

2021

Nature+Energy

YEAR THREE REPORT

2024

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ACRONYMS AND DEFINITIONS

NCA	Natural Capital Accounting
BAP	Biodiversity Action Plan
PTM	Priority Threat Management
WP	Work Package
Biocultural Approach	A framework of shared understandings, values and methodologies that investigates the interconnections between nature and culture.
Biocultural diversity	A dynamic, place-based, aspect of nature arising from links and feedbacks between human cultural diversity and biological diversity.
Biodiversity Action Plan	A plan outlining specific actions to enhance biodiversity in a given area.
Condition Indicator Scorecards	Evaluation tool for assessing the state of habitats.
Exemplar windfarms	A selection of windfarms that encompass the diversity of habitat and ownership types that exist in windfarms across Ireland.

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ACRONYMS AND DEFINITIONS

Natural Capital Accounting	A systematic way to report on stocks and flows of natural capital by organising this information in an accounting format that allows decision-makers to incorporate nature's assets into their decisions.
Natural Capital	Nature's assets, encompassing resources like soil, water, forests, biodiversity, etc.
Risk Register	A record of potential threats and risks associated with natural assets, providing a basis for risk assessment and management.
Smart Environmental Monitoring System	An advanced system using sound recording and radar to track bird and bat activity and presence in windfarms.
Synthetic Data	Artificially generated data to supplement real data for training machine learning models.
Web-based Decision Support Tool	An online tool developed to assist in decision-making related to natural capital and land-use planning.

ABOUT NATURE+ENERGY

The Nature+Energy is a four-year long project which began in 2021. The project is a collaboration between research (Trinity College Dublin, Maynooth University and Science Foundation Ireland’s MaREI Centre) and industry. We are partnered with Wind Energy Ireland and nine company partners, and we focus our research on nine exemplar windfarms around Ireland

The aim of the project is to develop the template and tools needed to optimise land management and the delivery of natural capital co-benefits from onshore windfarms.



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PROJECT OVERVIEW

Nature+Energy has 8 main workpackages

- WP 1: Natural Capital Accounting
- WP 2: Smart Environmental Monitoring System
- WP 3: Quantify Natural Capital at Onshore Windfarms
- WP 4: Natural Capital Asset and Risk Register
- WP 5: Sectoral Biodiversity Action Plans
- WP 6: Web-based Decision Support Tool
- WP 7: Industry Academia Sectoral Training and Collaboration Programme
- WP 8: Project Management and Communication

There is one additional, separately funded workpackage

- WP 9: Wind Energy Biodiversity Park



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UPDATE

The third year of the Nature+Energy project was busy and productive, with work progressing on all work packages of the project, in addition to three new members of staff joining the project. The project passed the halfway mark in early spring of 2023, and much of the work at this time focused on finalising baseline Natural Capital Accounts (NCA) for seven exemplar windfarm sites and developing the template for the risk registers. We explored different options to display Natural Capital Accounts, including interactive mapping tools. In addition, we began developing a platform to automate the development of natural capital accounts.

Throughout the year, work has been ongoing on developing and improving the smart-environmental monitoring system. Large amounts of data have been collected from exemplar windfarm sites, which are used to inform and train the machine learning algorithm to identify bird species. In August, [a paper](#) was published from this work, specifically on the tool developed to label the audio data.

Management actions are being collated for the Biodiversity Action Plans (BAPs), which will be the focus of work in early 2024, alongside work on the Decision Support Tool. We will use a novel priority threat management approach to develop the BAPs. As we enter the final year of the project, we are on track to complete the project deliverables and look forward to discussing the project and its progress at our penultimate steering committee and partner meeting in March 2024!



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TIMELINE

YEAR 1
(APRIL 2021-MARCH 2022)

- Initial site visits
- Development of methodology for Natural Capital Accounting
- Development of methodology for Smart Environmental Monitoring System
- Acoustic recorder data collection Remote data collation
- NCA condition indicator selection

YEAR 2
(APRIL 2022-MARCH 2023)

- Fieldwork on exemplar windfarm sites
- NCA Condition scorecard development
- NCA extent account development
- NCA condition account development, framework for NCA at site-level developed
- Machine learning algorithm for Irish bird species under development
- Shiny app for labelling bird acoustic recordings developed

YEAR 3
(APRIL 2023-MARCH 2024)

- Development of NCA accounting outputs (tables, maps, interactive maps)
- Development of risk registers
- Selection of methodology for BAPs
- Data collection for BAPs
- Project communication on social media
- Development of online platform for automation of NCA process
- Machine-learning algorithm for automated bat identification from sonograms

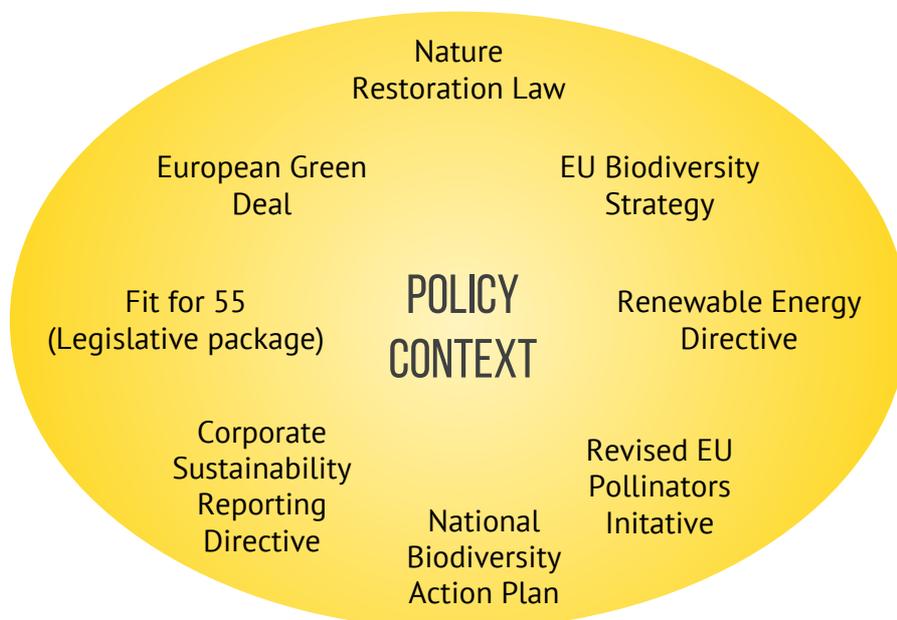
YEAR 4
(APRIL 2024-MARCH 2025):

- PTM interviews
- PTM cost-effective analysis
- Write-up of site-specific BAPs
- Write up of sectoral BAPs
- Development of Decision-Support Tool
- Dissemination of project outputs (natural capital accounts, BAPs, decision support tool)
- Project summary
- End-of-Project conference

POLICY CONTEXT

From halting biodiversity loss to nature restoration

The policy context for nature and biodiversity has changed significantly over the last decade. While the language of the 2014 Environmental Impact Assessment Directive focuses on halting net biodiversity loss, the rhetoric has now notably shifted to nature restoration with a new **Nature Restoration Law** (likely to come into effect in 2024) which aims to create legally binding targets to achieve the ambitions of the **EU Biodiversity Strategy** and restoring Europe's damaged ecosystems by 2050. There is increasing recognition in policy spheres of the intertwined nature of the climate crisis, biodiversity crisis and pollution crisis and the need for these to be tackled on multiple scales and by a variety of actors, including international and EU institutions, national governments, local authorities, industry and civil society. For example, the Nature Restoration law has been flagged as a key initiative in avoiding ecosystem collapse and preventing the worst impacts of climate change and biodiversity loss.



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Other recent EU initiatives include:

- the **2019 European Green Deal** (with its aim of no net emissions of greenhouse gases by 2050 including a clean and efficient energy transition and protecting our biodiversity and ecosystems);
- the **2020 EU Biodiversity Strategy** (a long-term plan to ensure that by 2050, all of the world's ecosystems are restored, resilient and adequately protected);
- **Fit for 55** (a recently completed package of legislation, adopted to reduce net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels); and
- the **2022 Corporate Sustainability Reporting Directive** (which modernises and strengthens the rules concerning the social and environmental information that companies have to report, explicitly refers to the EU Biodiversity Strategy and requires specific sustainability reporting standards for biodiversity and ecosystems).



Renewable Energy Directive

On 9 October 2023, the EU Council adopted the amended Renewable Energy Directive (RED III), part of the Fit for 55 package. The RED III aims to increase the share of renewable energy in the EU's overall energy consumption to 42.5% by 2030, with a further indicative target of 2.5%. Under RED III, renewable energy projects will benefit from an overriding **public interest presumption**, which will limit the grounds of legal objections to new installations and will enable projects to benefit from simplified and fast permit-granting processes. The public interest presumption has sparked concern among some Greens/EFA Members of the European Parliament who are worried that there are not enough safeguards for biodiversity.

European and national level targets and duties

Once the EU Nature Restoration Law comes into effect, binding targets will apply to meet the goal of nature restoration measures for at least 20% of the EU's land and sea areas by 2030 and for all ecosystems in need of restoration by 2050.

On a national level, Member States will be tasked with drafting and implementing a national **Nature Restoration Plan**. This will, for example, include legally binding measures to reverse the decline of pollinator populations by 2030, and to maintain increasing trends thereafter, and will work alongside the 2023 **Revised EU Pollinators Initiative**. In addition, since the Wildlife (Amendment) Act 2023 came into effect in November 2023, a **new public sector duty** requires all public service bodies to integrate biodiversity into their plans, policies and programmes, which will significantly reinforce Ireland's fourth **National Biodiversity Action Plan**. The new public sector duty is likely to directly impact on planning conditions for windfarms as local authorities integrate the requirements of discharging this duty into their planning processes.

NEW STAFF



RUTH BRENNAN

Dr Ruth Brennan is a marine social scientist, policy advisor and integration expert, specialising in marine environmental governance and transdisciplinary research. She is an experienced facilitator and communicator both through her research and her former career as a solicitor with a leading international law firm in London and Paris. Ruth's research interests include environmental governance at a variety of scales, with a focus on society-environment relations, socio-cultural values, socioecological systems and social justice. Her research offers insights into different ways in which environmental spaces are conceptualised by users, managers and through human-environment interactions, how this relates to natural resource governance challenges and what it means for community engagement. Since 2008, Ruth has worked as a social scientist on ethnographies of coastal communities and at the arts-science-policy interface. Her research experience spans national and European projects and her research has been widely published. Ruth has worked at universities in Ireland, the UK and the Middle East and has served as an expert advisor to the Irish and Scottish Governments. She is currently an Associate Research Fellow at the Trinity Centre for Environmental Humanities, a Senior Research Fellow in the School of Natural Sciences, Trinity College Dublin, a policy advisor to an Irish Member of the European Parliament, an external expert for the European Commission and a Board Member of the Maritime Area Regulatory Authority.

Ruth joined the Nature+Energy team in September 2023 as a Senior Research Fellow. Her role in the project is to bring social science insights to the Nature+Energy outputs, particularly in relation to the careful consideration of relevant socio-cultural and policy contexts, legitimacy and equity principles.

SENIOR RESEARCH
FELLOW



MARYAM NOROUZI

Maryam Norouzi received the B.Sc. degree in electrical engineering from the K. N. Toosi University of Technology, Tehran, Iran, in 2011, the M.Sc. and Ph.D. degree in electrical engineering from the University of Tehran, Tehran, in 2014 and 2021, respectively. In 2020, she was on sabbatical leave with the Fatigue and Stress Analysis Lab (FATSLAB), University of Waterloo, Waterloo, ON, Canada, conducting research on the use of cold spray technology for printing zero power wireless sensors on metallic structures. Moreover, she had industrial experiences in HONGFA company in China, Xiamen in 2018 as well as MAPNA Electric Vehicle Charging Infrastructure company in Tehran, Iran for two years up to 2023. Her current research interests include additive manufacturing techniques, remote sensing, non-contact measurements and passive microwave structures.

Maryam is currently a CONNECT Research Fellow at Trinity College Dublin and is part of the “Digitizing biodiversity” project developing an integrated sensor platform including the radar, audio, and video sensors on single hardware.

POSTDOCTORAL
RESEARCHER



AOIFE KIERNAN

Aoife Kiernan has recently graduated with a bachelor's degree in Environmental Sciences from Trinity College. She has always had a strong interest in environmental communications and has previously worked as a geological tour guide and as a teacher in science camps for children. During her undergraduate degree, she co-founded an environmental magazine.

Aoife joined the Nature+Energy team in November 2023 as a research assistant. Since joining the project, she has been focusing on the Demonstrator Park work package. In addition to this, she has been working on dissemination and communications of the project. She has set up Instagram, Twitter/X and LinkedIn accounts where she shares posts about the research Nature+Energy has been carrying out, with the aim of raising awareness among the public of the opportunities to have high biodiversity on windfarms.

RESEARCH
ASSISTANT

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WORK PACKAGE 1: NATURAL CAPITAL ACCOUNTING (METHODOLOGY)

DELIVERABLES:

D1.1. STRUCTURED DECISION-MAKING WORKSHOP

*D1.2. REPORT DESCRIBING SECTOR-SPECIFIC
NATURAL CAPITAL ACCOUNTING GUIDELINES AND
PROCEDURES.*

**AIM: DEVELOP A RIGOROUS METHODOLOGY FOR
NATURAL CAPITAL ACCOUNTING ON
WINDFARMS TO QUANTIFY STOCKS OF NATURAL
CAPITAL IN A STANDARDISED WAY.**

Natural capital is a term used to describe nature's assets, including soil, water, forests, biodiversity, etc. **Natural Capital Accounting (NCA)** is a systematic way to report on stocks and flows of natural capital by organising this information in an accounting format that allows decision-makers to incorporate biodiversity into their decisions. Using a natural capital approach can facilitate the identification and prioritisation of natural capital data and management decisions. New regulations, such as the EU's Corporate Sustainability Reporting Directive (CSRD), will mean that businesses will be required to incorporate natural capital assets into their financial reporting. Thus, tailoring and applying methodologies such as NCA to businesses and small-scale operations is becoming an increasingly frequent exercise.

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Our aim was to develop a methodology for NCA on windfarms to assess and audit stocks of natural capital, with a focus on habitats and their ability to support biodiversity. We explored different methods, including Corporate Natural Capital Accounting and the spatially-explicit UN System of Environmental Economic Accounting – Ecosystem Accounts (SEEA-EA). The latter was ultimately used, especially as it was ratified as UN statistical standard in 2021. To understand the existing knowledge of NCA and the goals of stakeholders, individual interviews were held in place of a structured-decision making workshop. Outputs of this fed into decisions when developing the framework for site-level natural capital accounting at windfarms. We developed condition indicator scorecards for field-based condition assessment, based on existing habitat-specific scorecards and scientific literature, and biodiversity indicators (e.g., Wild Atlantic Nature Scorecards, Hen Harrier Project Scorecards, FarmPeat Scorecards).

D1.1. Structured Decision-Making Workshop

Stakeholder interviews were conducted in place of a structured decision-making workshop.

In 2022, Dr. Courtney Gorman carried out interviews to establish whether N+E partners have integrated biodiversity goals into their business models and operational practices. The interviews provided insights into both the needs identified by N+E partners in this domain and significant differences as to the extent to which biodiversity objectives are being considered by different partners. These include:

- a high-level intention to improve the natural environment and a passive approach of letting nature take its course but not having any clear biodiversity objectives;
- absence of tools to plan or manage biodiversity interventions on site;
- a focus on risk assessments in environmental management systems but not a biodiversity management system;
- a global level goal that all new commissioned projects will be net biodiversity positive by 2030, including improving ocean health (Orsted, in partnership with WWF);
- specific biodiversity net gain objectives together with open access net biodiversity gain tools as part of the corporate environmental strategy (SSE Renewables).

The interviews provided insights into shared industry needs that emerged from the responses to the questions about biodiversity objectives.

NEEDS EXPRESSED BY STAKEHOLDERS DURING INTERVIEWS	WHERE THIS NEED IS ADDRESSED
Establishing a biodiversity baseline	WP3, WP5
Clarity and consistency with regard to planning requirements for habitat management plans in Ireland	WP5, WP8
Explicit biodiversity requirements in policy and planning for wind	WP8
How to make windfarm development more ecologically viable	WP5, WP6
A structured assessment process for the natural capital value of a site and a tool for assessing biodiversity benefits	WP3, WP4, WP6
A clear mechanism for feedback from local authorities and regulatory bodies on monitoring	WP5, WP6, WP8
How to do more efficient biodiversity and habitat monitoring with clear outcomes that identify causes of biodiversity impacts	WP2
Good procedure for implementing biodiversity measures and achieving a net gain	WP6
How to interconnect biodiversity management with other land uses	WP5, WP6
How to integrate planning, construction and operational practices with new environmental policies	WP5
How to anticipate and manage the potential effect of a Habitat Management Plan payment scheme with a landowner on their single farm payments	WP4, WP6
Where forestry is cleared for windfarm site, how and what to replant	WP5
How to make peatlands a carbon sink rather than a carbon source	WP5
How to manage unpredictable and extreme weather events for biodiversity	WP3, WP4
How has natural capital accounting been progressed by Nature+Energy so that it can be applied to a site in practice	WP1, WP3

WORK PACKAGE 2: SMART ENVIRONMENTAL MONITORING SYSTEM

DELIVERABLE:

D2. ONLINE SMART ENVIRONMENTAL MONITORING SYSTEM.

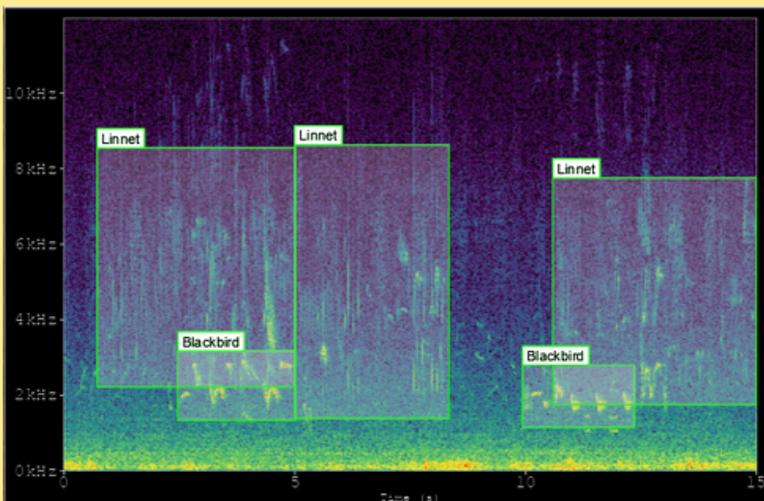
AIM: PASSIVE MONITORING SYSTEM CAPABLE OF DETECTING BIRD AND BAT ACTIVITY AT ONSHORE WINDFARMS RAND IN A VARIETY OF HABITATS AND WEATHER CONDITIONS

This system will comprise of a network of sound recording devices that will collect acoustic and ultrasonic data and transfer it to an online platform for further digital signal processing for species recognition. This will enable a step-change in how environmental monitoring is done in Ireland, enhancing data resolution considerably while simultaneously dramatically reducing running costs coming from traditional monitoring methods.

To understand the species composition at each site, which can be well approximated from the recordings, we analysed a sample of the data collected from the acoustic recorders. We consulted with ornithologists to discern and “label” the species found from this sample of sound clips; with this we produced timestamps of detected species. We created this dataset of manually annotated bird vocalisations using our audio annotation/labelling Shiny App and have a larger dataset of predictions using a large pre-trained model, [BirdNET](#), from the Cornell Lab of Ornithology.

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Another avenue we are exploring is supplementing our human labelled data with synthetic examples, reducing the cost of attaining training data and increasing the accuracy of our species recognition system. We are using a [Generative Adversarial Network](#) (GAN) to generate realistic and diverse spectrograms (visualisations of bird sounds), as well as including a feature to choose the species of bird to synthesize. This gives us more control to match the distribution of synthetic bird clips to what we have observed at each site, as well as having the generator learn to be synthesize distinct clips for different species.



Sonograph of bird sounds



Sound recorder

Noise removal is a key component to improving the quality of our dataset, since high levels of wind and wind turbines are commonly found in the recordings. We have developed a custom model to aid with removing undesired background noise, improving the signal of the bird calls present in clips. This sound source separation model,

based on the [U-Net](#) architecture, uses a dataset consisting of clean bird calls (sourced from the web) and a variety of examples of noise collected from windfarms, with little to no birds present. Pairs of bird clips and noise clips are then randomly combined, and the model is trained to separate these sources.

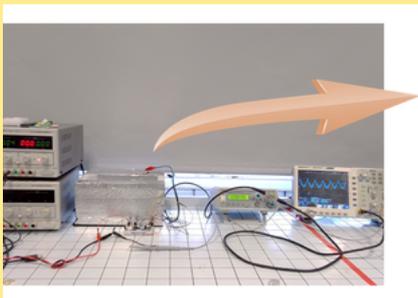
We would like to map developing technology and methods to clear outcomes regarding quantifying biodiversity, for example: bird/bat species activity and diversity, measurement of risk, changes in these chosen metrics over time, feeding into reporting. These requirements may be different for each partner and so expressing these desired outcomes at the next steering committee meeting would be incredibly helpful.

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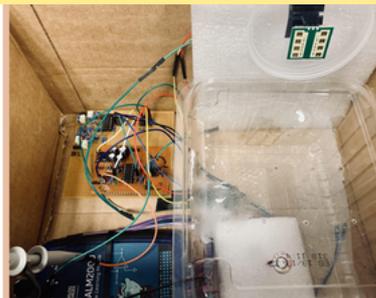
Aim: Enabling low-cost, low-power, and pervasive tracking of insect biomass using Doppler radar sensor

One of the focused aspects of this project is on the areas affected by human activities like farming and wind turbines. Human actions, such as habitat destruction, pollution, and climate change, can harm various species groups, including invertebrates.

For example, in areas with heavy farming, pesticides and land changes disrupt insect populations, including important pollinators. Similarly, the impact of wind turbines on insect communities is not well understood. Predicting and managing these changes is essential to protect biodiversity and maintain services like crop pollination. To address these challenges, we use advanced technologies like mm-Wave radio links and electromagnetic simulations.



Desktop Radar Sensor



These tools help predict changes in biodiversity, particularly among insects and bees, which are vital for healthy ecosystems.

Mm-wave radio signals are reflected by flying insects producing a micro doppler effect. The pattern of reflected radio waves recorded by a receiver can be analysed to provide detailed information about insect wing movements, helping us detect them.

We are currently developing a cost-effective radar sensor that can be deployed in the field to passively monitor pollinating insects, a key group to monitor when assessing biodiversity. So far, our studies on live wild-caught pollinating bees and wasps under controlled laboratory conditions demonstrate that species-specific reflection patterns are generated, which we then pass through machine learning processes, which result in classification of the pollinator species.

Integrating such technologies into a deployable environmental monitoring system will enable cost-effective data collection across different taxonomic groups

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WORK PACKAGE 3: QUANTIFY NATURAL CAPITAL AT ONSHORE WINDFARMS

DELIVERABLES:

D3.1. DATA ON NATURAL CAPITAL ON WINDFARMS ACROSS THE RANGE OF HABITAT TYPES INCLUDED IN THE IRISH WINDFARM NETWORK.

D3.2. DETAILED QUANTIFICATION OF NATURAL CAPITAL ON EXEMPLAR WINDFARMS.

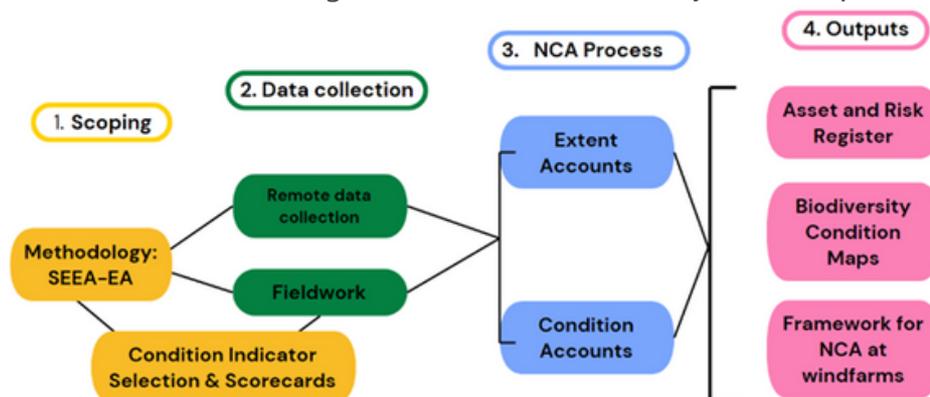
AIM: QUANTIFY NATURAL CAPITAL ON EXEMPLAR WINDFARMS FROM A RANGE OF HABITAT TYPES THROUGHOUT IRELAND.

1. **Scoping:** WP 1 – Establishing the methodology
2. **Data Collection:** Collated all ecological and environmental data available, using remote spatial data, existing environmental impact assessment reports for the exemplar windfarms, and onsite ecological surveys.
3. **NCA Process:** We developed ‘stock accounts’ which are comprised of ecosystem extent and condition.
 - a. **Ecosystem Extent Accounts:** Ecosystem extent accounts record the spatial area of all ecosystem assets within the Ecosystem Accounting Area. We defined ecosystem assets as contiguous areas which fit into a habitat type defined in Fossitt (2000) ‘A Guide to Habitats in Ireland’ – the standard guidance document for classifying Irish habitats. Habitat maps were created using GIS data and fieldwork data from spring/summer site visits in 2022. Area extent of habitats was extracted from GIS.

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b. **Ecosystem Condition Accounts:** To create a biodiversity condition account, habitat-specific condition characteristics that are relevant to the general capacity of the habitat to support biodiversity are necessary. These characteristics need to be able to show a directional change over consecutive accounting periods, in terms of potential changes to the overall biodiversity potential of the habitat. Characteristics are measured using variables and indicators. Variables are quantitative metrics describing characteristics which have an unambiguous definition and well-defined measurement units. Variables are rescaled against reference levels to create indicators. As windfarms are part of anthropogenic ecosystems and usually sited within highly modified anthropogenic ecosystems the ‘best-attainable condition’ was selected for use as the reference condition. This allows us to compare condition against what would be the most attainable condition for biodiversity under good management in a modified environment. Developing the condition account takes place over three stages which produces three accounts along the way: the variable account, indicator account and ecosystem condition account. As biodiversity condition is often quite changeable, we added a fourth standardisation step following the variable account. This allowed us to place every indicator on the same standard scale (0-3) and allow a way that ranges could be used for reference conditions or for variables.

4. Outputs: Condition scores are a value between 0-1, where 0 = poor condition, and 1 = best attainable condition. Condition is presented either in tabular format or displayed on a biodiversity condition maps. The outputs of the extent and condition accounts will also feed into following work packages such as the asset and risk register and biodiversity action plans.



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WORK PACKAGE 4: NATURAL CAPITAL ASSET AND RISK REGISTRAR

DELIVERABLES:

D4. WEB-BASED INTERACTIVE NATURAL CAPITAL ASSET AND RISK REGISTER.

AIM: ESTABLISH A WEB-BASED INTERACTIVE NATURAL CAPITAL ASSET AND RISK REGISTER FOR THE WINDFARM SECTOR.

The benefits derived from natural capital on windfarms can degrade due to pressures such as agricultural intensification, invasive species, pollution, inappropriate management and climate change. The condition of natural assets and the pressures they face determine the risk to those benefits. The risk register spreadsheets are broken down into two main parts: 1) biodiversity status and trends; and 2) risk register. The biodiversity status and trends tab is based on [Mace et al. \(2015\)](#). The main idea is that the condition indicators for biodiversity that were used in the ecosystem accounts are transferred into the risk register where the current status and overall trend can be examined in more detail for each habitat type. The current status is compared to a target status. The target can be based on the indices developed for characteristics in the condition scorecards or they can come from sources such as national guidelines or literature.

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The trend is described as either

- 1) positive or not discernible
- 2) negative; or
- 3) strongly negative

based on the degree of difference between the current and target statuses. The red, amber, and green (RAG) key included in the spreadsheet can then be used to describe the combination of the trend and status. RAG scores B and C indicate areas where biodiversity interventions will be necessary to improve the status. The risk register tab is intended to serve as a risk assessment for each habitat type within a site. The primary threats for each habitat type are threats that were identified through field visits while habitat mapping. These were threats that were pronounced and actively occurring on site to damage biodiversity. The risk is broken down into specific risks that occur due to the primary threat and a description of the risk. The likelihood of each risk was determined by what was observed on site as well as a literature search that was performed after the field season.



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WORK PACKAGE 5: BIODIVERSITY ACTION PLANS

DELIVERABLES:

*D5.1. BIODIVERSITY ACTION PLANS FOR
INDIVIDUAL EXEMPLAR WINDFARMS.*

D5.2. SECTORAL BIODIVERSITY ACTION PLAN.

**AIM: DEVELOP A BIODIVERSITY ACTION PLAN
FOR THE ONSHORE WINDFARM SECTOR IN
IRELAND.**

Here we will develop site specific Biodiversity Action Plans (BAPs) for each exemplar windfarm site and a BAP for the Irish onshore windfarm sector. While numerous examples of BAPs exist for local-scale projects, the methodology behind choosing actions is often not disclosed. In addition, prioritisation of actions is often absent from BAPs. Priority Threat Management (PTM) is an approach that has been used to develop conservation plans, by using stakeholder elicitation and cost-effectiveness to develop management strategies ([Carwardine et al., 2019](#)). Combining ecosystem accounting outputs, such as condition values and recommendations from the risk registers with the methods of PTM can provide a novel approach to develop BAPs in a transparent way.

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WORK PACKAGE 6: WEB-BASED DECISION SUPPORT TOOL

DELIVERABLE:

D6. WEB-BASED DECISION-SUPPORT TOOL AND ASSOCIATED GUIDE FOR USERS.

AIM: DEVELOP A WEB-BASED DECISION-SUPPORT TOOL FOR NATURAL CAPITAL AND LAND-USE PLANNING AND ENHANCEMENT ON ONSHORE WINDFARMS.

To aid decision-making and implementation of actions from the biodiversity-action plans, we will develop a web-based decision-support tool that can optimise the provision of habitat for biodiversity at windfarms. The tool will aid decision-making with support from published scientific research, elicited objectives from stakeholders, and cost-effective analysis that will be conducted when developing WP5. This tool will work alongside the BAPs, to assist decision-makers in prioritising actions to take for biodiversity.

WORK PACKAGE 7: INDUSTRY ACADEMIA SECTORAL TRAINING AND COLLABORATION PROGRAMME

DELIVERABLES:

D7. STUDENTS COMPLETE A NEW INDUSTRY-ACADEMIC WIND ENERGY SECTORAL TRAINING PROGRAMME.

AIM: ESTABLISH A NEW WINDFARM-SPECIFIC INDUSTRY ACADEMIA SECTORAL TRAINING AND COLLABORATION PROGRAMME TO ENSURE LONG-TERM PARTNERSHIP AND CONTINUED DEVELOPMENT AND TAKE-UP OF ECO-INNOVATIONS IN THE SECTOR.

To date there are:

- 7 student projects completed (masters and undergraduate)
- 2 student projects underway
- Yearly lectures to MSc Biodiversity & Conservation, Environmental Science and Statistics & Sustainability students as part of their 'Human-Biodiversity Interactions' module.

Students
carrying out
fieldwork:



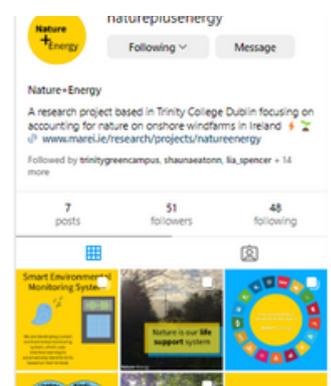
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WORK PACKAGE 8: PROJECT MANAGEMENT & COMMUNICATION

DELIVERABLES:***D8.1. PROJECT COMMUNICATION PLAN******D8.2. PROJECT WEBSITE AND SOCIAL MEDIA PRESENCE******D8.3. PROJECT INFOGRAPHICS (BEGINNING AND END OF PROJECT)******D8.4. POLICY BRIEF******D8.5. TWO-PAGE PROJECT SUMMARY******D8.6. END-OF-PROJECT CONFERENCE***

As we enter the final year of Nature+Energy, communications and dissemination become a priority.

We have launched several social media accounts, including [Instagram](#) (61 followers), [Twitter/X](#) (35 followers) and [LinkedIn](#) (79 followers) accounts, with the aim of spreading the messaging of the project with the general public. The core messages for the general audience, which were set out at the beginning of the project, centre around nature being our life support system, and the potential that windfarms have to provide more than just energy. We also share updates on the day to day running of the research project – new publications, fieldwork, lab work.



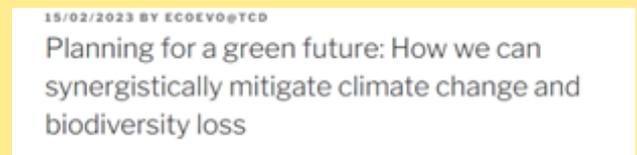
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In January, we published a [review of the potential impacts of climate change mitigation measures on biodiversity](#). This included looking at a range of energy production infrastructure and analysing their impacts on the biodiversity and ecosystems. We found that onshore windfarms have a high potential for mitigation of both biodiversity and climate crises.

We also published a [blogpost](#) based on this paper in EvoEco and Campus Buzz, two Trinity College Dublin-based blog pages.

We published a [paper](#) for an open-source data annotation tool, which was built as part of the smart environmental monitoring system.

Our [paper](#) showing that national economic recovery from financial shocks is accelerated in countries powered by renewable energy has received considerable news attention nationally and throughout the world.



Nature+Energy was included in the National Economic and Social Council Example report to the Taoiseach, "[Natural Capital Accounting: A Guide for Action](#)", as an example of NCA in research.

Through presentations, we engaged with diverse audiences:

- Master's course lecturing reaching over 60 students.
- Plant-Animal Interactions research group in the School of Natural Sciences.
- Central Statistics Office on natural capital accounting.
- INCASE (Irish Natural Capital Accounting for Sustainable Environments) presentation.

Additionally, we showcased our work at the Irish Ecological Association conference through a poster presentation.

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WORK PACKAGE 9: DEMONSTRATOR WIND PARK

DELIVERABLES:

PARK DEVELOPMENT TEMPLATE REPORT.

*THE CO-DEVELOPMENT OF AN INITIAL
DEMONSTRATOR WIND ENERGY BIODIVERSITY
PARK.*

AN EDUCATIONAL AND OUTREACH PROGRAMME

The demonstrator work package is an additional separately-funded work package that began in Q4 2023. It involves the construction of Biodiversity Parks which will communicate the biodiversity value of windfarm sites to visitors. This involves the development of one initial demonstrator biodiversity park at Carnsore Point, funded by the ESB and NTR. Work has begun on this, with a scoping exercise and plans currently being made for the content of the interpretive signage.

Additionally, the creation of a set of guidelines for organisations that would like to develop a similar amenity on their own windfarm has begun. This will contain options for different habitat types and budgetary requirements.

The last step in this work package will be the development of an education and outreach programme, which will begin in the coming months.

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THE ADVANTAGES OF A BIOCULTURAL APPROACH

Biodiversity Park as a community amenity:

A biocultural approach to developing a biodiversity park involves exploring the intimate relationships between people and place and reflecting how local communities and interest groups experience and understand their sense of belonging to place. At its heart, a biocultural approach is about engaging with local communities from the outset and reflecting the relationships between people and nature as an intertwined and interdependent ecosystem. This reflects the everyday realities of people who work with, and on, the land and sea. It also engages with those passionate about the environment such as local environmental groups or local trail and map development and management groups. A biocultural approach lends itself to the creation of an embedded community amenity that engages with the heritage and biodiversity of the Carnsore site while also raising importance of renewable energy in increasing community resilience to the increasing impacts of climate change.

An example of a biocultural approach to the relationships between people and place is an interactive online map which gathers local stories that are narrated through the voices of local people and which are intertwined with local biodiversity. There is great potential to co-create a biocultural map of the Carnsore Wind Energy Biodiversity Park, that can continue to be added to over time as new stories appear, as a means of creating a community-led and co-created amenity that makes visible to locals and visitors alike, the special relationships between people and nature on the South Wexford coast.

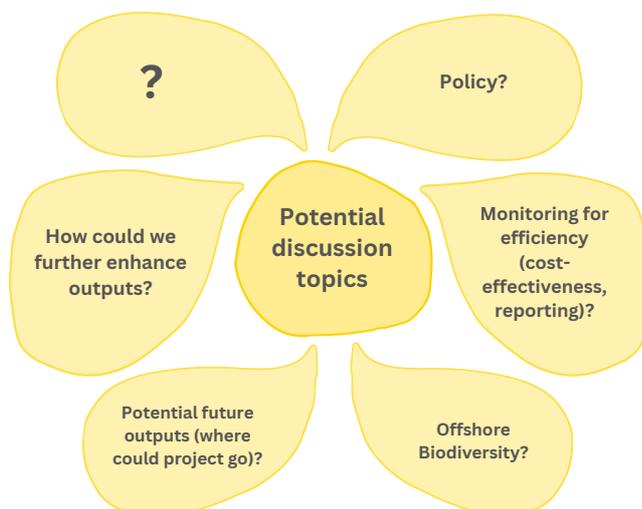


CONCLUSIONS

Our goal with this report is to highlight the ongoing work of the Nature+Energy project and provide background information. We hope that this provides a basis to encourage discussion and open-dialogue for our in-person meeting on **12th March**. At this meeting, we welcome your thoughts and questions, especially at this critical juncture as we enter the final year of the project and look towards outputs, dissemination, and future prospects.

Thank you for taking the time to read this document, and we look forward to seeing you at our upcoming meeting!

-The Nature+Energy Team



Nature+Energy

