental health (UNECE, 2014; Gov, 2019). The first directive adopted by the EU was in 1985, being directive 85/337/EEC (DHPLG, 2018). Due to the growing demand and use of EIAs (environmental impact assessments) in terrestrial and marine environments, international associations such

as the EU have been altering older legislations regularly to fit into modern approaches and developments. There has been a large quantity of literature released since the initial EU directive, but quantitative data has been scarce, relying on qualitative data which can be seen as more subjective (Wang, Yang and Xu, 2006; Fischer and Onyango, 2012).

In the case of renewable energy projects, quantitative data can be used to present accurate predictions on energy production (Willis *et al.*, 2010). Green infrastructure and renewable energy have been focus areas due to its potential positive impacts on wellbeing, pollution and area regeneration (Mackinnon *et al.*, 2018; Gov, 2019). These benefits are difficult to quantify. Environmental impact assessments are necessary in this case due to initial changes to the environment such as construction and land alteration having initial negative impacts on the environment in varying magnitudes, despite potential benefits later, the benefits being potentially difficult to quantify (Fischer and Onyango, 2012; Guo, 2022). This report aims to outline the current EIA process including processes, legislations and current UK and EU laws. A case study will be used to identify benefits to the current EIA process, as well as identifying flaws in the current system. The Swansea Tidal Lagoon will be the case study used, as it allows for a detailed look into legislations and processes of both on-shore coastal and off-shore marine developments. Literature from experts as well as current guidelines and recent reports will be used to assess the effectiveness of the EIA conducted and published in February 2014. The project itself has been denied, and some data and reports have been lost, however there is still enough information to make for a compelling case study in evaluating current legislations concerning marine EIAs in Wales.

1.1 History and Legislation

The main purpose of an EIA is to identify possible environmental impacts a major development project will have on the surrounding area, while providing transparency for both public and private projects (European commission, 2022). The first introduction of EIAs was in the United States in 1969, where the NEPA 1969 was introduced (Dobrevva, 2018; energy.gov, 2022). The act required EIAs to be conducted by federal agencies in regard to changes in policies or developments of large-scale projects which may affect the environment. This was a global driver of environmental

policy change, which later resulted in the first European directive regarding EIAs to be introduced in 1985, Directive (85/337/EEC) (Glasson et al., 2019; DHPLG, 2018). Despite the directive being introduced in 1985, there has been literature which stressed the necessity for such policies since the late 70s (Fischer and Onyango, 2012). As a result of the directive, all member states of the EU had to comply with new processes regarding development projects. These directives have been altered since then, most recently in 2014, and codified into a single act; currently the revised Directive 2011/92/EU is in force in the EU (European commission, 2022). The purpose of this was to help alleviate administrative burdens, and to streamline the process without negatively affecting current safeguards in place (European commission, 2022).

Within the UK, the legislation regarding EIAs is currently governed by the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, and stems down from the EU directive (gov, 2020). The understanding of the EIA process and its effectiveness has been improving over time, with more countries adopting such practices and new acts being adapted (Fischer and Onyango, 2012; Zhang, Kørnøv and Christensen, 2013). Projects fall within one of two categories, Annex 1, where EIAs are mandatory due to scale of the projects and their potential impacts, and Annex 2, where the national authority decides on a case by case basis whether an EIA is required (Dobrev, 2018). In Wales, the Well-being of Future Generations Act 2015 is an act that promotes sustainable development, research and public transparency regarding development projects (Welsh Government, 2015). As such, Wales adopts policies enforced by the EU and the UK, on top of independent domestic policies regarding environmentally friendly development. Any public bodies taking part in development in Wales must adhere to all policies in place before undertaking construction (TLSB, 2014d; Welsh Government, 2015; Orford and Henderson, 2017). In addition to this, the UK and Wales also have specific laws in place regarding development of marine environments, due to the UK's high potential of benefiting from such developments (Willis et al., 2010; Hamlyn, 2015). One of these is the Coastal Access Act 2009, first brought forward by the Department for Environment Food and Rural Affairs (Lyness, 2009; Willis et al., 2010). Resulting from this, any developments must first provide a description of the development, reasonable alternatives in technology and design, baseline of the area, significant impacts the development may

have on the environment, as well as ways to prevent or mitigate potential impacts (Orford and Henderson, 2017). Public opinion is also included within EIAs, as developments will have impacts on the human population in the area, and so more weight has been given to public opinion in regards to decision making (UNECE, 2014). All these factors will impact decision making and will ultimately decide whether a project is able to proceed or not.

1.2 The EIA Process and Stages

The EIA process has been adjusted, outlined, and standardised, so that thorough assessments can be carried out regardless of location or project type (gov, 2019; European commission, 2022). The UK government requires developers to use third party contractors to carry out EIAs in advance of any developments taking place. The EIA process is broken down into five stages, which are outlined in the Town and Country Planning Regulations 2017 as follows:

Screening: This stage is a preliminary assessment of the project to determine whether or not it falls within the scope of the Regulations (gov, 2020). The project is also assessed on whether it will have significant impact on the environment, thereby deciding whether an EIA is necessary to proceed. Projects are likely to require an EIA if they are large in scale or situated along conservation areas, SSSIs (Sites of Special scientific Interest) or areas vulnerable to anthropogenic intervention such as wetlands.

Scoping: This stage is used to determine the extent of possible impacts that need to be assessed and reported within the EIA (gov, 2020). Within this stage, the applicant may ask the local planning authority for information that may need to be considered within the EIA. This is known as a 'scoping opinion' and may be beneficial to the applicant due to local authorities often possessing useful information and can provide a preliminary opinion of aspects that may need to be assessed during the EIA process (gov, 2020). This stage can be particularly useful to plan the EIA in a way that makes approval most likely during later stages.

Preparing an Environmental Statement: The project only progresses to this stage where it is decided by the planning authority that an EIA is necessary for the project to continue. The Environmental Statement must be submitted, including information listed under the Town and Country Planning Regulations, specifically regulation 18(3) in compliance with regulation 18(4) (gov, 2020). Additionally, the planning authority is

required to provide any relevant environmental information they possess to aid the applicant in the process. The report must be completed by competent experts, whose relevant qualifications and expertise must be outlined by the developer along with the Environmental Statement (gov, 2020). Qualifications and third parties that can certify an expert in the field include CIEEM and BREEAM, both organisations that specialise in conducting EIAs (CIEEM, 2019; thomsonec, 2023). This is to ensure high quality and completeness of the report, making sure the third party that carries out the EIA is qualified to do so.

Making a planning application and consultation: During this stage the Environmental Statement and the development application are publicised through electronic means, along with a public notice within the local area of the project (gov, 2020). During this part consultation bodies must all receive a copy of the application, either through the applicant or local planning authority. This is to give the consultation bodies and the public concerned an opportunity to discuss and provide their views and opinions on the project and EIA before development commences (gov, 2020; UNECE, 2014).

Decision Making: This is the final stage where the Environmental Statement along with any extra documents which will affect the decision, including comments, representations, and public opinions, are submitted to and considered by the local planning authority (gov, 2020). The planning authority or Secretary of State will then decide whether the project is granted consent for development. The public and any relevant parties are informed of the decision, along with the reasoning behind it, publicly and electronically, to ensure transparency and avoid misinformation.

The five stages are a guide to the process; however, it does not always proceed in that specific order (Fig. 1). This is due to possible revisions which may be necessary for the project to proceed (Environment Agency, 2002).

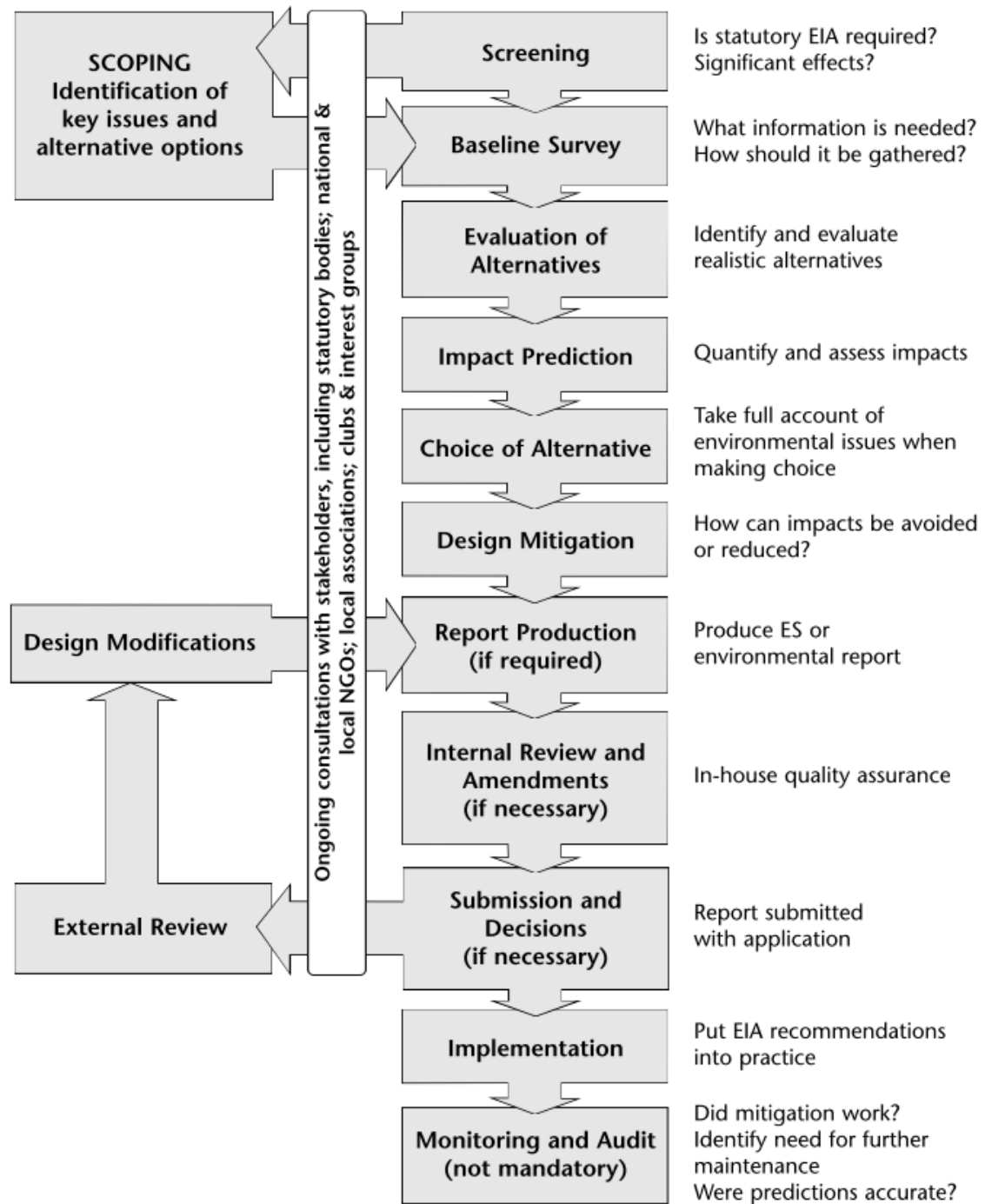


Figure 11. Key steps in the EIA process: The flow diagram shows how some of the stages in the process may be altered or repeated as a result of reviews and alternative options. The project is then altered to fit new requirements, after which the steps are repeated to see if the new version of the project is suitable for development (sourced from Environment Agency, 2002).

1.3 Concerns

The regulations and policies have been evolving and changing since their introduction by the EU in 1985 (Fischer and Onyango, 2012). This is due to ever changing technologies and advancements in environmental sciences, exposing new gaps in knowledge and legislation (Gonzalez and Enríquez-De-Salamanca, 2018). This means that even in current legislation, there may be gaps and omissions due to missing research or knowledge. This can especially be an issue since development projects can differ greatly in scope and purpose, resulting in legislations being vague to fit potential future projects. One such example can be found in the Town and Country Planning Regulations 2017, where the requirement of environmental statements being prepared by a 'competent expert' can be found (gov, 2020; legislation.gov, 2017). The term 'competent expert' is not clearly defined and can be up to interpretation. Many organisations such as CIEEM (Chartered Institute of Ecology and Environmental Management) and BREEAM (Building Research Establishment Environmental Assessment Method) are reputable organisations which train experts and provide qualifications to prove their expertise. This, however, is not guaranteed to be the case for all organisations. There is no universal government standard to hold 'competent experts' to, and as such the lack of definition can potentially lead to poor quality EIAs. This however can be mitigated by revisions, public opinions, and representations of EIAs during later stages of the process, which is why such steps are necessary to accurately assess potential projects. Yet, this does not guarantee all EIAs to be carried out to the same standard.

Most development projects will be marine, or on solid ground, however some projects can be both. This can create challenges for developers in the case of renewable energy projects due to all developments connecting to the national grid (Willis *et al.*, 2010; Hamlyn, 2015). Due to this, construction rights need to be obtained for marine parts of the project, as well as inland parts that may need to cut through public or private property (Hamlyn, 2015). This can complicate planning due to each component being under different jurisdictions and having differing levels of sovereignty on a national or international level, especially in the case of marine projects (Glasson and Bellanger, 2003; Hamlyn, 2015). This usually results in delays in developments due to legal challenges that arise in obtaining proprietary rights for construction on land and water (Hamlyn, 2015). For coastal projects this is usually not an issue, due to coastal

waters being governed by local authorities. Additionally, some of the current legislation present in the UK originally stem from EU directives, and as such contain similar standards and requirements to international laws within Europe (Hamlyn, 2015; Orford and Henderson, 2017; Dobрева, 2018). In the case of development projects in international waters, legal issues may arise due to international and national law potentially having differing requirements for construction (Hamlyn, 2015; Dobрева, 2018). Differences in law can lead to differing requirements between states that lead to higher costs of preliminary assessments, as well as delays in obtaining permits and rights for construction. In the case of large-scale projects, this can lead to significant costs and delays, affecting the feasibility of development in the long term.

2 Case study: Tidal Lagoon Swansea Bay (Generating Station)

2.1 Background and key information

Climate change and greenhouse emissions have been a widely discussed topic globally in the past decade, with high amount of pressure being put onto governments to encourage and develop renewable energy (Roche *et al.*, 2016; Moreira *et al.*, 2022). The Swansea Tidal Lagoon would have been the first energy producing lagoon in the world, situated by the Swansea docks in the Swansea Bay area (Fig. 2) (TLSB, 2014e; Langley and Evans, 2017). This meant the technology is still in its early stages of adaptation and has not been tested in this context yet. The proposed development would have potentially generated average electricity to power ~120,000-155,000 homes, alternatively equating to around 70-89 percent of Swansea Bay's annual domestic electricity use (TLSB, 2014e; Petley and Aggidis, 2016; Roberts *et al.*, 2018; Moreira *et al.*, 2022). The project was almost entirely privately funded, however the UK government should have provided funding based on the HMT Guarantee scheme, to help alleviate debt where market conditions constraint organisations from making use of typical lenders such as commercial banks (Hendry, 2016). The Swansea Lagoon was rejected in the end by the UK government, due to a high initial cost for a low energy return with relatively high strike price on electricity, when compared to other potential projects utilising wind and solar energy (Guo, 2022). One aspect that was not entirely considered was the longevity of the project, with a 80 year energy plan and possible 120 year operating life, compared to shorter operating life spans of solar and wind farms (TLSB, 2014e; Guo, 2022).

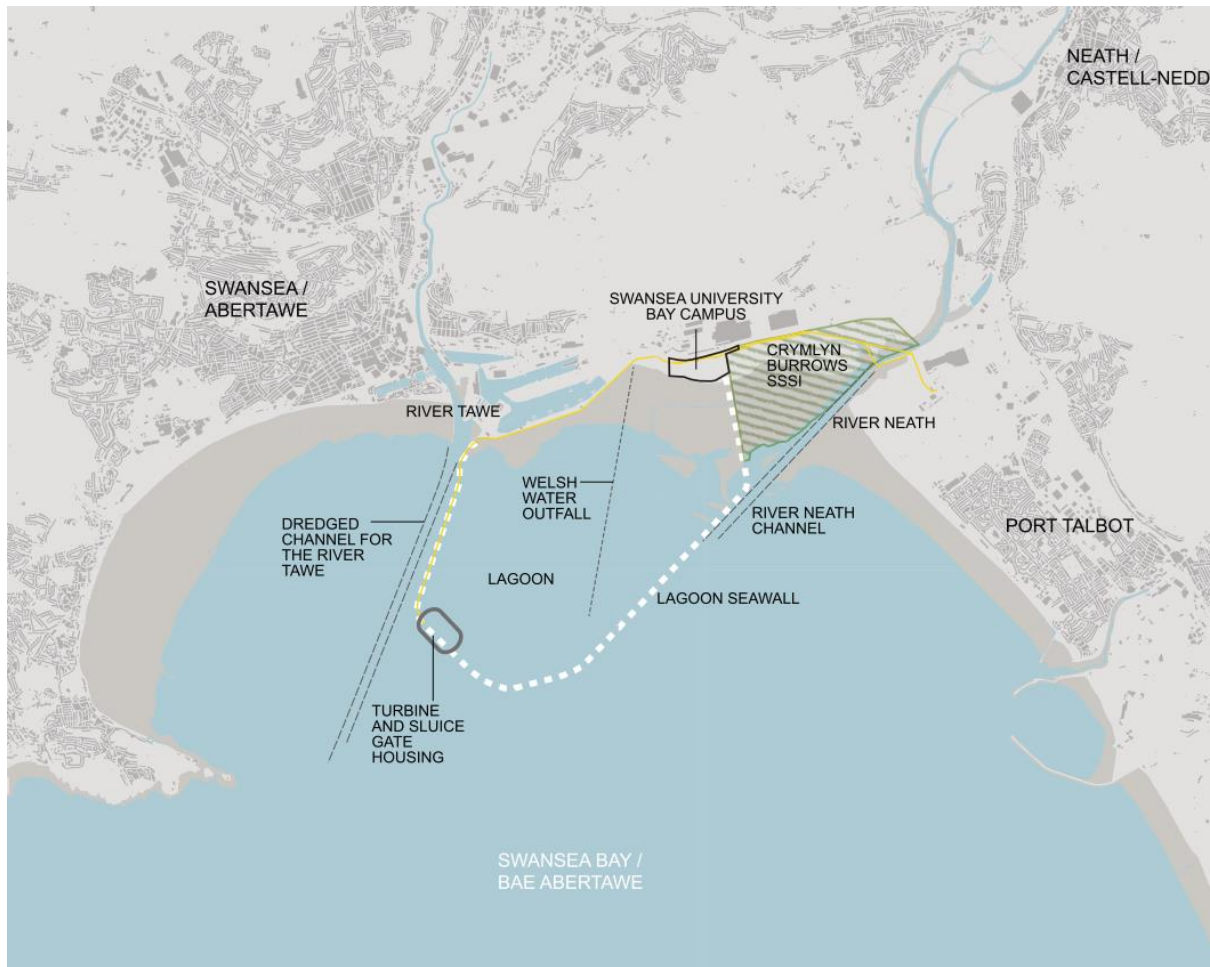


Figure 12. The proposed development area. Situated in Swansea Bay, the Western part of the lagoon connects to the Swansea docks. The Eastern section connects to land by Swansea University Bay Campus, bordering the Crymlyn Burrows SSSI (Sourced from TLSB, 2014e).

The lagoon itself produces energy using the tidal movement in the bay. 16 bi-directional turbines with a diameter of 7m within the array would produce the energy, using sluice gates which would control water movement in and out of the lagoon (TLSB, 2014e, 2014c; Petley and Aggidis, 2016). Water would be kept in the lagoon during low tide, and water would be kept out during high tide. This creates a constant water level gradient, allowing electricity to be generated during both high and low tides (TLSB, 2014e; Petley and Aggidis, 2016; Roberts *et al.*, 2018). With the Swansea Bay having an average spring tidal range of 7.5m, it has very high potential for effective electricity generation (Thomas, Phillips and Lock, 2015; Roberts *et al.*, 2018). The lagoon also featured off coast buildings for public use, as well as public swimming areas, safe places for water competitions, ecological parks, routes for pedestrians and cyclists, and public transport routes (TLSB, 2014e). This aimed to encourage the local

public's use of the lagoon and bring in tourism to the city of Swansea. As the first energy producing lagoon in the UK, apart from helping reach UK's renewable energy goals, this was a potentially positive impact on local culture and appeal to a wider audience across the UK.

There are a number of legislations that this project fell under. A marine license under the Marine and Coastal Planning Access Act 2009 was required for the project to proceed (Lyness, 2009; TLSB, 2014; naturalresources.wales, 2022). The application for the license was submitted concurrently with the planning application. Along with this application, the Development Order Form, the Environmental Statement, Consultation report were submitted to the Planning Inspectorate, including Natural Resource Wales (TLSB, 2014e). Additionally, an EIA was carried out due to the Marine Works Regulations 2007 (TLSB, 2014e). Electronic copies of all documents were sent out to concerned public parties, and hard copies were made available to the general public in multiple locations in the Swansea Bay area (TLSB, 2014e). This project followed all major directives and laws concerning development, and effort was made to provide the public with as much information as was available. This resulted in the planned development process being transparent, and majority of information on the project is still readily available on the Tidal Lagoon Power website (tidallagoonpower, 2023)

2.2 Environmental Statement

2.2.1 Preliminary scoping, consultation, and positioning

Preliminary research on the project was conducted as part of the application and EIA process (TLSB, 2014b). This is reported in chapter 2 of the ES conducted by Tidal Lagoon Swansea Bay, however a copy of the preliminary report is not readily available. A link to the website containing the document no longer exists, and as such obtaining a copy of the report was unsuccessful. This could be due to the project being denied, and so information on the project has been made unavailable on certain government websites. The project itself falls within Schedule 1 Regulation 15 of EIA regulations, which is a dam or other project which is designed to store or hold over 10 million cubic metres of water (TLSB, 2014b). This means the project automatically required an EIA to be conducted (Dobрева, 2018; gov,2020). In 2012, the applicant requested a scoping opinion from the Planning Inspectorate, and this document was granted in accordance with legislation. The preliminary scoping found 19 factors for

consideration, including local fauna, water quality, sediment transport, visual impact, and cultural heritage to name a few (TLSB, 2014a, 2014b, 2014e). The seabed feasibility was also assessed based on possible locations, to give the EIA a clearer definition of near-field and far-field areas to be studied during the following EIA stages (TLSB, 2014e). Preceding and following the initial scoping, continuous consultations and presentations were carried out with consultees and the general public between 2011 and 2013 as a way to start and continue engagement with concerned parties, as required by law in the case of this project (TLSB, 2014b; UNECE, 2014; Hendry, 2016; Dobрева, 2018). The practices displayed here followed legislation appropriately. However, due to the unavailability of the scoping report, it is difficult to comment on whether it followed government standards and legislations. From the rest of the available reports, it can be concluded that legislations were followed accurately, and consultees along with the general public were satisfied with the standard of the report submitted with the application. In this case continuous consultations with concerned parties would allow for mistakes and issues in the report to be identified and rectified before the project proceeded to the next stages.

For this project, multiple locations were considered during the planning stage. The location was selected on a number of factors, some of these including the tidal range, beach profile, position of the landfall, and potential turbine depth (TLSB, 2014c). With Swansea Bay being a shallow bay with a low sediment depth gradient and a high tidal range, it was a favourable spot when compared to other options (TLSB, 2014c; Hendry, 2016; Petley and Aggidis, 2016; Guo, 2022). Swansea Bay is a mostly inhabited area, and so factors such as potential impacts to water quality of public swimming areas was taken into special consideration (TLSB, 2014c). Many iterations of the lagoon design are provided, with the one with minimal impact to formerly mentioned environmental factors was selected (TLSB, 2014c). For example, the turbines were positioned facing south to westerly waters, to maximise potential electricity production, while having minimal impact of water quality within Swansea Bay (TLSB, 2014c; Roberts *et al.*, 2018). This development came as a result of consultations with local public authorities and general public, while providing numerous options and alternatives to proposed development. Due to this, an informed decision with possible options took place, resulting in minimal impact to the environment, while still providing benefits of the project.

2.2.2 Possible impacts and additional mitigation

During the process of the EIA, 19 possible impacts were identified (TLSB, 2014a, 2014e). Out of these 19 possible impacts, not all of them required additional mitigation measures. Majority of impacts were nullified or kept to a minimum due to the design of the lagoon; for example, the benthic ecology, and sediment transport saw small to negligible impacts across the bay, and water quality saw a possible improvement inside the lagoon (TLSB, 2014e; Langley and Evans, 2017; Horrillo-Caraballo *et al.*, 2018). This is a potential positive impact in the bay, and as such is in line with European and local legislation, despite potential initial negative impacts (Welsh Government, 2015; Dobрева, 2018).

In other cases, few to several mitigation measures were proposed, depending on the significance and extent of possible impacts. In the case of marine mammals, potential impacts were significant, and as such more mitigation measures were proposed. With most impacts occurring during construction due to noise, vertical piling techniques have been proposed, and in the cases of percussive drilling, the project would follow the Joint Nature Conservation Committee piling protocols to mitigate impact (TLSB, 2014e). Additionally, in the cases of benthic species, the lagoon wall was designed to promote ecological growth, partially to promote growth of vulnerable species such as the honeycomb worm (TLSB, 2014e). This promotes local fauna coexisting with new infrastructure, and is in-line with local legislations, such as the Well-being of Future Generations Act 2015, which promotes green infrastructure in Wales (Warren, 2010; TLSB, 2014e; Welsh Government, 2015). This legislation can potentially help local species, and in the case of the lagoon, can promote growth of rare species local to the area. The lagoon wall is promoting growth by being constructed from local and imported sediment. This idea is good in theory; however, the acquisition and transport of such materials can be negatively impactful in regard to greenhouse emissions. The rock armour that covers the barrier was predicted to produce over 50,000 tonnes of carbon dioxide during manufacture (Simon, 2015). This is not mentioned in the report and can be a factor omitted by legislation. This proposes a potential gap in assessment, as further research was only done by independent researchers, and was not a standard part of the EIA. The process of examining such impacts can be difficult and costly, however it could provide a more accurate insight into actual carbon emissions compared to emissions negated by the use of renewable energy. This can

be especially significant in large scale projects with long lifespans, however could also be applied to smaller projects or where the life span is not as long.

A Seascape and Landscape Visual Impact Assessment (SLVIA) was conducted as part of the EIA. Potential landscape and seascape impacts were identified within a 15km area around the designated project area (TLSB, 2014e). The SLVIA was conducted under the definitions stated by The Landscape Institute & Institute of Environmental Management and Assessment (IEMA) in 2013 (TLSB, 2016). Since the construction area was mostly within an industrial and maritime environment, the landscape area would be negligibly affected (TLSB, 2014e). After revaluation, a possible impact was brought forward in the form of the cable that would connect the lagoon to the national grid. The 275kV cable was therefore housed underground, so visual impact would be limited to the construction phase (TLSB, 2016). In this case, due to possible impacts being discovered after the EIA was conducted, the project details were amended in 2016 as to accommodate these changes based on guidelines outlined by IEMA. This presents a scenario where an impact was not initially considered during the EIA stage, however, was mitigated with further consultation.

3 Conclusion

EIAs in the UK have been under constant amendments and revisions since their initial adoption into law from the EU directive (Fischer and Onyango, 2012; Dobрева, 2018; gov, 2020; gov, 2021; European commission, 2022). This is as a result of the field constantly growing and evolving, with changes to legislation being necessary due to new techniques and concerns being discovered to ensure highest possible standard of EIAs being carried out across the UK. With the primary purpose of EIAs being prevention of environmental impacts and mitigating impacts where possible. Since their introduction many changes have been made to further promote environmentally friendly development. Many potential impacts are regulated and taken into consideration depending on the project type and location, to allow the best potential examination of impacts projects may have on the environment. Within this process, there exist gaps concerning certain vague definitions, as well as issues when development is both inland and marine simultaneously (Hamlyn, 2015; Dobрева, 2018). Vague definitions allow legislation to be applied to a wider range of projects without overly complex explanations, however, can lead to misunderstandings or

potential errors in the EIA process due to interpretation. In some cases of marine and inland projects, differences in legislation between land based and marine projects may lead to delays of projects and increased costs, potentially decreasing the feasibility of a project based on legal expenses. It is suggested that more specific definitions could be provided, not with less room for interpretation, but rather more standardised levels of responsibility to which experts and developers are held.

Some aspects of development are yet not required by the government as part of the EIA process. One example identified in the case study was greenhouse gas emissions as part of material production and transport. These gas emissions are not necessarily part of the construction itself and is handled by external parties, however these emissions still contribute to climate change, and as such should be taken into consideration (Simon, 2015). Such studies are undertaken by independent researchers, and as such should not be impossible to conduct by large companies working with multiple consultant third parties. Research such as this being part of EIAs could further display the impact development may have on climate change, especially in the context of projects promoting renewable energy. All renewable energy products produce greenhouse emissions during material production and transport, however knowing these amounts can give a more accurate representation of real impacts projects have on climate change.

Overall, the current processes and legislation in the UK and Wales concerning EIAs are satisfactory and provide a comprehensive break down of impacts development may have on the environment. It is not however perfect, and there is still room for improvement in legislation, as well as the process itself. When the legislation is followed appropriately, even large-scale projects such as the Tidal Lagoon in Swansea can be approved based on low environmental impact, however even then in some cases funding can be the ultimate issue which leads to a project not being approved.

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Analysis of the Environmental Impact Assessment (EIA) and decision of Moray West Offshore Wind Farm

S. Judd

Abstract

Environmental Impact Assessments (EIAs) are widely used around the world. EIAs help to minimise and mitigate environmental effects of construction and infrastructure. In the UK there has been use of such legislation since 1988. Each of the countries of the UK have slight differences to their EIA legislation but follow a similar base structure. The Moray West Wind Farm EIA was first produced in 2018 and was passed in 2019 and has since been edited in 2020. The EIA focuses on the offshore structures as a separate EIA was completed for the onshore terminals and infrastructure. This EIA is very thorough and focuses on all aspects needed for an EIA, but it offers more of a check list than going beyond what is needed. Even though there is much detail, there is a lack of mitigation tactics and how the company will enhance the site.

Keywords

Environmental Impact Assessment
Moray West
Wind Farm

1 Introduction

With an increased demand for energy supply around the world, there has also been an increase in pollution and energy production shortages. In the Environmental Act of 2021, new targets were set out to improve many areas of the environmental sphere. One important point was to decrease the production of pollutant PM_{2.5} by over a third (DEFRA, 2021). This is seen as highly ambitious. The pollutant is formed by non-smokeless fuels and can create many natural and health issues (DEFRA, 2022). The IPCC also has set targets to mitigate the rising temperature of the planet. They have stated that in order to survive on the planet a less than 1.5c increase in the planet can occur and have released pathways to make this a reality (IPCC, 2022). A way to help reach targets and improve the health of the UK and the world would be greater investment into green sources of energy. Now more than ever there is a call for

cheaper and accessible fuel. But in order to put these newer technologies in place, Environmental Impact Assessments (EIA) are needed to judge the environmental impact of such constructions.

An Environmental Impact Assessment (EIA) is a thorough analysis of major human activities and the significance of their environmental effects. EIAs were first conducted in the UK in 1988 as part of the Environmental Assessment Regulations for Scotland and through the Town and Country Planning Regulations in Wales and England (Jha - Thakur and Fischer, 2016). The EIA directive was updated in 2014 with amending legislation Directive 2014/52/EU (NPWS, 2022). The new amendments allow for inclusion of challenges which have occurred since the EIA was first put into UK legislation thirty years ago and for them to function more efficiently in the modern climate. As are a way to ensure that environmental impact is considered before the decisions are made on development proposals. An EIA is needed when a development falls within the description laid out by the 2017 Scottish EIA Regulations (East Lothian Council). The 2017 EIA Regulations state that an EIA is needed when a building or construction is schedule 1 or schedule 2. Schedule 1 developments are sites such as airports or oil refineries which have a clear negative effect on the environment and EIAs are compulsory. However, Schedule 2 has a greater focus on a wider range of developments as they are listed as 'development likely to have significant effects on the environment by virtue of factors such as its nature, size or location' (UK Gov't, 2017). This can often lead to disputes as it is not as clear cut as to what developments need EIAs. In Scotland there are ten 'regimes' that EIAs fall under. Some of these are; marine licensing, land drainage and transport (Scottish Government, 2022). Often an EIA is carried out in Scotland on the request of the planning authorities. This happens through a screening (Scottish Government, 2022). The action of undertaking an EIA before a construction minimises the positive feedback loops which could be created if the development went ahead without environmental consideration. This leads to a lower carbon footprint of the development and a lower cost to try and mitigate the effects the developments could cause. EIAs in other regimes such as agriculture, have older regulations in which they have to follow. The Scottish Agricultural EIA dates to 2006. This could be seen as an issue as the environmental standpoint of the government and the importance of mitigation and prevention is more important than ever before due to the current climate.

1.1 The EIA Process

The Scottish Government (2022) has stated that EIAs have five main steps and a sixth step for after the process. The steps are as follows:-

Step 1: Screening - Screening is needed to find out the need and validity of undertaking an EIA on a specific development.

Step 2: Scoping - This step is where it is decided whether or not a site or development needs an EIA after looking at the details of the site and looking at the preliminary damage and effects it could have on the environment.

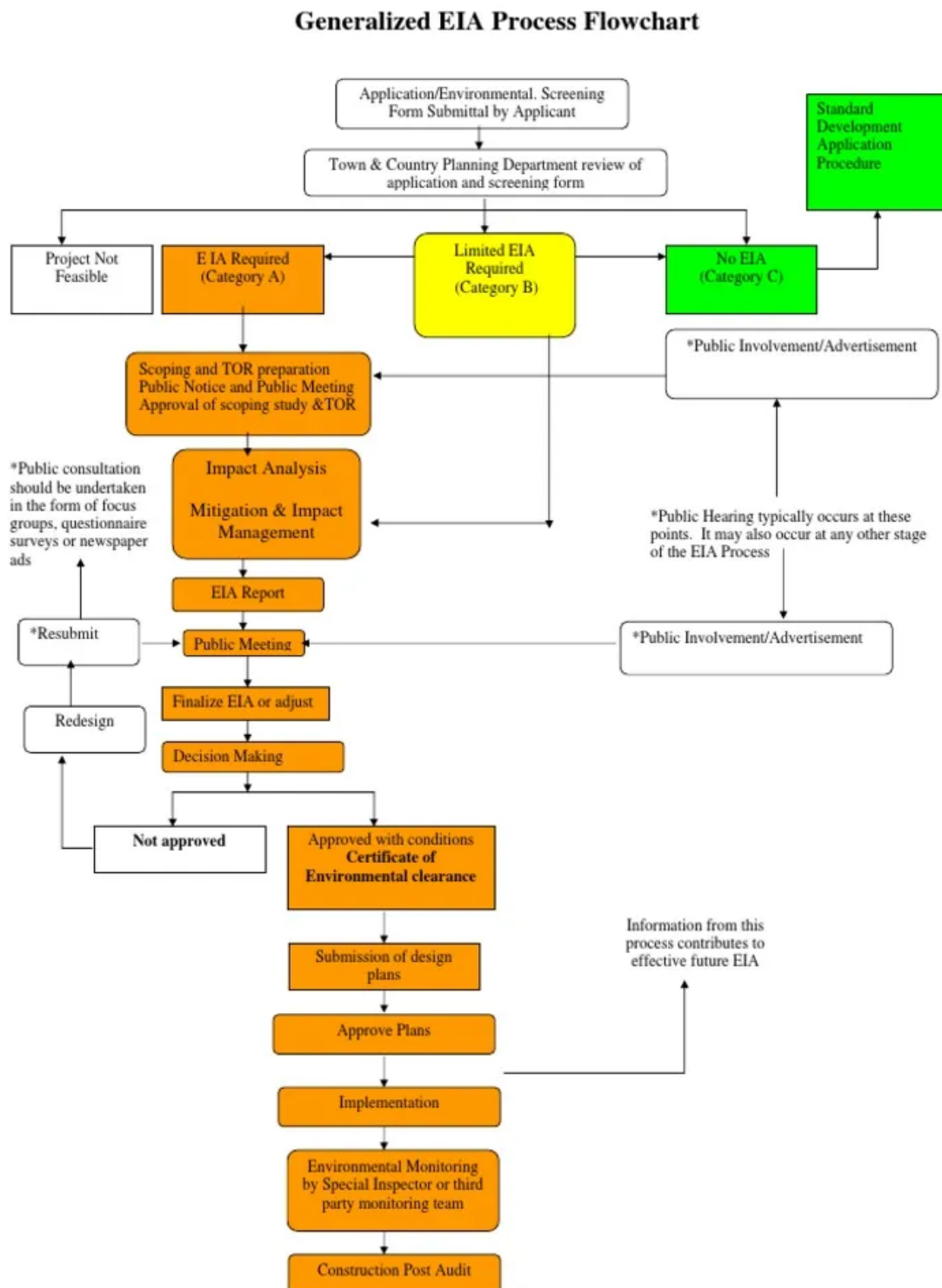
Step 3: Preparing the EIA report - This step has to include a more in-depth look at the likely significant side effects it could have on the environment.

Step 4: Making an application and consultation - The EIA and application at this point must be made public and advertised so that the locals and people who could be affected by the project are made aware. There must also be an open forum for people and stakeholders to offer their thoughts on the development.

Step 5: Decision Making - The authority under which the EIA has been submitted must look through the report and any comments to assess whether the application should be granted or not. The outcomes of the decision must be published.

Step 6: Post decision - The sixth step of the EIA is after the EIA is completed. This is when the developer must undertake any testing or monitoring which has been requested by the granting authority. This will again lessen the negative effects on the environment as the developers will look into a wider range of effects that could be caused and work out plans to mitigate them (Mygov.Scot, 2022). Below the process of an EIA can be seen via a flow chart.

Figure 13 Diagram of the EIA Process Kadinjappalli (2022)



2 Moray West – Case Study

2.1 The Development

The Moray West development application details the plans for an offshore wind farm in the Smith Bank in the Outer Moray Firth (As can be seen in figure 3).

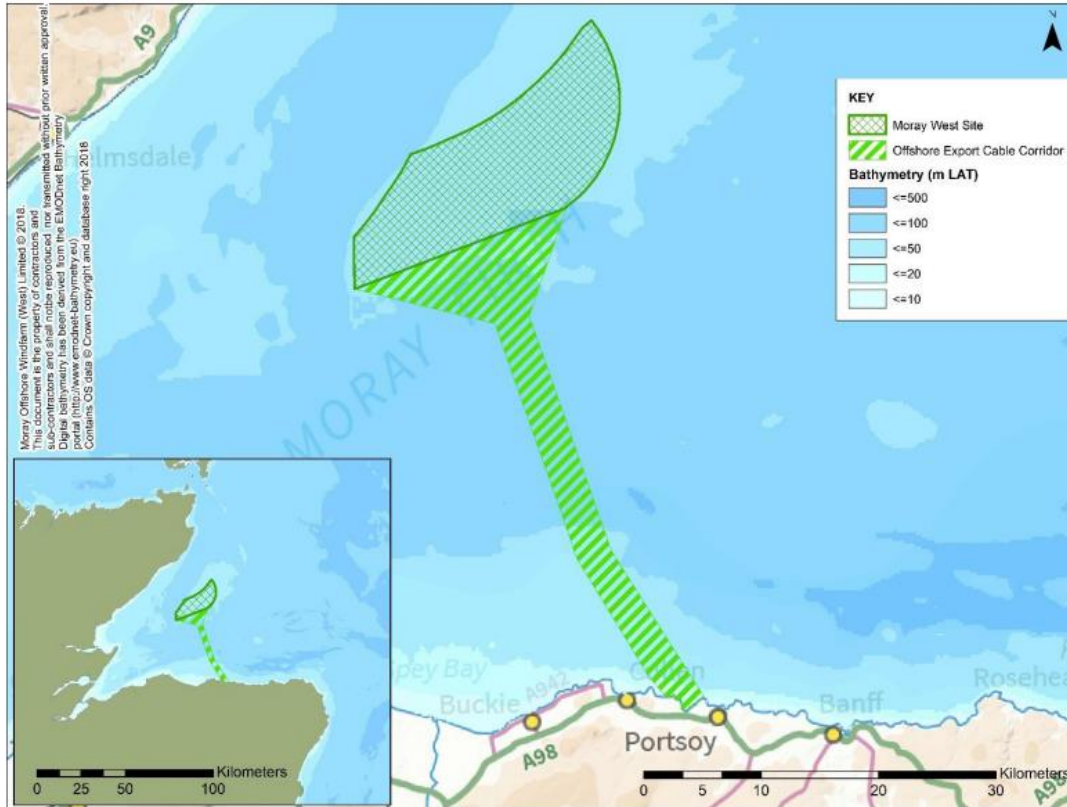


Figure 14 Moray West Offshore Wind Farm (2018)

The EIA was completed by a team at Moray West in association with GoBe Consultants. GoBe Consultants project managed the EIA and assisted with the data, analysis and interpretation needed for the EIA. It falls under the regime of marine licensing and the application was proposed in 2018. This was after the company *Moray Offshore Wind Farm (West)* received the Zone Development Agreement (ZDA) in January 2010. Before the EIA could be proposed further steps were needed to be taken out by the company. Scottish Ministers were first informed about the project in March 2014 and the site was proposed as three sites to generate 1,116 MW across the Moray East site. In September of the same year the needed marine licences were granted. The site was split into two due to the vast array of constraints which the company faced in the west end of the site (MOD practice site, non-renewable energy sites and European protected sites) (Moray Offshore Wind Farm (West), 2018). In 2016 the constraints of the West end of the Moray Firth were reduced due to the

removal of the MOD site and the Beatrice oil field was decommissioned. The development plan presented was to create a wind farm and construct transport cables both underground at sea and on land. The site would be 22.5 km from the Caithness shoreline and cover a total area of approximately 225m². When the application was presented, the plan was to have 85 wind turbines, which could be no higher than 285m from the highest astronomical tide (Moray West Public Notice, 2018). The development hoped to create 1/3 of the energy needed to power Scotland and save 1.1 million tonnes of CO₂ emissions every year (Moray West, 2022). The development was applied for under section 36 of the Electricity Act 1986. As can be seen, the process to develop such a site is difficult and long. There are many steps to complete which focus on both laws and the environment.

2.1.1 Non-Technical Summary

A non-technical summary is produced and in this case is the first document which can be viewed for the development. This is also one of the shortest documents. This makes the project more easily accessible for the public. It also offers the ministers and planners a simple overview of what the company wishes to achieve. This is a requirement of the Section 36 grant.

2.1.2 Visualisations

The EIA for Moray West is incredibly well illustrated with graphs, figures, and diagrams. It allows the reader to fully understand the effects. Furthermore, the inclusions of visualisations from various locations that will be affected shows the ministers that visual appearance has been contemplated. With this it makes decisions

easier as it showcases just how visible they would be and how it would affect the locals (Figure 4).

This is also an integral part of an EIA. Under the 2002 Guideline for Landscape and Visual Impacts Assessment, visual assessments are needed to be undertaken to fully

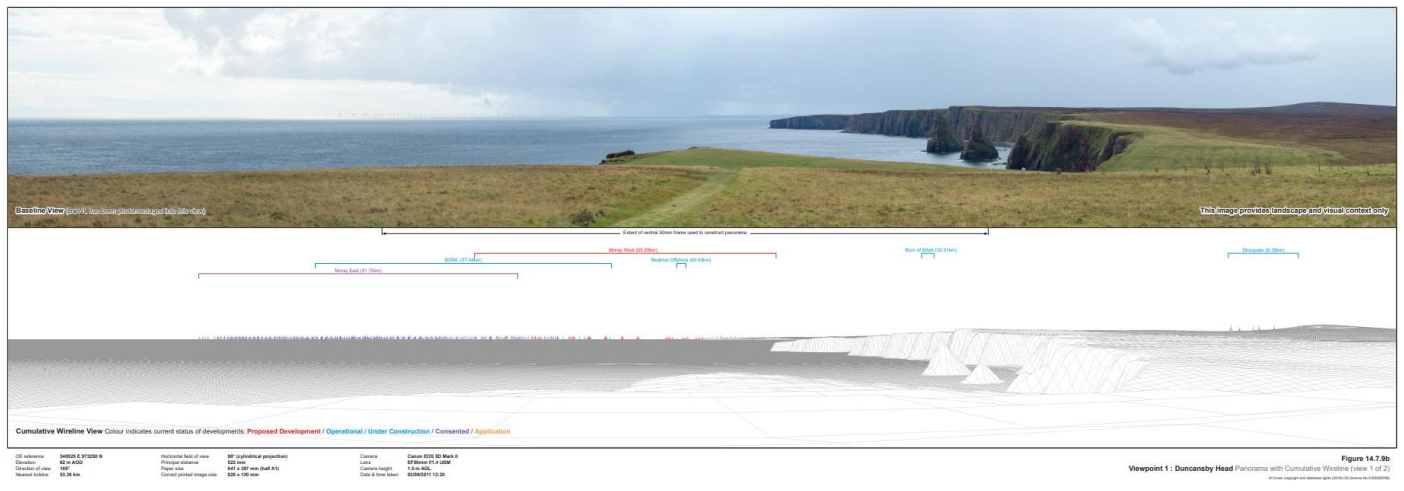


Figure 15 Moray West Offshore Wind Farm (2018)

assess the impact that new developments would have. Due to the nature of this legislation access to further details was not accessible.

2.1.3 Consultants

Many consultants were used to complete the EIA and make it the clearest it could be and to cover many different aspects which would be developed. Some of these consultants were: Sea Mammal Research Unit Consulting Ltd, Wessex Archaeology Ltd and Coleman Aviation Ltd (EIA, 2018). Using a range of consultants offers a solid grounding for the EIA and offers various viewpoints which allows for new ideas and issues to be identified which may not have been otherwise.

2.1.4 Volumes

The EIA for Moray West is split into four volumes all focused on different parts of the EIA. Volume one is the non-technical summary and offers a baseline knowledge and explanation of the site. Volume two is the main body and is the main EIA of over 1000 pages and has the in-depth detail needed for permission to undertake the development. Volume two also contains a contents page for the whole document. Volume three is much different to the first two sections as it is split into the different chapters and the files contain the accompanying diagrams, charts and maps which are included in the main document so make them much easier to access. This allows

full access to just the diagrams which is important as they contain much of the information for the EIA such as fish spawning locations (Figure 4) and Shipping paths (Figure 5) (Moray Offshore Wind Farm (West), 2018). Finally, volume 4 is the contents for the technical appendices.

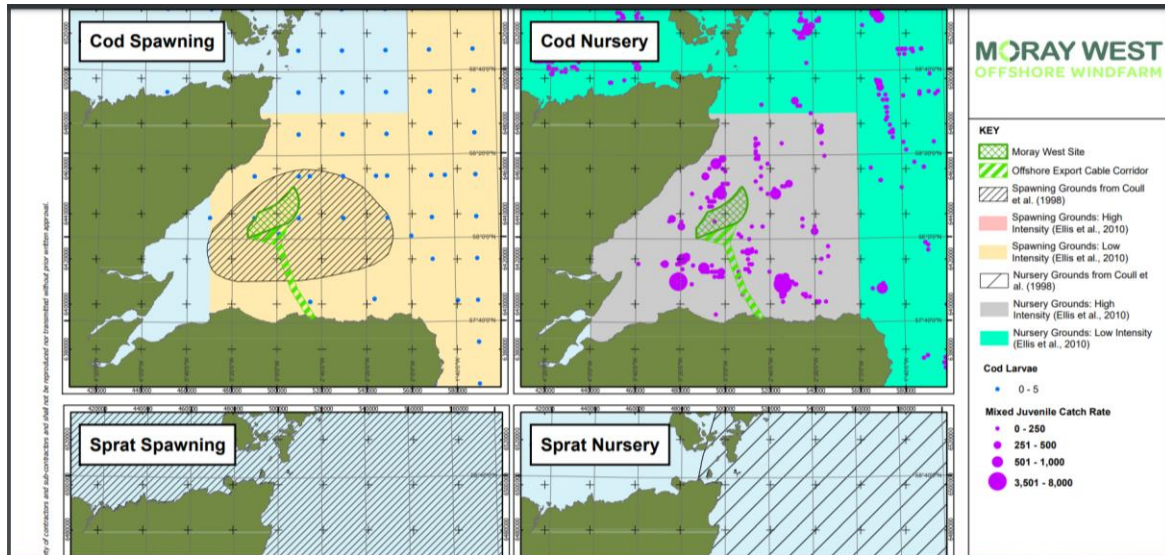


Figure 16 Moray West Offshore Wind Farm (2018)

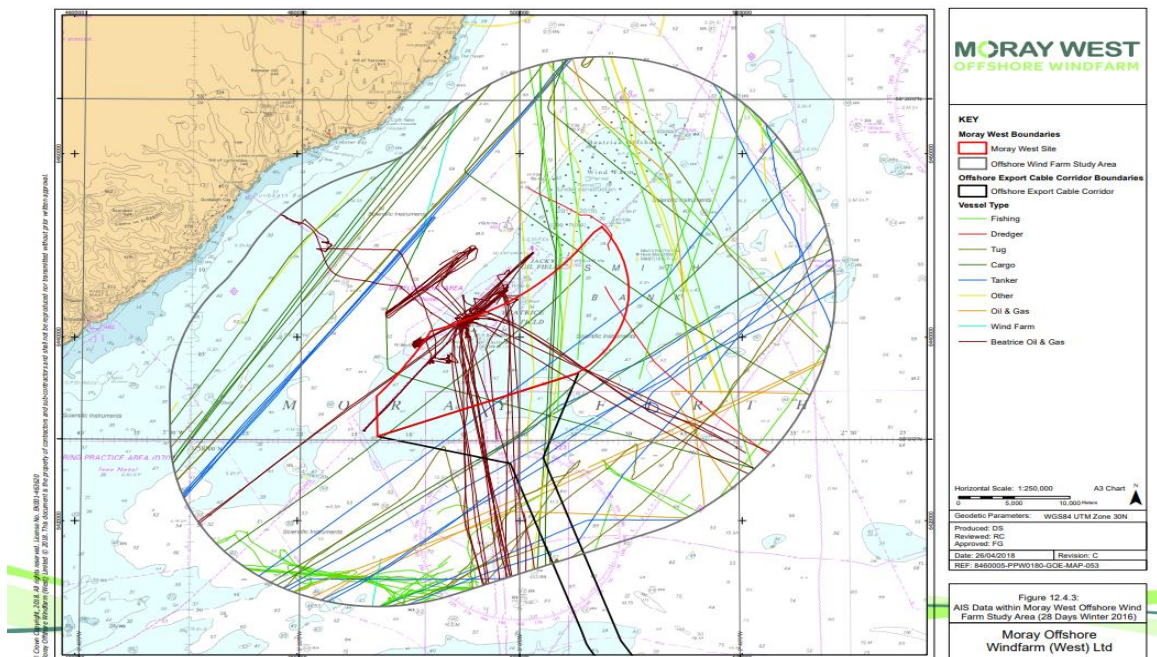


Figure 17 Moray West Offshore Wind Farm (2018)

2.2 *Theory and Law*

There were many laws and legislation that the Moray West wind farm had to comply with and have permission from before construction could be considered. These legislations are discussed below.

2.2.1 Electricity Act

Section 36 of the Electricity Act normally focuses on onshore power production and the use of overhead cables. Section 36 comes from the 1989 Electricity Act which has been amended over the years (Scottish Gov't, 2022). The most recent amendment was in 2022 and effected section 5.2.2 and 5.2.3. These sections state what is needed for an application under Section 36 or 37 if included in an EIA. Even though the focus of this EIA is the offshore turbines, the section 36 grant would be needed for the onshore generation station, which has a separate EIA under a different regime. Section 36 needs the following:

- a cover letter requesting the consent and where relevant the deemed planning permission;
- a planning statement;
- a detailed map showing the land where the proposed development would be built or the electric line(s) installed including detailed infrastructure, access routes etc. Further detailed maps on specific aspects of the EIA report will also be required;
- the fee to be paid as set out in section 5.3 below;
- a hard copy of the EIA report, including references to the technical appendices;
- a CD copy of the EIA report;
- a non-technical summary of the EIA report setting out, in lay terms, the significant environmental effects of the proposed development; and a separate schedule of mitigation.

(Scottish Gov't, 2022)

As can be seen there is a lot of paperwork needed to be offered a section 36 grant. Most of the requested documents are contained within the EIA itself but there is a need for further expansion on some of the points such as the cover letter.

2.2.2 Marine Licensing

Marine Licences were requested under the Marine (Scotland) Act 2010 and Section 65 of the Marine and Coastal Access Act 2009. A wind farm falls under section 21. 1.5

of the Marine Licences and states that a licence is needed 'To construct, alter or improve any works within the Scottish marine area either—

(a) in or over the sea, or

(b) on or under the seabed.' (UK Gov't, 2010).

2.2.3 Marine Services

Section 20 of the Marine Services was also needed for the planning of the project.

Section 20 states that: No person may—

(a) carry on a licensable marine activity, or

(b) cause or permit any other person to carry on such an activity. (Marine (Scotland) Act 2010). This legislation added to the above Marine Licences allowed the site to progress.

2.2.4 Zone Development Agreement

The Zone Development Agreement (ZDA) for this site was awarded by the Crown Estate in 2010. A Zone Development Agreement offers the terms under which development can take place on a certain site. This was completed under the Crown Estate Act 1961. The official documents were signed in March 2017 and were done so under the Provisions of Scotland act 2016.

2.2.5 Habitats Directive

Habitats which could be affected by the construction of the wind farm are also protected under Council Directive 92/43/EEC, known as the Habitats Directive, which was adopted in 1992 (European commission, 2022). This directive is to protect fauna and flora, including on offshore sites (Moray Offshore Wind Farm (West), 2018) as well as promote and protect biodiversity (European Commission, 2022). Under the Habitats Directive there are many sites which are split into two categories, Habitat regulations and offshore habitat regulations (Moray West). This directive is important especially in sites of wind farms due to the habitats which are affected under the water when embedding the bases of the turbines but also due to the risk that some people see which could affect birds which may fly through the area. As seen in the EIA there are fish spawning grounds right on the site which had to be considered when offering consent for the development. There is a cod (*Gadus*) spawning ground directly where the site will be. This offers many challenges as the population of cod has decreased significantly in recent years which has led to a cod avoidance plan in the UK (Scottish Gov't, 2020). Since fishing cannot take place in certain parts of the year in certain

locations it seems counterintuitive to allow a site to be built over a sizable spawning ground.

2.2.6 Wind Farm Thresholds

Out of the seven countries in Europe with the highest number of current wind turbine projects the UK has the highest number of thresholds and criteria (Vaissiere, *Et.al.* 2014). Development consent orders in the UK are quite common in certain circumstances but these are not seen in other countries. Even though there are more thresholds to be met in the UK the thresholds that are in place are quite significantly more lenient than other countries. The indicative threshold in the UK is only 5 or more turbines or more than 5mw but in countries such as Germany a site has to have over 20 turbines and an output of over 10mw (Vaissiere, *Et.al.* 2014).

2.2.7 EIA Effects on Wind Farms

Smart, Stojanovic and Warren (2014) discuss the importance of EIAs in windfarm development in Scotland and offer the opinion that EIAs actually hinder the growth of green energy. They state that there is a general public backing of such projects, but it is the legislation itself that pushes projects back or ultimately shuts them down. It is known that wind farms do have an environmental cost, hence the importance of EIAs but the scholars are stating that they can sometimes be too harsh and have a negative effect on positive change. Smart, et.al (2014) were writing as the process of applications were being put through the Scottish ministers and show that further research is needed to understand the importance of such legislation. What has to be considered in the present day is that new legislation such as the EIA Directive was amended in 2017 so the authors could not see the effect that such edits would have on EIAs and their connection to wind farm production.

2.3 Mitigation

As per schedule 4 of the EIA mandate it requires developers to include 'A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements...' (Moray Offshore Wind Farm (West), 2018). This aspect of the EIA should outline the significant adverse effects that any project could create. Throughout the Moray West EIA there is 'Embedded Mitigation' which aims to follow the guidelines of schedule 4. There has also been additional mitigation tactics included throughout as needed. Additional mitigation is normally used when the

threshold of significant effect has been reached - Significant in EIA terms. After the establishment of additional mitigation measures a reassessment and monitoring is agreed to be undertaken again to improve the construction and minimise a positive feedback loop.

2.3.1 Water quality

For water quality the mitigation is merely stated rather than clearly explained. In terms of the Marine Scotland OfTI Scoping Opinion, it simply says that 'Mitigation measures will need to be secured' (Moray Offshore Wind Farm (West), 2018). This does not cover any detail as to what the mitigation will be but is stated later in sections 6.8.2/3/4. Section 6.8.2 which details impacts on marine features. This section states that features are only likely to be affected if they are within one tidal excursion of the offshore export cable corridor. This section of the EIA does not seem to take in the wider effects of the project as there could be wider damage outside of the one tidal excursion zone.

2.3.2 Open Cut Trenching

The magnitude of the impact is assessed due to the cables being laid down by open cut trenching. This form of cable laying is intrusive and damaging to the surrounding habitats. There are other options to complete this work, but these do not seem to be mentioned and alternatives are not present. Sometimes open cut trenching is the only method in certain circumstances such as when there are severe dangers and heavy infrastructure surrounding the site, which may be seen at Moray West but there is no accounting for alternatives which could be less damaging to the environment (Gooding, Et. al, 2012). Even though alternatives are not identified the open trench cutting is discussed as to which tools would cause the greatest damage. The biggest effect from this form of trenching is seabed level rise which would cause severe damage to the local ecosystems and offset creatures that lived there. Furthermore, there is no mention of how the company will mitigate these effects. At the time of this EIA there was no detailed cable installation plan. On further research there does not seem to be evidence of this document yet and so the detailed plans for this section of the project are yet to be completed.

2.3.3 Geological Effects

Part of the wire is also going to disrupt designated coastal geomorphological features which are classed as SSSI. It is mentioned that the Dalrian geological exposures would be affected and are part of the SSSI. The fact that this development could do

local harm to scientific sites and important geological features takes away from the positives it would be providing as these sites and habitats are important.

2.3.4 Low Effect Areas

Many of the earlier points, especially in section 7 of the EIA have been listed to have a low impact so mitigation would not be requested. The issue with this is that mitigation can always be put in place even if there is a low impact as lots of low impact areas added up can result in a much larger overall negative narrative. Some of the areas of low effect are:

- Temporary habitat loss or damage
- Subtidal Benthic Biotopes
- Sedimentary Intertidal Biotopes
- Noise and vibration
- Accidental and controlled discharges

2.3.5 Mitigation Tactics

There are many categories of issues but there are few mitigating measures explained in the EIA which leads to gaps in their methodology and their commitment to environmental protection.

The only listed further mitigation needed is due to changes in site location. Further research, surveying and analysis will need to be undertaken if the area falls outside of the listed site in the EIA. So, the only further mitigation needed after the EIA, is if there are direct changes to the terms agreed.

Table 3 Moray West Offshore Wind Farm (2018)

Table 7.7.5: Summary of Development Specific Effects						
Potential Impact	Receptor	Impact Magnitude	Sensitivity of Receptor	Effect Significance	Mitigation (in addition to embedded measures)	Residual Significance
Construction						
Temporary habitat loss / habitat disturbance (subtidal)	Benthic and intertidal habitats and species	Low	Low - moderate	Minor adverse	Confirmation of the presence/extent of any Annex I habitat, and avoidance where present and as practicable.	Minor adverse
Temporary habitat loss / habitat disturbance (intertidal)		Low	Negligible - low	Negligible – minor adverse	N/A	N/A
Increased SSC / sediment deposition (subtidal)		Low	Low - moderate	Minor adverse	N/A	N/A
Increased SSC / sediment deposition (intertidal)		Negligible - low	Negligible - low	Negligible – minor adverse	N/A	N/A
Noise and vibration		Negligible	Negligible	No impact - negligible	N/A	N/A
Accidental and controlled discharges		Negligible	Negligible - high	Negligible – minor adverse	N/A	N/A
Risk of introduction of MINNS		Negligible	High	Minor adverse	N/A	N/A
Operation and Maintenance						
Long term habitat loss	Benthic and intertidal habitats and species	Negligible	High	Minor adverse	N/A	N/A
Accidental and controlled discharges		Negligible	Negligible - high	Negligible – minor adverse	N/A	N/A
Scouring of benthic habitats at foundations and around cables		Negligible	Negligible - high	Negligible – minor adverse	N/A	N/A

2.4 Public consultations

Public consultations are an important part of an EIA and any development plan. For any development to be progressed in Scotland a Pre- application consultation needs to be completed. A public notice was also distributed for the proposal of the wind farm. This notice contained the laws and legislation the application fell under and contained basic information on how to learn more. The use of the laws and legislations for most would not mean much so including these on the form forces individuals to look into them further and research if they are interested. The consultation phase should offer the people enough chance to make their points and be heard. The local people are quite often the biggest stakeholders as they are the most affected by the developments. When the local public is not consulted in these matters that can affect them, then it is often possible for projects such as wind farms to suffer controversy from the public body. This can lead, in some cases, to projects being halted before they begin due to the power of a public outcry. As such, it is important to host public forums to allow people to put forward their thoughts, and in doing so, minimise the level of opposition after the project is completed. Moreover, transparency normally helps calm these situations, and by including the public within a project, they gain a sense of collaboration and that the councils and developers are listening and considering their thoughts and fears. Furthermore, the environment is for everyone so

everyone should be able to understand the effects that developments are having on it.

For the Moray West EIA specifically the public needed to be informed under the Marine (Scotland) Act 2010, sections 22 to 24. As well as the public the company needed to welcome third sector industry concerns also. By the time the EIA was written the stages of pre application consultation had already been completed. The public engagement was completed in January 2018 in Portsoy. The public meetings were accompanied by appropriate advertisements via the local media to allow for opinion and feedback. Along with the public notices this allowed for the local people to be informed about the project even if they were not connected via social media or online. Many companies around the area were also contacted directly, some by phone, to discuss how they would be affected by the changing landscape if the project was to be approved. A scoping report was undertaken, and hard copies or email copies were sent to companies and businesses to further inform them. This can be seen in table 2.

Table 4 Moray West Offshore Wind Farm (2018)

2.4.1 Appendices Discussion

A point that is not necessarily about public consultation but involves the public is the presence of the appendices at the end of the report. Many EIA reports only release key parts to the public whereas this EIA has released the full report online for free. The appendices are rather important in EIAs as it shows the charts, graphs and images which are not included in the report. Having this missing in some EIAs makes it more difficult to understand the full extent of the project. Being able to follow and understand more clearly what the project is looking to do can help better shape the public's opinion of the project and better form their concerns. Furthermore, a greater level of transparency shows willingness on the company's part to keep the local people involved and informed.

Table 5 Moray West Offshore Wind Farm (2018)

Table 5.3.1: List of Consultees			
Organisation	Scoping Report*	Meetings	Other**
Highlands and Islands Airports Limited	✓		
Scottish Pelagic Fishermen's Association	✓		
Scallop Association	✓	✓	✓
SHE - Transmission	✓		
Ithaca Energy	✓		
Babcock Offshore Helicopters	✓		
CHC Helicopters	✓		
Bristows Helicopters	✓		
University of Aberdeen	✓		
PA Resources AB (publ)	✓		
Moray Firth Sea Trout Project	✓		
Scottish Enterprise	✓		
Highlands and Islands Enterprise	✓		
Moray Canoe and Kayak School	✓		✓
Deveron Paddlers	✓		✓
Suds Surf School	✓		✓
New Wave Surf School	✓		✓
* Hard copy or email link to electronic copy of the Moray West Offshore Wind Farm Scoping Report 2016 and / or Moray West Offshore Transmission Infrastructure (OfTI) Scoping Report 2017			
** Email / telephone correspondence or consultation through attendance at public events.			

2.5 Enhancement

As part of the planning regulations enhancement has to be a central point of the project. This specific project also focuses on enhancement due to the regulations under the National Marine Plan which was adopted in early 2015. This states 'in an aim to enable the sustainable development and use of the marine area in a way that protects and enhances the marine environment whilst promoting both existing and emerging industries' (Moray Offshore Wind Farm (West), 2020). This indicates that enhancement is the focus on more than one regulation which needed to be followed for this project to be passed.

2.5.1 Legislation

This EIA has a section which is directly discussing the legislation that needs to be adhered to. They all have clear descriptions and, quite a few mentions enhancement. To be precise 'enhancement' is mentioned twenty-one times throughout the document. Enhancement is mentioned in relation to the 2030 targets, the National Marine Plan (2015), General Policy (Gen) 9 Natural Heritage, The Scottish Biodiversity Strategy, The Highland-wide Local Development Plan and Moray Local Development Plan

(2015) (Moray Offshore Wind Farm (West), 2018). This range of legislation highlights the importance of enhancement as it is mentioned multiple times. There are different focuses of such enhancement; some of these are biodiversity, heritage and local development. The downside of this, however, is that most of the mentions of enhancement are via the legislation. This leaves a gap in the report as to how these enhancements will be factored into the project. A few examples of this are included but not in great detail. One of the 'enhancements' is actually negative as it states that 'As currents move water past the individual offshore wind farm foundations, a turbulent wake is formed. Within the turbulent wake, vertical mixing can be enhanced above ambient levels, which could potentially contribute to a local reduction in the strength of vertical stratification' (Moray Offshore Wind Farm (West), 2018). Enhancement is needed to meet the criteria of the legislation, but this has to be a positive form of enhancement and the example shown above is quite clearly negative as it results in a decrease in a natural environment. This is one of only three examples of how the wind farm will 'enhance' the site and the surroundings and offers little to fulfil the requirements. The other two examples are positive. One is to improve foraging opportunities. This would be beneficial as it could lead to an increase in local biodiversity as there would be more foraging and possibly more different types of foraging. Finally, the report states that there would be 'locally elevated turbulence levels that also locally enhance sediment transport potential' (Moray Offshore Wind Farm (West), 2018). Sediment transport can again help biodiversity but too much movement could result in the opposite effect and become negative to the environment around the potential wind farm.

2.5.2 Examples of Best Practice

Examples of best practice can be found in two EIAs from Scotland which are currently under review. One is for Maclean's Nose Atlantic Salmon Fish Farm and Billia Croo Test Site. Billia Croo states that by adding perches they will enhance roosting and feeding opportunities for species such as guillemots and shags (Western Isles Marine and Environment Ltd, 2018). This is good practice as it actually indicates what will be done to enhance the site and what that enhancement is rather than the Moray West EIA in which it just says something vague will be enhanced and not how. Furthermore, an example from Maclean's Nose is that by implementing new management measures then the environmental performance will be enhanced using examples of sea lice

management. For this site there is also an in-detail discussion on cumulative enhancement (EMCE, 2019).

2.6 *EIA Decisions*

In 2019 on 14th June the licence for the site was granted. The licence offered was to last 35 years (Marine Scotland Information, 2020). Since being accepted the plan has been altered once and a new screening request was entered on the eighth of September 2020 to increase the blade width of the turbines proposed to go on the site. As of this year the final stages of the planning are being undertaken including the need for Archaeological cooperation in discoveries and an Environmental Monitoring Plan (EMP). Having these shows that the past and present environment are being considered when creating the farm. Archaeological finds could be important to the wider knowledge of the Scottish past and people's identities. The EMP indicates the ongoing consideration for the environment and states that it 'is to provide the overarching framework for environmental management during the construction and operational lifespan' (Marine Scotland Information, 2022). This is important as the most damaging effects to the environment are during the creation stages. The collecting of materials and construction of the turbines will release CO₂ and other greenhouse gases and the placing of the farm will cause underwater habitat damage, this will also be present when laying the underwater cables. Having a plan laid out and accessible before the project starts allows the public to fully comprehend the environmental effects and the mitigation process being put into place.

2.6.1 *Cumulative Impact*

Even though sections of this EIA look like they could have possibly halted the production of the wind farm (such as the Cod Spawning site), a reason it could have been passed could be due to the infrastructure which is already present around the site. As stated above the MOD site and the Beatrice oil field were both previously around the stated location for the windfarm. This may have actually benefited, as well as hindered, the planning and subsequently the passing of the planning due to the previous infrastructure already having caused effects and the area already being developed. This could indicate cumulative impact as it is not being placed in a completely new location which was pristine but rather a site which was already affected by infrastructure. Furthermore, the previous infrastructure partially being for

non-renewables the improvement to renewables could have been seen as a betterment of the environment.

2.6.2 EIA Weaknesses

The grant of application happened after 2017 and the major change in the EIA regulations. Since, there has been more minor edits to the legislation in 2020/21. Even though there have not been any major legislative changes there are a few points within the report which may be questioned further if it were to be applied for today. The cod spawning ground may lead to further investigation. Even though the report says that the site does not have many fish in that locale, spawning is an important part of the fish life cycle and effecting this could greatly affect the cod populations.

A further point that could be asked to be better explained is that of enhancement. With such a focus on enhancement in so many of the legislations one would think there would be a greater explanation of how the project would enhance the area. Enhancement not being explained in full may hold more weight today as there is greater focus on the climate crisis and biodiversity than there was 6 years ago.

3 Conclusion

EIAs have changed since their implementation in the UK 30 years ago. These changes have led to stricter rules on EIAs, but the basic need for an EIA has never changed to protect the environment when developing areas. EIAs in Scotland vary to other countries, and even vary between counties. Argyll and Bute, for instance, requests EIAs on smaller projects such as partial re-slating of roofs (Scottish Gov't, 2022). Moray West and GoBe Consultants have created a detailed and thorough document looking at the many effects that the proposal of a new wind farm could have on the local environment. This EIA took many years to be passed and may have partially been due to the Covid-19 pandemic but due to the nature of the development and sheer quantity of variables to assess the work done would be a timely endeavour. The use of an EIA is to protect the delicate ecosystems that countries have as well as the wider environment. Mitigation of the project could be given more importance throughout the EIA but due to the application being passed it would suggest that the standards of the EIA were of expectation but there are still more avenues which could have been researched and alternative methods could have been looked into. The more modern EIAs are much better at identifying risks to the environment and health

but it could be said that there is some way to go with improvements the reports are not perfect, and likely never will be, as there are many mitigating circumstances that cannot be controlled or easily researched, but there is a clear goal for the future and clear improvements to be made.

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Analysis of the Environmental Impact Assessment (EIA) Review on the Upper Ogmere Wind Farm Project

D. Yandamuri

Abstract

Environmental Impact Assessment (EIA) is a process that identifies and evaluates the anticipated significant ecological consequences of planned development, as well as strategies for reducing or minimizing any substantial detrimental effects on the environment. The EIA for the Project was completed using information gathered by the applicant and designated independent consultants during a site inspection and evaluation, as well as interaction with mandatory selectors and other participants. The goal of this Environmental Impact statement is to offer a comprehensive and impartial analysis of the important environmental consequences that are expected to result from the planned development, as well as enough evidence to validate the results and recognize the source of the data supplied (Ltd, Upper Ogmere Wind Farm).

Keywords

Environmental Impact Assessment
Environmental Impact Assessment Procedure
Environmental Impact Assessment Decisions

1 Introduction

The UK and Welsh administrations have made it plain that they are committed to reducing carbon emissions through energy conservation and renewable energy sources. There is a firm policy directive that perhaps more needs to be done through the regulatory system to meet the substantially increased production of renewable energy that is now anticipated. Most recently, in September 2017, Lesley Griffiths, the Cabinet Secretary for Environment, set Wales an aim of producing 70% of its power usage from sustainable power by 2030 (Ltd, Upper Ogmere Wind Farm). The goal of Environmental Impact Assessment is always to safeguard the surroundings to ensure that whenever a local authority decides whether it should grant construction permits for a project that is likely to experience major ecological consequences, it does so with

a clear awareness of the likely major impacts and tends to take this into consideration in the process for making decisions. The guidelines provide a system for selecting projects that need to be subjected to an Environmental Impact Assessment, as well as for analyzing, consulting on, and making a decision on projects that are anticipated to have substantial environmental consequences. This Environmental Statement (ES) has indeed been developed by RES Limited (RES) to supplement a project proposal submitted to the Planning Inspectorate of Wales (PINS) seeking authority to build, regulate, and decommission the Upper Ogmores Wind Farm, subsequently alluded to as 'the Proposed Development'. The ES's goal is to assist PINS in assessing the potential substantial ecological impacts of the Advancement and determining the necessity for prevention programs to mitigate such effects.

1.1 The Applicant

Renewable Energy Systems Ltd ('RES') is a subsidiary of the Sir Robert McAlpine group, a British kinship design and construction corporation with over 100 decades of experience. Featuring activities in Europe, North America, and Asia-Pacific, RES is recognized as one of the world's top autonomous renewable energy providers. RES is involved in a variety of renewable power technologies, including that wind generation, offshore wind, and photovoltaic, in addition to the implementation of knowledge like power storage and supply planning. Ever since the early nineties, RES has indeed been engaged in Welsh, developing and/or constructing five inland wind turbines, including that of the recently finished 34MW Garreg Lwyd Hill Wind Farm in Powys (Ltd, Upper Ogmores Wind Farm)..

1.2 The Background

RES has undertaken an Environmental Impact Assessment (EIA) for renewable energy development ('the Project') on property south of the A4107 in Bridgend County, between Blaengwynfi, Nantymoel, and Blaengarw. The Project's goal is to generate and store renewable power. The project will use onshore wind technologies to create green power (*Appendix 0101 scoping report - upper ogmores wind farm*). According to preliminary research, the Project might hold as many as eight (8) wind turbines. The Project will also investigate the supply of energy storage systems as a component of the infrastructure in order to correlate on-site power output to energy consumption and to allow the minimization of any prospective grid constraint needs.

1.3 Upper Ogmores Wind Farm Project Identification

The project was chosen and planned by considering the Strategic Search Areas (SSA) defined within TAN8 and in compliance with internal RES processes that are meant to produce optimum ecological impact with minimal major negative consequences within the project's neighborhood (*Global Renewable Energy Company*). For site selection, RES develops complex Geographic Information System (GIS) models that attempt to reflect planning, environmental, technological, and economic needs. RES conducted computer-based research to determine the appropriateness of wind farm sites in Wales. The adoption of GIS technology permitted unbiased and uniform analysis across the entire country. This research has been revised regularly when new information became available or other variables changed. The GIS model integrates public guidance from statutory consultees when accessible and suitable.

1.4 Scope of Environmental Statement

EIA is a procedure that collects, evaluates, and incorporates data about a project's ecological effects into its construction to assess whether or not it needs to be accorded planning approval. In an ES, the applicant gives details about the project and its potential environmental implications. This allows decision-makers to evaluate these implications when deciding on the linked planning application (*Environmental impact assessment: Guidance*)

. The EIA method has several fundamental characteristics:

- It is methodical, consisting of a series of duties specified both by law and by practice.
- It is analytical, involving the use of expert abilities from the environmental sciences;
- It is objective, with the goal of informing the decision-maker rather than promoting the project;
- It is interactive, with provisions for gathering information and comments from statutory authorities and important stakeholders; and
- It is progressive, with possibilities for ecological issues to be handled

throughout project design and development.

If the scope of the EIA is far too narrowly prescribed, a significant area of ambiguity or an unanticipated detrimental effect may surface later in time, with possible ramifications for the concept and timeline for implementation. If the scope is established too broadly, time, money, and energy may be squandered on chasing superfluous detail. The magnitude and characteristics of the Project have been carefully examined in the context of detailed site and environmental baseline circumstances. The objective has been to include topics deemed possibly important in the EIA. When a problem isn't included in the planned scope of the EIA, it does not mean that there won't be any related consequences, but instead that they will be insignificant. It is anticipated that all consultees may agree on a focused scope that will result in a well-thought-out yet short ES. Following agreement on the scope of the EIA and completion of the requisite surveys, possible 'effects' will be confirmed and evaluated by comparing the detected degree of change to the documented susceptibility of the ecological receiver. This examination will use a common matrix and nomenclature for simplicity of comparison between subject areas, while this may not be applicable across all subject areas.

1.5 Site Characteristics

The 'Site' is defined as the amount of land deemed appropriate for the Proposed project and therefore is depicted by the red border displayed in Figure 1. The Site Location is focused upon the summit of Werfa (568m) and stretches from east to west all over the alpine terrace north of the Garw and Ogmores basins and south of the Afon Afan valley. Abergwynfi to the northwest, Blaengarw to the southwest, and Nant-y-moel to the southeast are all within 2km of the Site (*Upper Ogmores Wind Farm Archives* 2022). The Area is occupied by unfenced highland moorland that has been heavily grazed by sheep. Within a walled area, a communication mast and related facilities are positioned in the middle section of the Site.

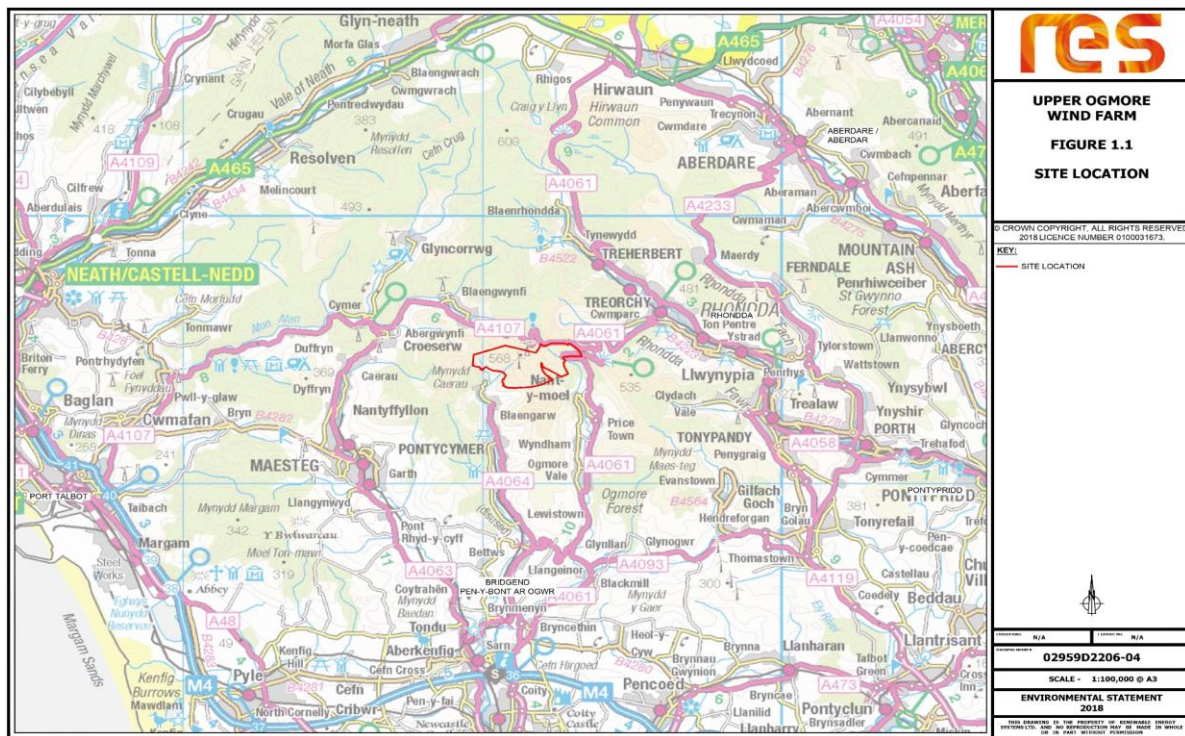


Figure 18 Site Location

2 Case Study

The planned Upper Ogmere Wind Farm and Power Storage Unit, also known as the 'Proposed Development,' is situated on farmland south of the A4107 in Bridgend County, between Blaengwynfi, Nantymoel, and Blaengarw. A tiny component of the proposal border, pertaining to off-site entrance enhancements on a Natural Resources Wales forest management track, is situated in Neath Port Talbot County (*Appendix 0101 scoping report - upper ogmore wind farm*). The planned project is situated at E29150 N19450. The planning application includes seven horizontal-axis wind turbines with three blades each. Four turbines (T3, T4, T5, and T7) have a maximal tip height of 149.9m, while three turbines (T1, T2, and T6) have a maximal tip height of 130m. The overall capacity factor of the seven turbines will be around 25.2 MW. The proposed project would comprise a new sites entrance, additional access paths, crane hardstandings, a supervision construction and substation composite, power inductors, basement wiring, power storage units, drainage systems, and improvements to a forest product path and affiliated plant felling, as well as a potential second deflection of the forest management track.

2.1 Project Description

The following elements might be continuous characteristics of the Proposal during its lifespan (*Appendix 0101 scoping report - upper ogmore wind farm*)

2.1.1 Wind Turbines

The wind turbine business is advancing at a rapid pace. Designs are becoming more technically and economically sophisticated. Because the best turbine type for a certain area might vary over time, no definitive decision on a turbine for the Proposal has indeed been made. The most appropriate device would be selected in advance of construction, within the total height restriction reviewed as part of the EIA and approved as an aspect of the DNS request (*Upper Ogmores Wind Farm Archives 2022*).

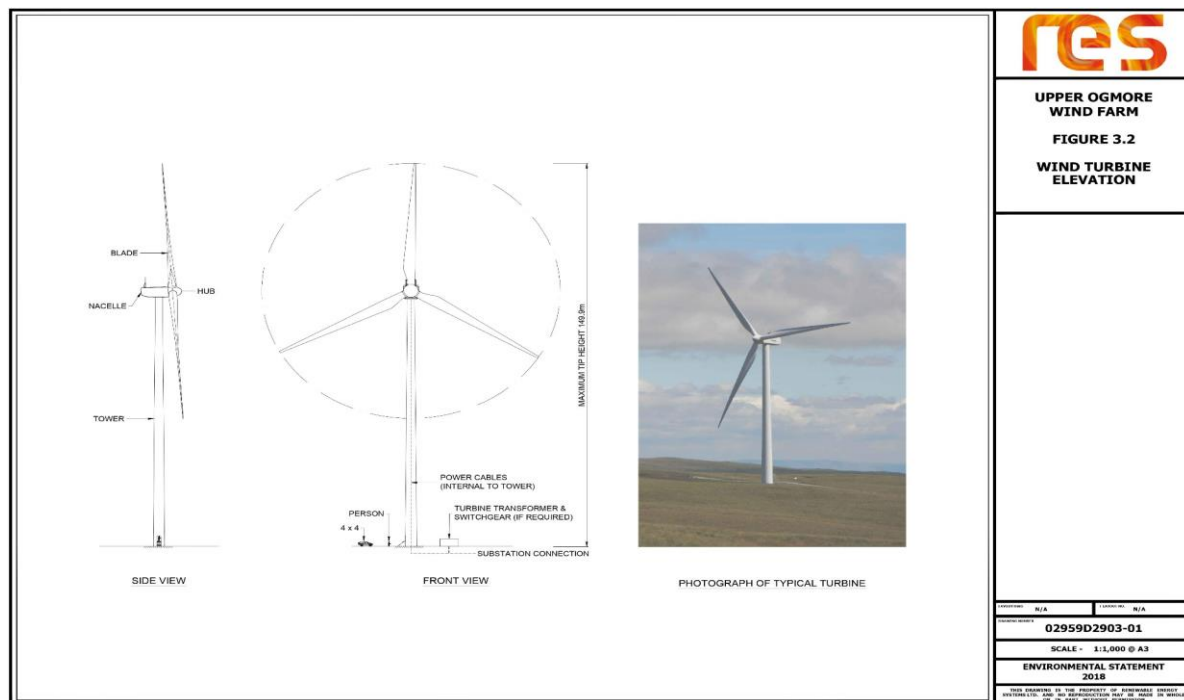


Figure 19 Wind Turbine Elevation

2.1.2 Transformers and Controllers for Wind Turbines

Among most modern wind turbine designs, the transformer and switchgear are positioned beside the base of every building, however, for bigger turbines, certain builders embed the transformer in the nacelle or tower base. The transformer's role is to elevate the generating energy from 690 volts (V) to the greater transmission range of 33 kilovolts (kV) required to deliver the power into the grid. However, at this point, it

is uncertain whether an internal or an exterior transformer would be employed, although (*Upper Ogmore Wind Farm Archives 2022*)

the former has been chosen in order to avoid a worst-case scenario (i.e. from a land-take and visual perspective).

2.1.3 Foundations for Wind Turbines

The wind turbines would indeed be sustained by steel-enhanced concrete supports (*Upper Ogmore Wind Farm Archives 2022*). If the soil conditions are adequate, a gravity model framework will be employed. The specific volumes of concrete, reinforcing, dimensions, and levels may differ based on the type of turbine employed. Based on the local soil conditions, alternative turbine bases might also be explored for different blade positions. The size, components, and building methods connected with the turbine bases assessed as part of the EIA will be explicitly defined in the ES.

2.1.4 Hardstanding for Cranes

Mobile cranes are used to install the turbines. These need substantial hard standing areas near turbine positions that can hold the weight of the towers on their outriggers. These usually comprise one primary permanent location near the turbine location, where even the primary turbine construction crane is placed. The ES will explicitly explain the specifications, resources, and construction methods related also with crane hard standing examined as part of the EIA (Ltd, *Upper Ogmore Wind Farm*).

2.1.5 Tracks, Entrances, and Exits On-Site

To grant access to every turbine position inside the Project, a complex of entry tracks will be necessary. Current tracks will be used whenever possible and updated as necessary. Tracks will normally be 5m wide, with additional width added at curves and allowing locations as needed. RES will confer with authorized consultees about the placement of additional access tracks that intersect with common property, sensitive ecosystems, and hydrological characteristics. During the iterative planning process, the placement and appearance of every Location entry point as a result of the Project would be considered with the applicable Statutory Consultees. Swept route analysis will identify any off-site mitigating activities necessary to allow the flow of Abnormal Indivisible Loads (AILs) (Ltd, *Upper Ogmore Wind Farm*).

2.1.6 Life of The Project

The Wind Turbine and Grid Storage Project are scheduled to operate for 35 years from the moment of commissioning. Once at the conclusion of this time period, a choice is made about whether to renovate, eliminate, or substitute turbines. If renovation or substitution is decided, suitable long-term plans will be submitted. Conversely, if the Development is decommissioned, all turbine elements, transformers, the substation, and accompanying structures would be removed. Particular components of the entrance tracks may stay on-site to guarantee that the proprietors remain able to benefit from better access. To minimize unwanted ground invasion, the cement foundations are often left in place. The polished concrete platform may be excavated to a certain depth, but the entire basis would be leveled over along with dirt and regenerated to return the land to its own previous state (Rem & Whitlock, *Wind* 2023).

2.1.7 Maintenance Programme

Wind turbines and wind farms are intended to run mostly unsupervised. The planned design's turbine would indeed be outfitted with an automated system developed to monitor and manage a multitude of factors to guarantee good operation effectiveness (for example, begin, close, rotary orientation, blade inclinations, and so on) as well as to keep an eye on the situation (e.g. generator temperature). The command and management mechanism the necessity arises, the turbine will immediately shut down. In some instances, the turbines may come into full (if the shut-down was due to high gusts, for example). or that the power system had varied outside of the acceptable range), but then other closures (e.g. Overheating of the generator) would necessitate an examination and manual restart. The construction essentially would include a comprehensive general Supervisory Control and Data Acquisition system (SCADA) which would constantly probe every one of the turbines and the high voltage (HV) connector (Rem & Whitlock, *Wind* 2023). If a failure occurred that necessitated the intervention of an operator, the SCADA system would alert duty personnel through a mobile messenger service. The operational power system may be remotely controlled. The SCADA system would include a capability that would enable a distant controller to close down all or some of the wind turbines. This is examined 24 hours a day, seven days a week.

2.2 Landscape and Visual

The baseline for the examination comprises landscape and visual receptors. The topography of the place and research region is characterized using observation

methods as well as existing ecosystem feature evaluations and the LAND MAP database. People living in communities, visiting the local region for enjoyment, and commuting throughout the area on roadways are examples of visual receptors. Exemplary perspectives were chosen to measure the spectrum of visual receptors, and these perspectives were decided upon during dialogue (Rem & Whitlock, *Wind* 2023). The installation of seven big turbines beside access tracks, a powerhouse, a control tower, and the Energy Storage Facility (ESF) will have a substantial (major) impact on the scenery of the site as well as the Mynydd Llangeinwyr Uplands LCA throughout the operation. Substantial influences on terrain features are anticipated to be observed within a 2 km radius of the projected turbines, and even farther toward the north and west. The region in which important impacts will indeed occur is roughly constrained to the east even by the crest of Craig Ogwr, the summit of Mynydd William Meyrick, the settlers of Price Town, the south end of the primary crest of Mynydd Llangeinwyr, the peace deal of Blaengarw, the peak of Mynydd Caerau, as well as the sharp corner bend on the A4107. Further than this radius, the impacts on terrain features would've been limited or insignificant, if not non-existent.

2.2.1 Legislation and Planning Policy

The UK Government has established a range of national policy statements, one of the most important among which are the overall National Policy Statement for Energy and the National Policy Statement for Renewable Energy Infrastructure. Several declarations were put before Council in June 2011 for authorization and then were approved on July 19, 2011 (*National Infrastructure Planning* 2023). Even though the main objective of the NPSs was to establish a legislative framework for decision-making on national level massive infrastructure installations in the power sector, they are not constrained to initiatives that are serious conditions by the UK State Secretary (including a wind turbine in Britain with more than 50MW of generation capacity). "In Britain and Wales, this NPS is expected to be a substantial element in making decisions on proposals that come under Town and Country Planning Act 1990 (as modified)," it is said. Additionally, "the power NPSs should accelerate the shift towards a low-carbon economy, allowing the UK to meet its goals for climate change faster compared to the present planning process". There is a clear concern and requirement to accelerate the transition to a low-carbon business (through the adoption of renewable energy technology).

2.2.2 National Planning Policy

The Welsh Government's land use development policies are outlined in Planning Policy Wales (PPW, Edition 9, November 2016). It sets the administration's aims for natural and historic preservation and enhancement, particularly the safeguarding of native ecosystems, trees and woods, and landscapes through legislative declarations (such as National Parks). The LAND MAP framework has been recommended as a valuable resource for landscape evaluation. PPW is supported by Technical Advice Notes (TANs), and TAN 8: Renewable Energy (2005) is relevant to this evaluation (*National Infrastructure Planning 2023*)

2.2.3 Renewable Energy TAN 8

TAN 8 Framework for Sustainable Energy outlines relevant government policies and guidelines on onshore renewable energy systems. "Onshore wind energy has the highest potential for an increase in electricity produced from sustainable power within the short to medium term. To attempt to achieve the goal of wind energy manufacturing, the Construction Government appointed substantial technical tasks, which resulted in the decision that, for effectiveness and environmental purposes, a massive amount (over 25MW) of wind energy advancements should indeed be focused on particular places characterized as Strategic Search Areas (SSAs) (*National Infrastructure Planning 2023*)."

2.2.4 Consultation

Bridgend County Borough Council, Neath Port Talbot County Borough Council, Rhondda Cynon Taf County Borough Council, and Natural Resources Wales have all been surveyed on the method for assessing the impacts on environmental features an optical attractiveness. RES and its advisers will keep working with every enterprise on LVIA-related issues all across the Environmental assessment (*National Infrastructure Planning 2023*)

TABLE 1: Consultation Responses (Ltd, Upper Ogmore Wind Farm)

Consultee	Date and Summary of response
BCBC	08 Dec 2017 The proposed technique of assessing landscape features and optical amenities, in addition to the creation of

	photomontages, was fully endorsed.
RCTCBC	09 Nov 2019 References to relevant details about local landmarks and the Planning Guidelines for Wind Turbine Development: Landscape and Visual Impact Assessment Requirements (2014). RCTCBC has indicated that it endorses the project, despite the fact that it hasn't been accepted.
NPTCBC	05 Oct 2017 Clarification that providing guidance on perspective identification and reviewing the LVIA methodology would result in a non-statutory fee. This issue was not overtaken since NPTCBC will be able to provide feedback through the legal consultation procedure.
Planning Inspectorate Wales EIA Scoping Direction	May 2018 Recommended that now the landscape and visual consequences of the Planned Project be studied and that every feature be incorporated in representations to the greatest extent possible. It was stressed that the control building, transformer, and storage facility, in furthermore to any structural elements, must be represented in just about any nearer representations.

2.3 Assessment Methodology

The construction will strive for a cohesive and organized form in accordance with Welsh Government and SNH guidance. The ES will explain the reasoning for the ultimate design plan. The goal in planning the wind turbine intends to create a structure

that is compatible with its surroundings in aspects of landform and structure, and that offers a simple visual impression, preventing the grouping of turbines as well as the separation of distant turbines in perspectives from critical sites. All aspects of the planned wind farm architecture will be addressed in terms of position and layout, and the LVIA will detail how well the layout of supplementary components has developed to reduce the visual effects, particularly from adjacent and vulnerable visual receptors (Ltd, *Upper Ogmored Wind Farm*).

Survey Methods

Phase 1 Habitat Surveys

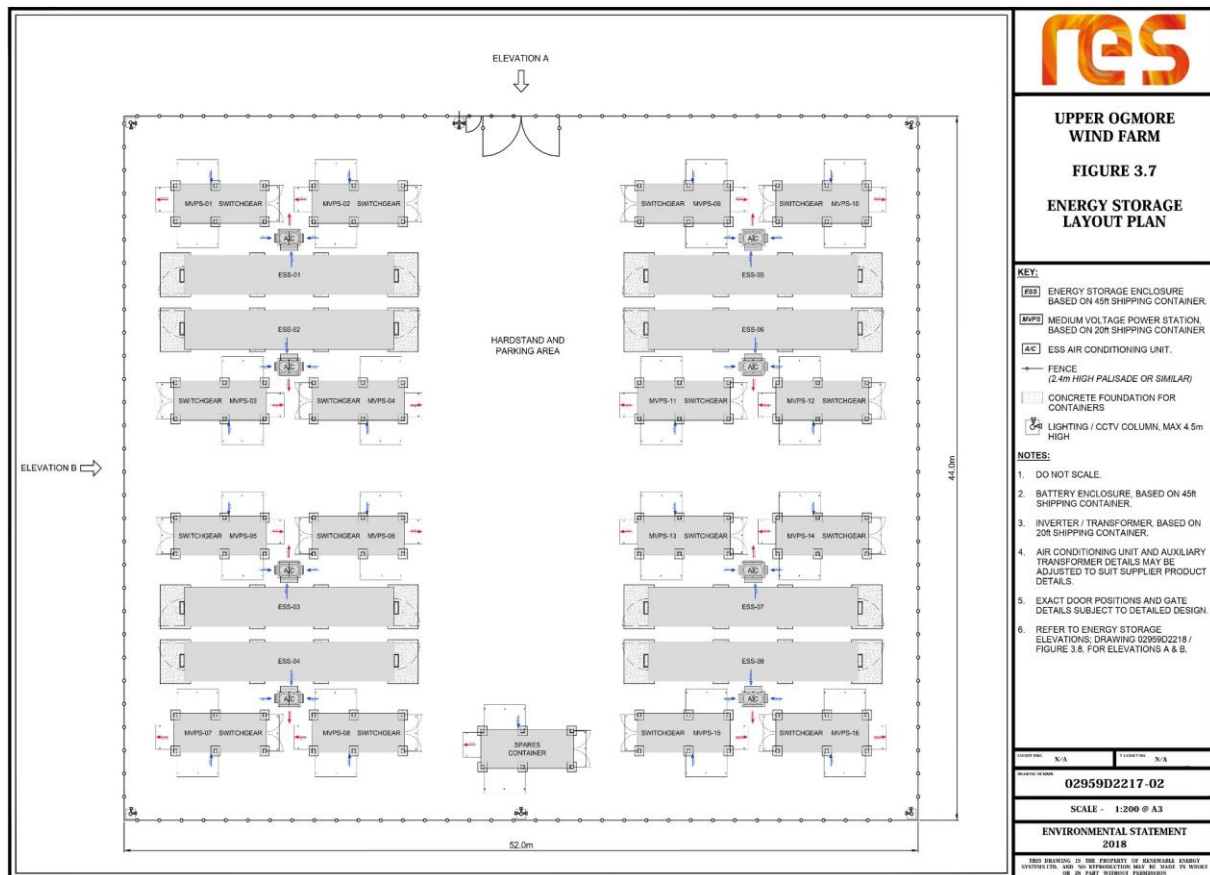
Enhanced Phase 1 habitat surveys including the whole Site were conducted on July 24th and September 2nd-4th, 2014. On October 7, 2016, a study of the Bwlch forestry track was conducted, from the track intersections with the A4107 to the southern end of the Pen-y-Cymoedd wind farm Site. The studies included recording habitats using conventional methodologies (JNCC, 2010) 17, and detecting any indicators of endangered or critically endangered, as well as the availability of (*Appendix 0101 scoping report - upper ogmored wind farm*)

adequate habitat for these kinds of species, in accordance with the IKEA.

Honey Buzzard Surveys

There seem to be recordings of honey buzzard *Pernis apivorus* nest sites in the Neath Valley (about 10 km north-west of the Site), nevertheless, the particular sites are proprietary and have not been discussed in detail. Consultees proposed a honey buzzard study to support the neighbouring Llynfi Afan (REP) proposal (*Appendix 0101 scoping report - upper ogmored wind farm*)

Figure 20 Energy Storage plan



Merlin Surveys

Following the conclusions of merlin during the 2014 migratory bird surveys, merlin surveys were undertaken in 2015. Merlin breeding was thought to be extremely improbable inside the Site. The Area has no plants, and much less heavily cropped, dry grassland ecosystems predominate on the hillsides that define it. Considering this, it was assumed that merlin, if extant in the area, would reproduce elsewhere. Furthermore, mating bird walkover studies of the Site and it's 500m boundary conducted during April and June 2014 yielded no reports of breeding merlin (*Appendix 0101 scoping report - upper ogmore wind farm*)

Bat Surveys

Regarding Bat Conservation Trust (BCT) study regulations, a daylight evaluation of a construction site within the Werfa mast substance, as well as a solitary onset survey (following an evaluation of the building's low likelihood of supporting roosting bats), was conducted as a security precaution in August 2016. Around 200m of the Site, there are no additional buildings or trees ideal for roosting bats. The expanded Phase

1 study of the suggested access route found no trees that may sustain a bat roost (*Appendix 0101 scoping report - upper ogmore wind farm*)

2.3.1 The Site

The property covers 362 acres and also is located on Werfa's peak (568m). The plain dips slowly down over all sides from this pinnacle, but only significantly to the northern edge, which parallels the official borderline over the highland. The plateau dips dramatically toward the valley borders on the opposite sides. The site encompasses the top hills of the source of the Garw Valley in the southwest, falling to an altitude of roughly 300m. The steep terrain continues further than the area to the south all along the lengthy slope of Mynydd Llangeinwy. The eastern section of the site is made up of the small cwms just at top of the Ogmore Valley and the thin highland peaks that connect them. Small streams flow the property to the southeast and southwest (*Upper Ogmore Wind Farm Archives 2022*). There seem to be various public routes of access that cross the property, along with a bridle route that connects Cwmparc to the Garw Valley and walkways that connect with the other adjacent valleys and trace the Mynydd Llangeinwyr mountain south. In addition to the fenced meadows in the east, the rest of the property is a freely accessible area due to the unfenced highland grazing. The A4107 joins the Afan Valley well with A4106, which unites the Ogmore Valley further with Rhondda Valley mostly in the northeast. Both routes go through the high slopes via a succession of hairpin turns. The intersection between the two roadways at Bwlch has a parking space and is indicated as a lookout on OS maps, with a sight northeast beyond Treorchy and distant from the area.

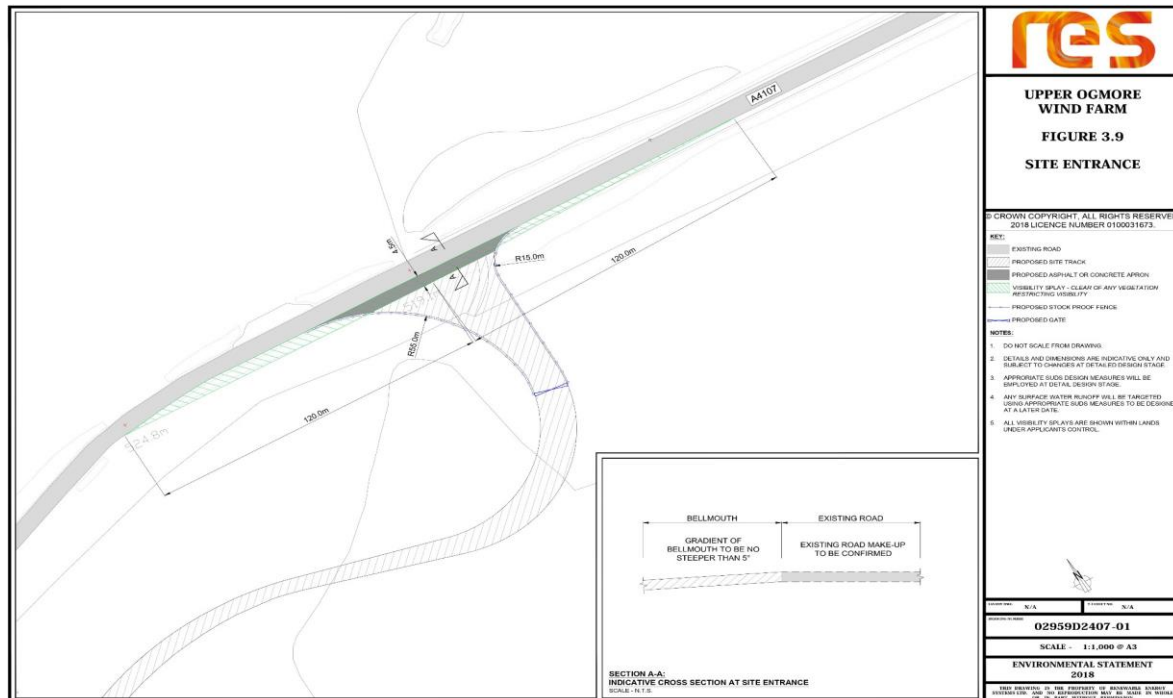


Figure 21 Site Entrance

2.3.2 LANDMAP

LAND MAP is a GIS that stands for Geographical Information System based landscape service that records and evaluates landscape traits, attributes, and effects into a nationally uniform data collection. LAND MAP divides data through five 'perspective levels,' which are as specified: Geological Landscape, Landscape Habitats, Visual and Sensory Landscape, Historic Landscape, and Cultural Landscape are all examples of landscapes. Aspect levels are subdivided into (*Upper Ogmire Wind Farm Archives* 2022) 'aspect regions,' which serve as LAND MAP methods with respect. Almost every feature region is indeed assigned a score that ranges from 'Excellent' (essential at such a global or national scale), 'Good' (significant at a local or city level), 'Medium' (significant at a community scale), or 'Low' (less or no relevance).

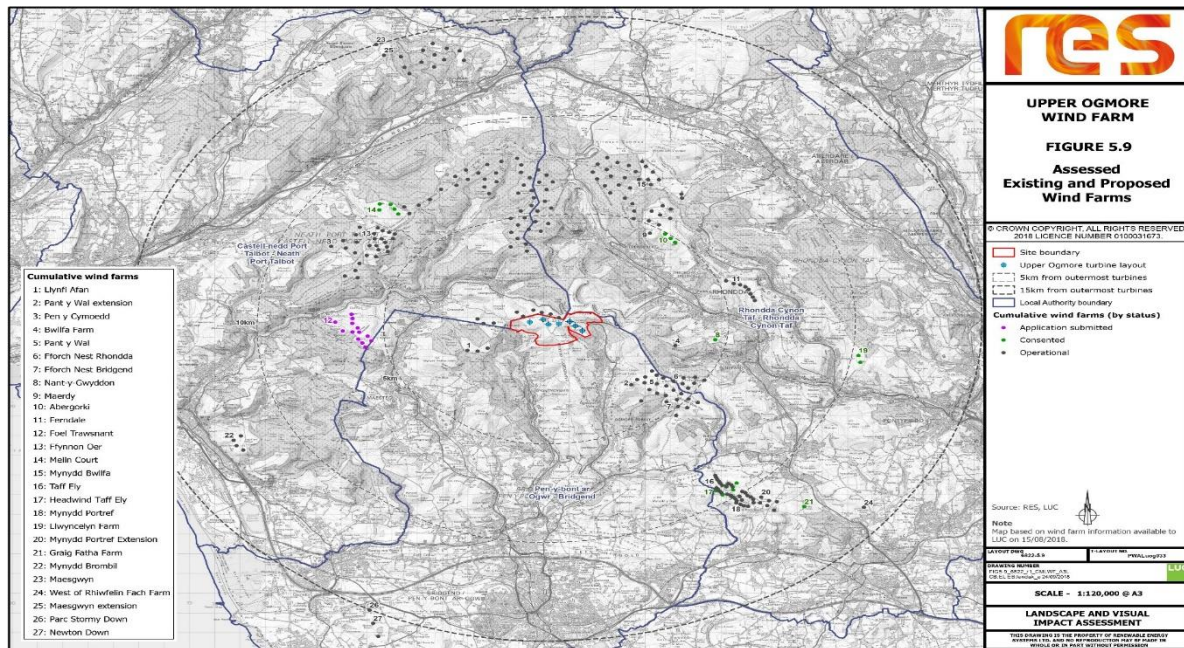


Figure 22 LANDMAP DESIGNATIONS

2.3.3 Baseline Assessment

Noise may have an impact on the surroundings as well as the level of well-being experienced by people and communities. The influence of noise, both during development and operation, is thus a substantial issue in the evaluation of planning permission. Wind turbine operational noise is caused by two categories of sound sources: aeronautical sources generated by the flow of wind from over turbine blades and mechanical sources caused by the gearbox, generator, and other sections of the powertrain. Baseline noise readings and their placement have previously been discussed with Bridgend County Borough Council's Environmental Health Department. In February 2018, an ambient sound survey was launched, as well as the results will be utilized to improve the acoustic evaluation (*Upper Ogmores Wind Farm Archives 2022*). Measures will be done to reduce the influence of existing programs on survey findings. The findings of measured values in 2013 to provide an acoustic evaluation of the Llynfi Afan Renewable Energy Park will also be utilized to provide a more comprehensive picture of the baseline ecosystem when applicable. Following the completion of the background sound measurement, an evaluation shall be conducted to identify the effect of development and operating sound in accordance with the appropriate recommendations.

2.3.4 Mitigation

It is well known that standard measures of landscapes and visual mitigation, including screen planting, are useless for wind turbine construction. Wind farm mitigation is typically restricted to the avoidance of possible immediate consequences through thorough placement and the avoidance of unwanted aesthetic effects by wind farm design (*Global Renewable Energy Company*). As a part of the planning process, the landscape and aesthetic goals for the Planned Project drew on the overall and LCA-specific criteria offered in the BCBC SPG on Renewable sources in the Landscape. The turbines and accompanying facilities would be built in accordance with agreed-upon Building Project Specifications, which might include plans for implementing different components of the operations to assist avoid potential negative consequences. These will be included in Construction Environment Management Plan (CEMP), which will be followed throughout the project.

2.3.5 Results

The advantages connected with the planned project's building phase (employment, salaries, Gross value added, and financial) are shown as a scale. This interval is the outcome of the use of two distinct methodologies for assessing direct building phase effects. The first method makes advantage of the projected value of an investment in Wales. We may predict GVA levels, employment, and salaries by allocating this to different economic sectors (using current and/or predicted statistics). The second method uses full-time job annual comparable statistics derived from previous RES wind farm operations. The input-output model is employed to determine the direct and induced effects of the investment/activity. In Wales, corporate rates are calculated using the Rateable Value (RV) of a building as well as the non-domestic factor ("poundage," or non-domestic rate (NDR)), less any relevant reliefs. The RV is established by the Valuations Office Agency (VOA), whereas the NDR is established annually by the Welsh Government. As of 2018-19, the NDR, or "poundage," is the same in all 22 Welsh Council regions. Individual governments acquire all NDR income and submit them to the Welsh Government, which apportions them among city council areas according to their proportion of residents aged 18 and over. This is true irrespective of the amount of money raised by any county council. This money is utilized to finance the expenditures of local governments. In relation to economic advantages, the sector of renewable energies provides environmental benefits while

adding to the total energy supply. The development plan has 7 turbines, with each having an estimated capacity of 3.6 MW (*Global Renewable Energy Company*). According to an estimated generating capacity of 38%, the quantity of energy generated by the Planned Project is enough to cover the demands of about 22,00014 residences per year. This is more than a third of the existing (2016) existing homes in Bridgend County Borough.

3 Conclusion

The planning application would provide ecological and economic advantages to the surrounding community and area. Considering the social and financial demand for additional job possibilities, private enterprise development should be welcomed (Ltd, *Upper Ogmores Wind Farm*). Implementation of the Planned Project would provide employment that matches the regional area's skill set. Corporation tax payable to regional and local governments will rise during the Planned Project's operating phase. The planning application will also contribute to the Welsh and UK government's attempts to meet energy objectives. During the planning stage of the Proposed Site, RES conversed with the owners of the two communications towers at Werfa. As a consequence, the turbines have indeed been placed at appropriate setback ranges so that they do not conflict with the poles. Additional monitoring access to the poles is necessary through a tiny existing route that traverses the projected wind energy track at one point. RES shall retain access to the masts throughout implementation and for the duration of the Proposed Site. In accordance with Western Power Systems, the 11 kV overhead line that supplies the communications towers will be rerouted and undergrounded at T7 to guarantee adequate clearance distances.

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A case study - Environmental Impact Assessment (EIA) of Bristol Airport Expansion

A. Withnage

Abstract

According to the town and country planning Environment Impact Assessment has done for the Bristol Airport Expansion project to identify the adverse effects on natural environment and take them as serious to find out mitigations protect surrounded environment factors. As stated in aviation white paper, it is recognised the demand for Bristol airport will raise by 10 – 12 million passengers in 2030. Based on that Bristol airport expand project was proposed. In this scoping report adverse effect on environment and mitigation practices has identified as air quality, biodiversity, geology and land quality, flora and fauna, water resources and quality, transport. Based on this EIA report Environment statement was made and after that environment consultants will be take actions towards the planning applications.

Keywords

Environment Impact Assessment
Bristol Airport
Environment statement

1 Introduction

1.1 *Environment Impact Assessment (EIA)*

Environmental Impact Assessment (EIA) is a procedure/method or a tool which is used to evaluate the critical impacts to the environment of a development project proposal ("Environmental Impact Assessment (EIA)"). If project needs an EIA, developer can be requested to the council for a formal screening. Moreover, if project is needed EIA report then can be requested for a scoping as well.

The EIA contains five general phases as follow:

I. Screening

It is necessary to identify whether a proposed project is under the rules and regulations within the EIA and have to determine the whether EIA is needed or not, in this stage

developer should be clearly identify the EIA necessity and need to proceed further (GOV.UK; 2014).

II. Scoping

In this phase, it will be determined the issues with EIA and assessed with that finally environment statement will be issued. The developer might be asked the local planning authority for scoping opinions which states the authority's point on the data that must be given (GOV.UK; 2014).

III. Preparing an Environmental Statement

If it is decided Environment assessment is compulsory for the development the applicant should be submitted an environment statement which included with minimum data required to evaluate the adverse effects of the development going to cause as regulation 18(3) and regulation 18(4) (GOV.UK; 2014).

The developer must ensure that the Environmental Statement is produced by the qualified consultants in order to guarantee its accuracy and quality. A declaration statement from the developer explaining the relevant experience or qualifications of such specialists must be included with the Environmental Statement (GOV.UK; 2014).

1.2 Making a planning application and consultation

The Environmental Statement must be made available online and through public notice. It is required to give the public and the relevant consultants to express their opinions regards the development and the Environment Statement (GOV.UK; 2014).

I. Decision making

First, the local planning authority and / or the secretary should be valuate the decisions, comments from relevant authorities/consultants taken from the planning application process and the environment statement and then they should decide the proposed development granted or not. The important point is that the decision made in this phase should be transparent to the public by electronically or public notice (GOV.UK; 2014).

1.3 A SWOT analysis for the EIA in the UK as below;

Strengthens

- i. Present UK government give their immense effort to continuation of EIA within the UK and further they are ensuring further protection on EIA tool.
- ii. The environment management assessment institute with collaborate with the environment agency enhance the capacity building programs, training programs, and EIA guidance document within the UK

(Jha-Thakur and Fischer, 2016; 6-8).

Weaknesses

- i. It is stated that, EIA easily draw anything but there is no relevant fit, as an example it should be wider in concentration with topics as carbon emissions.
- ii. Insufficient attention on changes made in decision making process of EIA
- iii. Monitoring is identified as an important phase and it should be improve further to manage adverse environment effect and the and to deliver the mitigation

(Jha-Thakur and Fischer, 2016; 10-11).

Opportunities

- i. According to the Liverpool workshop 2013 it is identified the new EIA directive (2014/52/EU) as a good opportunity
- ii. Practical usages of Information Technology for EIA

(Jha-Thakur and Fischer, 2016; 12).

Threats

- i. EIA legal conditions are not clearly understand

(Jha-Thakur and Fischer, 2016; 13).

2 A Case Study of Bristol Airport Expansion, Environmental Impact Assessment

2.1 Introduction

The Government's Aviation White paper illustrates the necessity of airport development with rational reasons in the United Kingdom; furthermore it provides the information on Bristol airport (BIA) development to meet air travel demand rising within 10 – 12 million passengers by 2030. The forecasts regarding BIA stated that passengers usage will be grow around 8 million by 2015. With comparisons to other airports BIA expansion development is more important because of existence proper infrastructure facilities, catering for passengers at the incensement of 9 million passengers per annum. Moreover White paper mentioned the possible development expansions within BIA as below;

- South west air is the most suitable for the expansion; many passengers from south west (around 70%) fly into neighboring airport due to the traffic.
- BIA will be a one of major airport in the UK so it is suggested to have new terminal and runway extension as well.
- There is no support to build an airport within the north side of the Bristol

It is very important to evaluate BIA environment effects since this is laid within a green belt.

(Bristol International Airport, 2005)

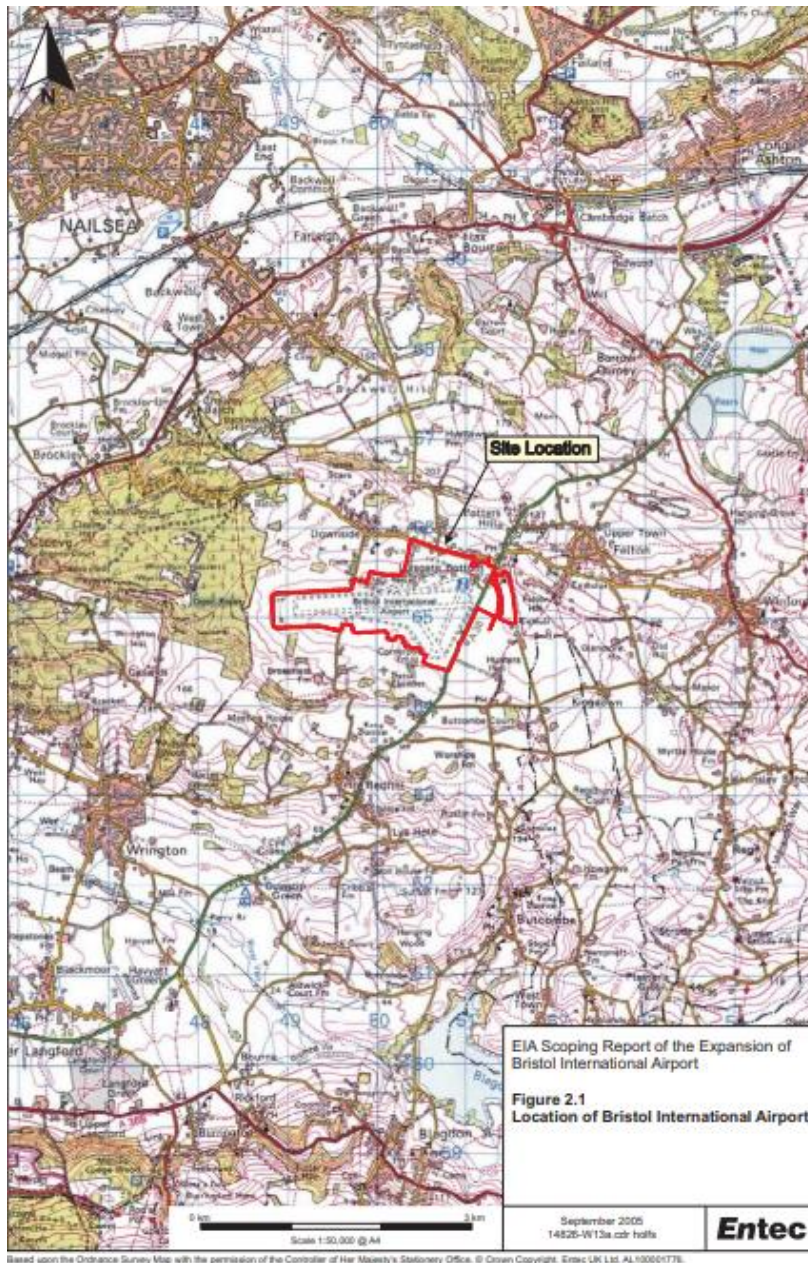


Figure 1 Bristol International Airport Location (Bristol International Airport, 2005)

Legislation

The procedure of Environment Impact Assessment included in the town and country planning, England. The process of Environmental Impact Assessment in the context of town and country planning in England is ruled by the Town and Country Planning (the '2017 Regulations'). These rules apply to construction projects that have Part III of the Town and Country Planning Act 1990 planning permission (GOV.UK; 2014). According to The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 - SI No. 293, the BIA scoping report has made as a part of the EIA report. Prior to granting planning permission for some types of

development covered by The Town and Country Planning Act 1990, an EIA is required by the EIA Regulations. As stated in the aviation white paper, there is a need for EIA on BIA expansion project (Bristol International Airport, 2005).

Scoping of Bristol International Airport expansion project

The main goal of this scoping report is to recognize the proposed development's adverse effects which should be taken into account as serious. Potential environmental effects and fundamental stages of development such as permanent land use changes and new infrastructures in the scheme need to be consider within the scoping (Bristol International Airport, 2005).

One of the main objectives of this EIA is to collect all necessary environmental data to support the development and minimizing the adverse effect on environment. The EIA team must collaborate closely with the project design team to accomplish this.

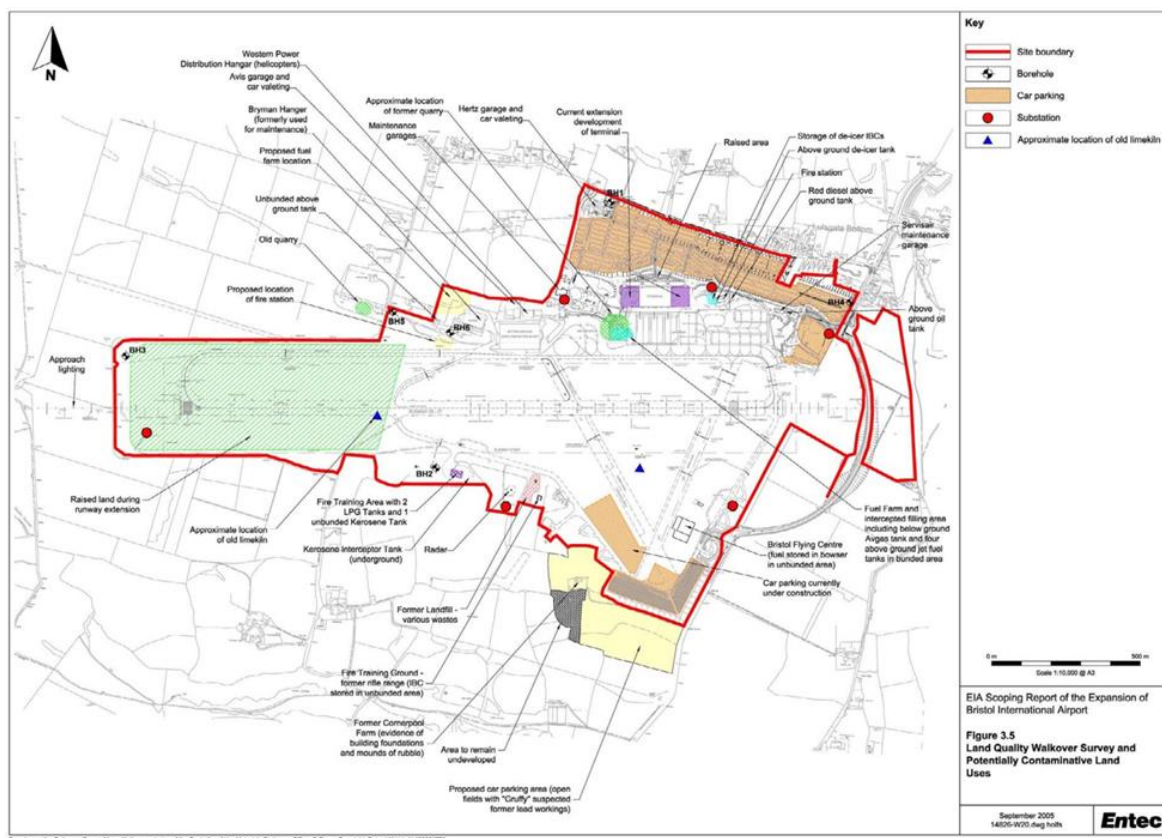


Figure 2 Bristol International Airport Land Use Plan (Bristol International Airport, 2005)

The proposed scope of the EIA is brief as below. Environmental factors which need to be considered described as below;

Air

The air quality strategy in the UK was circulated in January 2000, in this air pollutions at national and local levels are illustrated broadly (Bristol International Airport, 2005). Air pollution will lead to changes in the atmosphere it may cause badly on environment and human health too (Zanetta, 1994; 5). UK Government has implemented a three – stage approach to evaluate the air quality. Air quality should be evaluated by local authorities regards to the regulations. At the initial stage ozone got short term objectives but with the European strategy for limiting ozone concentration and with the transboundry nature of the ozone, ozone not evaluated within the air quality.

Possible air pollution sources within the Bristol International airport as follow;

- Airplane operations
- Vehicle emissions
- Energy consumption
- Fuel storage of the airplane
- Airplane storage tanks and refilling tanks
- Maintenance, building operations

Nitrogen Oxide, Carbon Monoxide, Carbon Dioxide, Sulphure Dioxide, Volatile organic compounds, Particulates are recognized as main air pollutants within the BIA. Recent studies from Aberdeen University illustrated that BIA air pollution will lead to stunt babies and causal factors have identified as exposure of mother to polluted air within the pregnancy period furthermore smaller gestational births, coronary artery disease, diabetes and asthma has recognized as major diseases can be caused with this air pollution (Greenwood, 2019).

Emissions from the aircraft, emissions caused by the road traffic, dust nuisance, Deposition of airborne pollutants on designated sites are recognized as major potential effects need to be considering further with expansion of BIA (Bristol International Airport, 2005).

Mitigation actions need to be taken within BIA as follow;

- a) Airfield layout should be modify to minimize idling and taxiing time

- b) There should be a proper traffic management strategy to avoid the emission
- c) Encourage people to have public transport, it will be minimize the congestion

(Bristol International Airport, 2005)

Geology and land quality

A qualitative risk assessment based on the "source-pathway-receptor" approach is used to identify the likely important consequences that relate to geology and land quality. This methodology can be defined as follows (Bristol International Airport, 2005).

Source- A pollutant that might be harmful to environmental and human receptors. In a broader sense, this could refer to specific ground conditions, like the existence of abandoned footings, which could have an effect on redevelopment plans. People, other living things, physical systems, and manufactured objects may all be affected by the "source."

Receptor- The "receptor" can only be affected if a functional pathway connects the "source" and the "receptor." It is possible to consider groundwater and surface water systems to be receptors in and of themselves due to the fact that their quality is regulated by statutory agencies and that they act as pathways for pollutant migration to other receptors.

- Buildings and buried services – current and proposed;
- Land quality – current and future;
- Surface water;
- Groundwater; and
- Flora and fauna.

Possible impacts of the proposed development on biodiversity, surface water, groundwater, and/or the presence of toxins

Pathway- The potential path by which the "source" and "receptor" might interact. This can involve the physical transfer of contamination, groundwater, wind-blown dust, vapour migration, excavation and deposition, among other methods.

The existence of "gruffy" patches, which have been linked to historical lead and calamine mining, could point to the possibility of elevated metal concentrations close to the proposed auto parking lot to the south. The site that Cornerpool Farm once inhabited, which could potentially be contaminated by waste or rubble and where there are signs of building foundations, is suggested to be used for the car parking space(Bristol International Airport, 2005).

Improvements to drainage, including an update to the site's interceptors, are among the environmental enhancement measures connected to the proposed construction. This will lessen the possibility that hazardous contaminants will affect the condition of the land.

It's possible that historical activities in the intended development zones have contaminated the land. During the development and rebuilding processes, such contaminants that may otherwise go undetected and continue to endanger sensitive receptors may be characterized (Bristol International Airport, 2005).

Water resources and quality

A strategy based on the "source-pathway-receptor" concept is used to identify impacts that are expected to have a major impact on surface and groundwater features. Anyone who causes or intentionally permits the entry into surface or groundwater polluting substances, particularly those on Lists 1 and 2 of the 1998 Regulations, is guilty of an offence under the Water Resources Act of 1991 and the Groundwater Regulations. The BIA is situated on Broadfield Down, a dome-shaped periclinal formation, the core of which is made up of Carboniferous Black Rock Limestone (BRL). The surrounding soil has a high potential for leaching, according to the Environment Agency's Groundwater Vulnerability. As a result, the lack of a large physical barrier and the poor chemical attenuating qualities of the soil would imply that there may not be much standing in the way of potentially tainted recharge waters making their way to the water table beneath the ground. BIA will keep growing till it reaches its current capacity. An increase in the use of potentially polluting products is predicted, but any consequences should be mitigated by following the present environmental management and pollution prevention/response methods. According to the Environment Agency, BIA is not at risk from severe river or sea flooding. Climate

change is anticipated to cause changes to climatic factors. The main effects of this could be drier summers and more variable and intense rains during the winter. An increase in surface runoff and the possibility of localized flooding may be caused by the shift in rainfall pattern. It has been expected that there will be a general drop in groundwater recharge, which will lower groundwater levels and have corresponding consequences in groundwater supported watercourses (Bristol International Airport, 2005, 2006).

To accommodate the expected short-term increase in passenger volume, a new parking space is now being built. This location will use a Sustainable Drainage System (SuDS) that is connected to the current drainage system and consists of a permeable surface covered in a layer of sand and geotextile (Bristol International Airport, 2005, 2006).

Mitigation practices as follow;

- There should be a proper management plan during the building period
- Modification of current drainage system
- There should be a system to contain pollutants at fire station and fuel farm
- Use of SuDS to increase the amount of runoff

Transport

The EIA's methodology will follow the guidelines outlined in the Institute of Environmental Assessment's (IEA) "Guidelines for the Environmental Assessment of Road Traffic," which were issued in 1993. Therefore, the evaluation will concentrate on possible effects on:

Local roads and the people who utilize them

Along with the relevant occupants and users, the land uses and environmental resources fronting those highways are all important

The movements of commercial Heavy Goods Vehicles³⁶ (HGV) travelling to and from the site during the construction period of the development are expected to have an influence on transportation during construction. Once the plant is operating, private vehicle travel to and from the site will have the greatest impact on transportation (Bristol International Airport, 2005, 2006). The general operation of the highway network, including traffic speeds and capacity of highway linkages and junctions, may

be impacted by changes in the baseline traffic as a result of construction activity, particularly HGVs.

Even if the development is abandoned, background traffic volumes are expected to increase and it is necessary to quantify these increases in order to conduct a thorough assessment of the effects. Therefore, in order to adjust the data from any previous traffic counts to the anticipated values in the assessment year, a growth factor must be applied starting on the date of the count.

However, it is thought that the effects of the airport expansion on traffic flows could be significant, and mitigation in the form of promoting the use of public transportation as a key method of reducing dependence on private vehicles, along with other measures (such as careful highway and car parking design, and use of traffic control systems), will also be required (Bristol International Airport, 2005, 2006). Road users' increased vehicular activity would have consequences in terms of road safety on vulnerable road users and increase potential risk of accidents.

Biodiversity

It is not feasible for an ecological evaluation to take into account every single species and habitat that could be impacted by a development. Instead, it ought to concentrate on legally protected species and "important ecological sensors."

Within a 2 km radius, records of specific highlights of species that are legally protected include (Bristol International Airport, 2005, 2006);

- crested newt (*Triturus cristatus*) within 500m of the west of the runway
- horseshoe bats found with the North Somerset
- bats being recorded within Cornerpool Farm
- badger (*Meles meles*) found along the existing southern boundary of the airport
- slow worm (*Anguis fragilis*) founded in the southern boundary of the airfield

Before the next steps in the process can be determined, desk studies are still employed as the initial stage of researching a place. Recent scoping reports included desk studies for the Mumbles Lifeboat Station, Heathrow and Gatwick Airports, and other locations (Statement, 2010; Heathrow Airport, 2018; Gatwick Airport, 2019; Glasson, 2019). Desk studies, on the other hand, are carried out from distant office

locations and might not take into account local expertise or unrecorded key species in a scoping report, for instance. As a result, new species may have established in a region but may not be noted in secondary data sets (Glasson; 2019).

The desktop analysis found several priority species close enough to the BIA to be taken into account in the scoping report (Bristol International Airport, 2005). The site walkthrough identified four active badger 16 setts, probable bat roosting sites, and bat foraging/commuting habitats, supporting the presence of badgers and bats although no surveys were conducted at the time. The report only specifically addresses surveys for a few particular species and just states that more surveys would be conducted at the proper time of year to offer more reliable data. Potential impacts to the biodiversity as follow;

	Receptor	Potential impact
1.	Vegetation in Felton Common County Wildlife Site	Due to the dust deposition which comes from the construction project will affect for the plant growth and survival
2.	Bats	Disturbances occur to bat's roosting structures Modification of routes
3.	Great crested newt	Death , injury can be caused
4.	Badger	Habitat damages or losses
5.	Slow worm and other reptiles	Habitat damages or losses or disturbances to individuals
6.	Nesting birds	Injury or disturbance to birds or their nests

7.	Semi-improved calcareous grassland	Loss the grasslands by constructions
8.	Groundwater fed water courses	Ground pollution water

Table 1- Potential impacts to the biodiversity (Bristol International Airport, 2005)

Suitable mature trees and hedgerows should preserve as mitigating methods (Bristol International Airport, 2005). New habitats will be developed as part of the airport development, and/or existing habitats will be improved. Some of Cornerpool Farm and/or other distinct pieces of land to the east of the A38 may fall under this category. The establishment or improvement of such habitats would be in line with offering more opportunities for locally recognised natural resources, and where practical, would strive to contribute to LBAP targets (Bristol International Airport, 2005, 2006)

3 Conclusion

Bristol International Airport expansion project is a very important as a locally in UK, since future UK aviation passenger demand will increase rapidly. Before the expansion constructions start it is recognized that there should be an EIA, so with this EIA it was identified the adverse environment effects which will be happened after the construction. It was identified some species which will be loss or disturb and some factors which will be disturbances to humans as well. Based on these factors environment statement should be building up and then the planning application should be done by the qualified consultants. Finally decisions should be made based on these all factors. EIA is basically very important to preserve the environment and UK is one of the countries which were encouraging EIA by the government as well.

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Appendices

Appendix 1

a. Part 1 section 4 guidance on completing an EIA taken from The Town and Country Planning (Environmental Impact Assessment) (Wales) 2017

<i>The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017</i>
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Section 4

(2) The EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of proposed development on the following—
--

- | |
|--|
| <ul style="list-style-type: none">(a) population and human health.(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC (1) and Directive 2009/147/EC(2);(c) land, soil, water, air and climate.(d) material assets, cultural heritage and the landscape; and(e) the interaction between the factors listed in sub-paragraphs (a) to (d). |
|--|

(3) The effects referred to in paragraph (2) on the factors set out in that paragraph must include—

- | |
|--|
| <ul style="list-style-type: none">(a) the operational effects of the proposed development, where the proposed development will have operational effects; and(b) the expected effects deriving from the vulnerability of the proposed development to risks of major accidents and disasters that are relevant to that development. |
|--|

(4) The relevant planning authority or the Welsh Ministers, as the case may be, must ensure that they have, or have access as necessary to, sufficient expertise to examine the environmental statement.
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b. Schedule 4, part 2 of The Town and Country Planning (Environmental Impact Assessment) England and Wales Regulations 1999

Town and country planning (Environmental impact assessment) England and Wales Regulations 1999	
SCHEDULE 4	
INFORMATION FOR INCLUSION IN ENVIRONMENTAL STATEMENTS	
PART I	
1. Description of the development, including in particular—	
	(a) a description of the physical characteristics of the whole development and the land-use requirements during the construction and operational phases;
	(b) a description of the main characteristics of the production processes, for instance, nature and quantity of the materials used;
	(c) an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed development.
2. An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.	
3. A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.	
4. A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development, resulting from:	
	(a) the existence of the development;
	(b) the use of natural resources;
	(c) the emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the applicant of the forecasting methods used to assess the effects on the environment.
5. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.	
6. A non-technical summary of the information provided under paragraphs 1 to 5 of this Part.	
7. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information.	
PART II	
1. A description of the development comprising information on the site, design and size of the development.	
2. A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects.	
3. The data required to identify and assess the main effects which the development is likely to have on the environment.	
4. An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.	
5. A non-technical summary of the information provided under paragraphs 1 to 4 of this Part.	

Appendix 2

a: Site Map of Brynrhyd Solar Farm, from Environmental Written Statement: September 2021(Pegasus Group,2022)

