VALMAS Workshop 4 Meeting Minutes

1230-1730, 12th Oct 2026

0900-1730, 13th Oct 2026

0900-1200, 14th Oct 2026

University of Strathclyde and Online

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Day 1

1230-1300: Welcome and project Admin

Workshop Objectives And Project Progress: Nicky opened Workshop 4 in Glasgow by aligning the team around the project's practical mission, reviewing first-year outputs and challenges, and confirming the schedule for the three-day internal workshop.

- **Project Purpose:** Nicky reaffirmed that the project aims to support a just, nature-positive and economically efficient energy transition, with outputs that can be applied by government, industry and other external users.
- **Work Package Structure:** Nicky emphasized the need for each team to maintain awareness of how its work contributes to the whole project.
- **First-Year Outputs:** The team reported progress including a community of practice with more than 175 members, newsletters, an active website and LinkedIn presence, stakeholder and evidence databases, the Natural Capital and Employment Values Framework, modelling fact sheets, industry workshops, a funded PhD project, network development and decision-support fact sheets.
- **Project Challenges:** Nicky reported delays caused by transferring the budget to NOC, continuing uncertainty about access to fieldwork sites, staff changes and the need to improve coordination between the project's evidence synthesis and related sister-project work. These issues were described as ongoing project-management matters rather than changes to the overall direction.
- **Future Workshop Location Details:** The team will not meet all together in person again for approximately one year; smaller meetings and an online modelling workshop will occur in the interim. In response to Steve's question about the future meeting schedule, Nicky agreed that Workshop 7 can be moved from Cardiff to Aberdeen in Quarter 13, where decision-support work can be addressed alongside the planned Aberdeen activities.

Project Coordination And Personnel Changes: The meeting included practical coordination decisions, introductions for new team members and confirmation that Michelle Slater will retire at the end of November, with continuity to be provided by colleagues at the University of Aberdeen.

- **New Team Members:** Nicky welcomed new or recently involved participants including Matty, Daisy, Keila and Katarina, and noted that Matty will formally begin work in November.

- **Anne-Michelle's Retirement:** Anne-Michelle announced that they will retire at the end of November. She noted that colleagues at the University of Aberdeen will provide continuity for the relevant work.

1300-1645: WP Update Session

WP1: Synthesis and Integration of MAS Research and Evidence Landscape

Stakeholder And Governance Frameworks: Emma McKinley and Anne-Michelle Slater described the stakeholder database and governance matrix, while the group discussed how to turn those resources into useful case-study, equity and decision-making analyses rather than static mapping exercises.

- **Stakeholder Database:** Emma reported that the project has a database containing more than 400 stakeholders, developed with the READ-ME project and already used in its analysis of equity in decisions associated with oil and gas and offshore-wind decommissioning. The database is stored in the work-package folders and can be updated by team members.
- **Database Applications:** The team has not yet decided whether the database should support power-and-influence analysis, network analysis, place-based equity assessment or another approach. Emma asked members to suggest uses that would generate practical value, while the group noted that large stakeholder-mapping exercises can become time-consuming without influencing later work.
- **Case Study Integration:** Anne-Michelle proposed making the stakeholder list useful by examining how listed actors actually participate in selected case studies, including their roles in just-transition and justice processes and consultation or consenting panels. This approach would extract relevant relationships from specific places rather than attempt to analyse every database entry equally.
- **Equity And Interviewees:** The READ-ME equity framework may help identify groups that are commonly excluded from decision-making discussions and inform selection of interviewees. The group also discussed using READ-ME's forthcoming public-perception survey and incorporating questions about perceptions of nature-based solutions, their value and possible greenwashing concerns.
- **Stakeholder-Framework Links:** Justine proposed using the stakeholder database to identify groups with distinct viewpoints and test whether the natural-capital framework captures their perspectives. The group agreed that the database may be most useful as an input to other project activities, including

interviews, framework development and engagement, rather than as a standalone mapping output.

- **Governance Matrix:** Anne-Michelle explained that the governance matrix will connect international, EU-derived, UK and Scottish law; policy; responsible bodies; stakeholders; decision-making processes; and case studies. It will cover consenting, operational conditions, decommissioning plans, environmental impact assessment, biodiversity policy, marine protected areas, nature-positive and marine-net-gain approaches, and the differing jurisdictions and institutions around the North Sea.
- **Decision-Making Mapping:** In response to a question, Anne-Michelle and Emma confirmed that stakeholders have not yet been mapped directly onto decision-making processes, although the team intends to do so. The proposed mapping would show which actors, laws, policies, consultation requirements and responsible bodies are involved in particular case studies.
- **Research Community Role:** The group discussed whether the research community should appear in the governance diagram. It is already represented as a stakeholder category in the database, but participants also raised the need to show how research expertise feeds into decisions rather than treating researchers as peripheral observers. The discussion was deferred to the later governance session.
- **Policy Flexibility:** Anne-Michelle clarified that the matrix will include both binding legal requirements and more flexible policy themes that may change over time. She cited marine net gain and the Marine Recovery Fund as examples requiring careful treatment because policy status and terminology differ across jurisdictions, particularly between Scotland and the rest of the UK.
- **Investor Requirements:** Justine noted that international investors and banks may require biodiversity net gain for impacts on critical habitats even where UK policy does not mandate it. The investor perspective should therefore be considered as an additional lens when analysing governance, case studies and decision-making.

Evidence Synthesis And Future Scenarios: Steve Watson and Andrew Edwards-Jones, reported completion of the main evidence-gathering phase, outlined the SWOT synthesis and continued work to align five narrative scenarios with modelling parameters.

- **Evidence Sources:** Steve reported that the evidence-gap analysis draws on the updated ORIES database, the READ-ME decommissioning evidence synthesis and an NVivo-based review of current and grey literature. ORIES covers

construction, operation and decommissioning, READ-ME provides additional detail on decommissioning options and socioeconomic context, and NVivo captures newer or unpublished material not necessarily included in systematic reviews.

- **Evidence Coverage:** The ORIES database contains more than 2,000 relevant records across oil and gas and offshore wind. Evidence was separated into direct and supporting categories for carbon and fisheries, while biodiversity was divided into birds, fish, benthic invertebrates, marine mammals, plankton, microbial groups and cross-taxa or ecosystem studies.
- **Evidence Gaps:** The synthesis found substantially less evidence for carbon than for fisheries and biodiversity. A key weakness is that ecological change is often not linked clearly to ecosystem-service benefits; for example, fish aggregation does not necessarily demonstrate increased fisheries catch, and carbon studies do not always demonstrate persistent storage.
- **SWOT Analysis:** The team is combining quantity, quality, geographical coverage, temporal coverage, life-cycle coverage and before-and-after evidence into a SWOT assessment. Strengths include evidence that artificial structures alter ecosystems and a relatively strong fisheries and biodiversity evidence base; opportunities include using decommissioning as a learning opportunity, establishing reference sites and standardising indicators; threats include loss of artificial habitat during removal and limited transferability of evidence between locations.
- **Biodiversity Classification:** In response to Ian's question, Steve and Andy confirmed that the biodiversity evidence can be subdivided further by metrics such as abundance, diversity, resilience and other measures. This will help connect the evidence to different economic and non-economic values, including species abundance, existence value and benefits to future generations.
- **Evidence Outputs:** The team is maintaining a detailed report documenting methods and findings and is considering whether the material should become a formal report, a paper or both. The evidence is also informing external best-practice guidance on net gain for oil and gas decommissioning, and the team aims to align its outputs with related insight-synthesis work during the following year.

Scenario Narratives: The team has developed five narrative scenarios: Island Nation, Money Matters, Climate Mitigation and Green Growth, Wellbeing Economy and Total Transformation. They differ in political drivers, socioeconomic characteristics, energy deployment, environmental impact and approaches to decommissioning.

- **Scenario Parameters:** Emma explained that the narrative scenarios are being mapped onto previously co-designed 'Lego brick' parameters, including climate projections, timeframes, offshore-wind deployment, oil and gas decommissioning, fixed and floating wind, nature-inclusive design and compensation. Climate and timing assumptions are currently treated as relatively stable, while deployment and decommissioning choices vary by narrative.
- **Scenario Questions:** Outstanding questions include whether oil and gas activity should increase rather than decline, how to represent the current clear-seabed policy, whether scenarios should allow removal, relocation or repurposing based on decision priorities rather than fixed dates, and whether the modelling system can run more than one climate or model configuration.
- **Next Scenario Actions:** Emma and Sam will circulate the scenario matrix and open questions to relevant team members. The group plans to use time during the following workshop sessions, including Wednesday, to refine the scenarios and agree which combinations should be passed to the modellers.

Community Of Practice And Knowledge Exchange: Emma reported that the community of practice is active and expanding, with newsletters, LinkedIn activity and an online seminar series planned, while asking all work packages to contribute content and evaluation ideas.

- **Community Ownership:** The community of practice is intended to be co-designed, co-owned, co-delivered and co-facilitated by the whole project. Each work package was asked to identify material, events, papers, workshops or expertise it can contribute.
- **Engagement Metrics:** The newsletter has approximately 164 subscribers, with strong opening and click-through rates, and the LinkedIn community has just under 200 members. Emma noted that the LinkedIn channel needs more regular content to encourage discussion and interaction.
- **Newsletter Content:** The next newsletter is planned for the week after the workshop and can include project updates, relevant papers, reports, workshops and external events. Contributions should support the wider community rather than simply promote the project.
- **Online Seminar Series:** The Insights Online series begins on 5 November with discussions focused on clear-seabed policy. Further sessions are planned for January on governance, March on nature-inclusive design and May on fisheries, with exact dates and speakers still being finalised.

- **Evaluation Framework:** The team has not yet developed a monitoring and evaluation framework for assessing the community of practice's impact. Emma identified this as one of two amber items in the work-package plan and proposed a follow-up discussion with Elle and the work-package team.
- **Work-Package Dependencies:** Stakeholder mapping and READ-ME analysis feed into stakeholder engagement and work package 5; scenario work is being aligned with work package 5 narratives; governance mapping feeds into the natural-capital framework; and all work packages are expected to contribute to community-of-practice activity.

WP2: A Natural Capital and Pluralistic Values Framework

Natural Capital Framework and Analytical Lenses: Justine presented the current natural-capital framework and proposed expanding it through natural-capital, governance, relational, investor, developer and research lenses while connecting the framework to decision-support outputs.

- **Framework Development:** Justine reported that the team has drafted principles, reviewed existing frameworks, agreed the framework's overall structure and incorporated feedback from previous workshops. Further work is needed with WP 5 on narratives and with WP 6 on translating the framework's 'why', 'what' and 'who' into decision-support outputs.
- **Framework Components:** The framework follows the life cycle of marine artificial structures from planning, assessment and approval through construction, operation, monitoring and decommissioning. It links institutional drivers, policy, power dynamics, social values, relationships with nature, marine ecosystems, ecosystem services, capital inputs and outputs, values assessment, decommissioning scenarios, safety, market drivers and multiple environmental and socioeconomic impacts.
- **Natural-Capital Lens:** The natural-capital lens emphasises ecosystem condition, biodiversity, ecosystem services, climate and environmental quality, safety, biodiversity credits and incentives that may encourage leaving structures in place or removing them. Local and global nature policies and community perceptions can influence decisions and receive feedback from the framework.
- **Governance Lens:** The governance lens focuses on property owners, rights holders, developers, international actors, labour and supporting sectors, policy, liability, safety law, technology, pollutants, market policy and the management of jobs, industry and economic value. It is intended to connect the framework to the governance structures being mapped by Anne-Michelle.

- **Relational Lens:** The relational lens considers culture, history, local place relationships, identity, imaginaries and care for life. It gives greater emphasis to social and human capital, local jobs and safety, individual or pension-investment choices, and how public understanding of biodiversity may influence institutional drivers and policy.
- **Additional Lenses:** Justine proposed examining investor, developer and research-community lenses, potentially through case studies. The group agreed that viewing the framework from different perspectives can reveal missing information, clarify which data should be collected and improve the eventual decision-support tool.
- **Liability And Risk:** In response to Anne-Michelle's question, Justine acknowledged that liability and risk are not adequately represented in the current framework. The team will examine ownership of infrastructure, contractual transfer of responsibility and the possibility of government or taxpayer liability, particularly through an investor or developer case study.
- **External Sharing:** Justine agreed to share a clearer version of the framework with READ-ME and discuss how it could be communicated through the website and newsletter. The team considered a website article or report with links to feedback mechanisms; an interactive version may be developed later, but it is not expected within the immediate newsletter timeframe.
- **Framework Papers:** The work-package team is drafting a paper on a multi-principled, systems-based natural-capital framework and a policy-scoring paper examining how current policy captures the framework's principles and where gaps remain.

WP3: Multiscale Impact Modelling and Future Scenario Assessment

Modelling Architecture and Scenario Design: Gennadi Lessin, Michael Bedington and Molly James described updates to the coupled modelling system, structure parameterisation and biological realism, while the team debated the number and purpose of future scenarios.

- **Modelling Priorities:** Gennadi reported that work package 3 is currently focused on high-resolution modelling, model tuning, updating unified scenarios and providing inputs to other models. The team has also produced an accessible poster and model fact sheets to explain the modelling to non-specialist audiences.
- **Climate Scenarios:** The coupled model has been updated to a newer version with improved biochemical-process parameterisation and boundary and atmospheric forcing based on an SSP3-7.0 climate scenario. Present-day, mid-

century and end-century time slices are being considered, with each slice covering approximately ten years because the model is computationally expensive.

- **Model Debugging:** The updated baseline simulation reproduces expected seasonal nitrate patterns, including winter maxima, summer minima and higher coastal concentrations. Phosphate is currently accumulating near open boundaries and in high-resolution areas, and the team is investigating horizontal-mixing parameterisation as a likely cause.
- **Scenario Scope:** The initial plan was to run one future scenario, but the group agreed that both mid-century and end-century periods are relevant. The current practical focus is six scenarios involving different climate periods and artificial-structure configurations, while additional scenarios may be added later if the models perform reliably.
- **Scenario Comparisons:** The team discussed the need to distinguish climate effects from changes in marine artificial structures. Participants proposed adding a scenario with present-day structures under future climate conditions to provide a business-as-usual comparison. Gennadi acknowledged that the design would not be fully factorial but could still isolate useful contrasts.
- **Structure Representation:** The modelling currently uses present-day structures and a 2050 deployment dataset for future periods because reliable end-century infrastructure projections are unavailable. The group discussed larger turbines, increased or reduced oil and gas activity, decommissioning and whether future structure layouts should represent realistic deployments rather than purely experimental combinations.
- **Scenario Decision:** No final scenario matrix was adopted during this session. Gennadi will bring the options into the modelling breakout and wider workshop discussions so the team can agree which scenarios should receive priority over the next several months.
- **Biological Modelling:** Molly has added temperature-dependent pelagic larval duration, active swimming, daily vertical and tidal migration, life-stage-specific behaviour, settlement and mortality parameters to improve connectivity predictions. The team will discuss whether to parameterise the model for particular species using survey data so that outputs can be better validated.
- **MISER Update:** Sevrine reported that MISER is being transferred to the new PML high-performance computer and is being coordinated with related code and functionality updates, including benthic size classes. A fuller presentation and discussion will take place during the modelling session.

- **Modelling Deliverables:** The modelling team is considering a perspective paper describing how modelling supports the broader project, alongside a later synthesis paper based on model outputs. Gennadi also proposed a conference poster focused on how modelling supports other work packages and decision-support tools.
- **Interdependency Matrix:** For the next modelling breakout, each work package will record its information requests against each model in a shared matrix on SharePoint. Modellers and work-package representatives will then discuss what each model can provide, what constraints apply and which requests should be prioritised.

Structure Parameterisation and Data Integration: Michael explained how wind turbines, oil and gas structures and biological substrate are represented in the hydrodynamic model, while the team identified data gaps involving subsea infrastructure, decommissioning status and cross-jurisdictional analysis.

- **Modelled Effects:** The structure parameterisation represents wind-speed deficit from turbines, form drag and turbulence around structures, and the amount of biological substrate available on structures. Wave interactions and some smaller effects are not currently included, although related information may be available from other projects.
- **Wind Deficit:** A PyWake package calculates turbine interactions and reductions in wind speed, which are then applied to the ocean model. Generic turbines with different rotor sizes are used, with a 30-metre water clearance assumed because the source data does not provide that information. Atmospheric feedback is not represented because the model is ocean-only.
- **Form Drag:** Very high-resolution numerical simulations calculate drag coefficients for individual wind and oil and gas structures. These simulations are computationally expensive, so their results are reduced to average drag parameters and applied as bulk values in the larger-scale model, where individual structures are smaller than grid cells.
- **Biofouling Substrate:** Available structural surface area is estimated from structure schematics and distributed across the model's vertical layers. This provides the substrate input needed to represent biological growth without resolving every structural component at the full model scale.
- **Infrastructure Datasets:** Offshore-wind locations and characteristics are based on the latest Waldman dataset, while oil and gas structures are based on the current Martins dataset. The wind data includes location, rotor diameter, fixed or

floating status and expected start year; assumptions were needed to distinguish floating technologies and classify mixed sites.

- **Decommissioning Data:** The Martins dataset identifies some structures as decommissioned or scheduled for removal by 2050, including structures with topsides removed. The team needs to confirm whether these assumptions match the project's intended decommissioning scenarios and determine how partial removal should be represented.
- **Subsea Structures:** In response to questions, Michael said the Martins dataset includes some subsea assets and indicates whether structures have topsides, but cables and certain mobile or ship-based assets were excluded. The team will check whether wellheads and other subsea infrastructure are sufficiently represented and will coordinate with the database team as updated classifications become available.
- **Array Effects:** Wind-wake interactions are explicitly calculated across turbine arrays because wakes overlap and interact. Water-column form drag is instead aggregated within each model grid cell because the relevant physical scale is smaller; individual drag effects are summed without explicitly modelling interactions between structures.
- **Jurisdictional Analysis:** The model covers the whole North Sea, after which outputs can be subdivided according to UK, Scottish, Norwegian, Danish and other jurisdictional boundaries. This will allow the physical results to be interpreted alongside differing legal responsibilities and governance regimes.

WP4: Filling Evidence Gaps with New analysis, Observations and Field Data

Fieldwork And Environmental Monitoring: Rebecca and Astley outlined work package 4's plans for marine-growth, biodiversity, blue-carbon, contaminant and acoustic monitoring, including new passive samplers, infrastructure databases and operator collaborations.

- **Passive Sampler:** The team is developing a deployable passive-sampling device containing twelve rotating membrane samplers. Only one sampler is exposed at a time, allowing sequential measurement of different contaminants or time periods. The membranes capture freely available contaminant fractions rather than total sediment burdens, providing an estimate of what organisms could take up.
- **Sampler Capabilities:** The device is made from chemically inert materials, includes a temperature sensor, can operate to approximately 1,000 metres depth and can be fitted with anchors, acoustic monitors and other instruments.

It can be deployed from a vessel or remotely operated vehicle and reused after retrieval.

- **Marine Growth Database:** Kate Gormley and Megan Squire are compiling a database of marine growth on offshore structures, including species, percentage cover and thickness at ten-metre depth increments. The database will support future analyses and may be linked to infrastructure status, structure type and regional assumptions across the North Sea.
- **Infrastructure Mapping:** The work package plans to map structures as active, removed, left in place or derogated and attach marine-growth assumptions to each structure. This mapping should be linked with the Martins infrastructure data used by the modelling team so that field and model representations are consistent.
- **Biodiversity And Blue Carbon:** Saskia's work will assess biodiversity using sediment sieving, benthic microfauna and environmental DNA, alongside carbon sources, sinks, fluxes and retention using isotope measurements and modelling. Sediment cores may be analysed at one-centimetre intervals where available.
- **Fieldwork Access:** The ideal field programme would include transects around oil and gas platforms and wind parks, but vessel access, operator schedules and funding remain constraints. The HKZ wind park has agreed to host a March or April campaign alongside an existing seaweed-farming team, allowing the project to collect complementary samples without bearing the full vessel cost.
- **Operator Engagement:** Operators have shown interest in environmental DNA sampling because it requires little additional vessel time. As a result, the team may collect water samples at many sites while concentrating the full biodiversity and blue-carbon programme at sites where comprehensive access and operator support are available.
- **Contaminant Targets:** The initial passive-sampler programme is focused on mercury and polycyclic aromatic hydrocarbons, with sulfide under consideration as an indicator of bacterial activity relevant to mercury behaviour. The available sampler positions can be reassigned to other contaminants if site-specific priorities emerge.
- **Sediment And Microplastics:** The team may receive sediment grabs from 53 sites associated with a North Sea operator and has been asked to investigate microplastics. This work would complement the contaminant-flux measurements, although sediment grabs are less suitable than cores for the detailed blue-carbon analyses.

- **Laboratory Collaboration:** Metals can be measured using commercially available samplers, while digital diffusive-gradient samplers and some organic-contaminant analyses require substantial laboratory work. The team is relying on expertise from AIMS and ANSTO to construct and process the relevant devices.
- **Acoustic Monitoring:** No acoustic deployments have yet occurred. The acoustic equipment will be co-located with contaminant samplers once deployment sites and schedules are confirmed.

Offshore Monitoring And Site Access: Astley and Rebecca reported progress on offshore monitoring, including lifecycle assessment, contaminant and microplastics sampling, and negotiations with operators for access to North Sea oil and gas and offshore wind sites.

- **Offshore Lifecycle Assessment:** John Reed completed an offshore wind lifecycle assessment before moving to a new post. The work adapted an existing land-wind program to include construction, land use, operation, and decommissioning impacts. Steel tonnage was estimated against water depth using published and grey-literature datasets; monopile structures were substantially heavier than jacket structures, with structures extending to approximately 65 metres of water depth. The assessment translated structural steel impacts into carbon intensity per kilowatt-hour over a 30-year operating life, with jacket impacts reaching roughly 50 kilograms of CO2 per kilowatt-hour in some cases and monopile impacts being approximately twice as high.
- **Operator Access:** Two sites were described as nearly confirmed, with two or three additional sites under discussion. Formal operator approval and non-disclosure agreements are still required before access can be treated as confirmed. The team is seeking opportunities to join existing operator vessel campaigns, limiting project expenditure on vessel hire while using project funds for staff, materials, and a separate campaign where necessary.
- **Sampling Activities:** The planned work may combine eDNA, contaminant quantification, blue carbon, biodiversity, and microplastics sampling. Microplastics may originate from turbine blades, pipeline coatings, and other infrastructure; the team intends to compare concentrations near and farther from infrastructure. Where operators collect multiple sediment grabs, the project hopes to obtain one grab for complementary analyses while the operator retains the remaining samples.
- **Oil And Gas Sites:** CNOOC has provided access to reports and databases and is being engaged regarding the Golden Eagle and Scott platforms. Golden Eagle is a newer platform without a cuttings pile and may serve as a relatively undisturbed control site, while Scott has operated since 1993 and is expected to contain

legacy contaminants. A Q2 2027 campaign at Scott is considered the strongest current access opportunity, subject to final approval. CNRI's Central and South Ninian sites remain under consideration, including potential participation in campaigns associated with decommissioning, while access to the Thistle platform in 2028 remains uncertain because operator engagement has become intermittent.

- **Offshore Wind Access:** Three workshops involving offshore wind operators, the Crown Estate, Marine Energy Wales, and other stakeholders generated proposed actions, but the team has not yet secured access to offshore wind sites. The Moray Firth is a priority because EcoChange has existing data there and it could support Work Package 3 ecosystem modelling. The team will seek advice on alternative routes to obtain access during the following day's discussion.

WP5: Assessing Shared and Social Values to Enable a Just Transition Across and Within Sectors

Work Package 5 Integration: Tiziana and Sam outlined Work Package 5 as the bridge between biophysical evidence and societal and governance decisions, covering shared visions, economic and socio-cultural values, just-transition trade-offs, and policy implications.

- **Work Package Structure:** Tiziana explained that Task 5.1 develops shared visions for the future North Sea; Tasks 5.2 and 5.3 assess economic values and social-cultural values; Task 5.4 examines shared values and societal trade-offs through a citizen panel; and Task 5.5 translates findings into governance and policy implications. The work will use natural-capital, relational-value, governance, and justice lenses, aligned with the needs of other work packages.
- **Visioning Workshop:** Sam described the 25th November workshop, titled "What Is the North Sea For Anyway?", which will ask stakeholders to define desirable 2050 outcomes, identify current practices to retain or reduce, and discuss the innovations, governance arrangements, and policies needed to reach a sustainable or nature-positive future. The Three Horizons method will structure discussion around the present situation, emerging positive developments, and pathways toward the desired future. Stakeholder recruitment is being informed by Work Package 1 mapping; further contacts from offshore wind, unions, shipping, and ports are requested. A student will conduct pre-workshop questionnaires and post-workshop interviews, and a later online seminar may allow stakeholders unable to attend to respond to findings.
- **Economic Valuation:** Task 5.2 is assessing available biophysical and monetary evidence for biodiversity, fisheries, and carbon under the project scenarios. Carbon can be valued using established carbon prices, while fisheries can be

assessed through market prices, changes in catches and productivity, and associated local and national economic activity. Biodiversity valuation is more difficult because the non-market valuation literature is less mature. The task depends on ecological and modelling outputs from Work Packages 3 and 4, scenarios from Work Package 1, and alignment with the framework from Work Package 2. Final outputs are expected between May and July 2028, with provisional outputs earlier.

- **Socio-Cultural Values:** Task 5.3 will use stakeholder mapping, questionnaires, and interviews to examine instrumental, intrinsic, and relational values associated with scenario changes. It will identify potential winners and losers, justice concerns, and stakeholder views on acceptable or legitimate compensation. Outputs are intended to inform Work Package 2's pluralistic values framework, the citizen panel, and Work Package 6 decision-support tools.
- **Citizen Panel and Governance:** Task 5.4 is expected to convene approximately 50 citizens to consider scenario trade-offs, distribution of benefits and costs, compensation, and fair decision-making. Task 5.5 will integrate these findings with governance mapping to identify justice issues, policy entry points, institutional barriers, and requirements for decision support. Work Package 5 is seeking input from Work Package 6 on what evidence the citizen panel should generate for tool development.

Climate Change And Scenario Design: Mike raised the need to treat climate change as a changing baseline in Work Package 5's stakeholder and scenario work, and Sam agreed to incorporate explicit climate-change discussion into the visioning workshop.

- **Workshop Integration:** Mike asked how climate change would be represented when stakeholders consider North Sea transitions, given that climate-driven changes may challenge industries regardless of energy-system choices. Sam acknowledged that the workshop plan had assumed participants would consider climate change when discussing a 2050 future, but agreed that this should not be left implicit and would add explicit questions or discussion prompts on climate change and changing baselines.
- **Valuation Resources:** Steve offered to send Tiziana outputs from the EcoWind project, which used the project database to produce UK-wide fisheries and carbon maps valued in relation to marine artificial structures. The material does not yet cover biodiversity but may provide a starting point for Task 5.2 and potentially for later models and decision-support tools.

WP6: Decision Support Tool Development

Decision Support Tool Development: The Work Package 6 team presented progress on ORIES, A-SPACE, strategy simulations, the digital twin, and federated data architecture, emphasizing dependencies on modelling, scenario, socio-economic, and stakeholder inputs.

- **ORIES Updates:** The ORIES tool has been expanded to include floating wind, fixed offshore wind, and oil and gas alongside existing information. The team is incorporating feedback from the second workshop, with adding oil and gas to the spatial component identified as a major planned change. ORIES can potentially incorporate Work Package 5 economic and socio-cultural evidence and selected field data in the second project year.
- **Marine Net Gain Tool:** The proposed marine net gain tool has not yet been developed. The team expects it may be a targeted, potentially Excel-based tool for specific end users such as Defra or the Crown Estate rather than an open public-facing application. It was agreed to explore collaboration with EcoChange, which has related funding and may already have a partially developed tool, to avoid duplicating work. The group also noted that the tool's name may need to change if "Marine Net Gain" does not accurately describe its eventual scope.
- **A-Space Integration:** A-Space is largely dependent on Work Package 3 modelling data. Liz explained that its current social-values functionality is relatively blunt, and Work Package 5 data could enable more meaningful ranking and design of spatial management scenarios based on stakeholder priorities. A preliminary idea is to use M-Space during citizen panels so participants can review scenarios, provide feedback, and potentially help generate revised scenarios. The team needs to agree what modelling outputs will be delivered and when, as well as which Work Package 5 datasets can realistically be integrated.
- **StrathE2E Simulations:** The StrathE2E application currently runs simulations on demand, but the team is considering pre-running a large set of management scenarios so workshop participants can interactively compare options and trade-offs. This would require Work Package 5 to specify which outputs and preference dimensions matter, after which the team could generate and store a simulation library and add a screening interface. The approach is technically feasible but requires advance decisions because producing the simulation set takes time; preliminary interface testing can begin before the final models are available.
- **Digital Twin And Data Architecture:** Tom described the next phase of the digital-twin task as defining requirements through an interactive session. The

intended methodology links data collection, decisions, real-world interventions, monitoring, and subsequent adjustment. Because digital twins span data collection, management, modelling, and decision support, the team will first identify a focused application to demonstrate. The federated data architecture work will document practical case studies, potentially beginning with ORIS, to show how datasets can be exchanged, versioned, described, and reused across projects. The data management plan has been updated to version 3.0, including ethics and GDPR changes.

- **Stakeholder Engagement:** Work Package 6 plans regular stakeholder touchpoints to keep the tools relevant and aligned with user requirements and external data standards. A further engagement point is expected early in the following year, with development continuing toward a later workshop where the decision-support tools will be demonstrated.

1645-1725: Governance Overview and Progress

Law Policy and Governance Mapping: Anne-Michelle presented a framework connecting laws, policies, governance processes, natural-capital principles, and implementation, prompting discussion about how legal structures, policy choices, stakeholder influence, and judicial review shape marine decisions.

- **Law Versus Policy:** In response to Mike's question, Anne Michelle explained that law and policy are distinct but interconnected. Law provides the formal structure, often moving from international conventions to national and devolved legislation, while policy guides how decisions are made and generally changes more quickly than law. Both contribute to governance and must be considered together at each stage of a decision.
- **Planning And Consenting:** Marine spatial planning and marine licensing are supported by international, European, UK, and devolved legislation and operate through bodies such as the Crown Estate, Crown Estate Scotland, and the Marine Directorate. Policies such as the Marine National Plan and regional marine plans guide how those legal powers are applied, with the relevant policy mix varying according to location and the specific licence or decision.
- **Influence And Judicial Review:** The discussion identified soft power, public opinion, NGOs, industry influence, and major events as factors that can shape policy and law beyond formal economic weight. Anne Michelle explained that legal challenges generally proceed through judicial review, which tests whether a decision was lawful and whether relevant policies, discretion, and regulations were properly considered. Judicial decisions can have wider effects, as illustrated by changes to environmental-impact-assessment treatment following earlier cases.

- **Implementation Feedback:** The framework is intended to cover more than policy design: implementation, consent conditions, monitoring, reporting, decommissioning plans, and practical construction decisions also matter. Acts of Parliament provide primary law, while regulations and other secondary legislation can change more readily. The group noted that implementation produces feedback into future policy and regulatory changes.
- **Framework Refinement:** Participants asked for more underlying detail explaining the diagram's lozenges, arrows, and categories. Anne Michelle clarified that the categories arose from governance discussions and the natural-capital framework rather than a purely systematic extraction process. They agreed that sharing the underlying spreadsheet of laws and policies would make the framework more usable, and that further focused meetings with work packages may be arranged to apply the approach to their respective outputs.

Day 1 Actions

- **Workshop Scheduling:** Update the project schedule to move Workshop 7 to Quarter 13 in Aberdeen. (Tom)
- **Scenario Development:** Circulate the scenario questions and the draft matrix linking narrative scenarios to management-scenario components so the relevant teams can review them before the follow-up discussion. (Sam)
- **Stakeholder Database:** Decide how the stakeholder database will be used, including whether to connect stakeholders to case studies, justice-transition processes, and forthcoming interviews rather than conducting an unused standalone mapping exercise. (Emma, Michelle, Sam, Justine)
- **Community Of Practice Evaluation:** Arrange a follow-up discussion to define a monitoring and evaluation framework for assessing the Community of Practice and its impact. (Emma, El)
- **Community Newsletter:** Send relevant papers, reports, events, workshop invitations, and other aligned content to El for inclusion in the next Community of Practice newsletter. (All)
- **Decision Framework:** Incorporate liability and risk— including potential developer, owner, government, and taxpayer liability—into the natural-capital decision framework. (Justine, Michelle)
- **Framework Communication:** Prepare a shareable version and accompanying narrative for the natural-capital framework, coordinate with El on the best website/newsletter format, and decide whether it is ready for the next newsletter or should be shared later. (Justine, El)

- **Framework Collaboration:** Share the natural-capital framework with Dale and coordinate with the Read Me project on integrating relevant outputs. (Justine)
- **Modelling Scenarios:** Agree which additional modelling scenarios should be prioritised, including whether to add a present-day-structures future baseline and how to represent oil-and-gas changes, decommissioning, and clear-seabed assumptions. (Gennadi, the modelling team, the wider project team)
- **Infrastructure Data:** Verify whether subsea structures and wellheads are represented in the infrastructure datasets, and coordinate updated classifications and decommissioning information with Kate and Rebecca's database work. (Michael, Kate, Rebecca)
- **Modelling Requirements:** Complete the cross-work-package matrix of requested modelling outputs and use it to agree what each model can deliver and under what constraints. (Gennadi, wider project team)
- **Offshore Site Access:** Obtain formal operator sign-off for the proposed monitoring sites and complete the required NDAs before confirming vessel access. (Astley, Rebecca)
- **Blue Carbon Campaign:** Select a separate PML vessel location that complements the contaminant and HKZ campaigns while maximizing eDNA and blue-carbon coverage within the available budget. (Astley, Rebecca, Saskia)
- **Corrode Coordination:** Continue coordinating with the Corrode project to align contaminant, erosion, corrosion, and organism-impact work and avoid duplicated sampling or analysis. (Astley, Rebecca)
- **Offshore Wind Access:** Develop an approach for securing access to offshore wind sites, with particular focus on the Moray Firth, and bring proposed solutions to the next discussion. (The team)
- **Visioning Workshop Recruitment:** Provide Sam with contacts from offshore wind, shipping, ports, and trade unions to broaden representation at the North Sea visioning workshop. (The team)
- **Visioning Workshop Design:** Revise the 25 November workshop plan to include explicit discussion of how climate change affects the 2050 North Sea vision and transition pathways. (Sam)
- **Economic Valuation Evidence:** Send Tiziana the Eco Wind fisheries and carbon valuation maps and database links for potential use in Work Package 5.2. (Steve)
- **Scenario Coordination:** Clarify the modelling outputs, common scenarios, and potential case studies that Work Package 5 can use for its economic and social-value assessments. (Tiziana, Work Package 3 team)

- **Citizen Panel Requirements:** Define what information and outputs the citizen panel should provide to the other work packages, particularly Work Package 6. (Tiziana, Work Package 6 team)
- **Decision Support Tools:** Provide Work Package 6 with the scenarios, model outputs, and socioeconomic evidence needed to parameterize the decision-support tools. (Work Packages 1, 3, 4, 5)
- **Marine Net Gain Tool:** Coordinate with Eco Change and other relevant projects to determine whether the proposed marine net gain tool can be jointly developed for shared end users and agree its scope and naming. (Stephen, Eco Change team)

Day 2

0900-1000: Digital Twin Discussion

Digital Twin Scope And Architecture: Tom introduced the digital twin exploration work, explaining the distinction between digital models, digital shadows, and digital twins, while the ValMAS team identified data integration, decision support, and feedback loops as likely priorities.

- **Digital Twin Definitions:** The group distinguished a digital model, where people manually assimilate data into a model, from a digital shadow, where data collection and model execution are automated. A digital twin adds a traceable feedback loop from model outputs back to the physical world, either through automated systems or human decisions; the loop may operate over minutes, days, years, or decades.
- **Example Feedback Loop:** Tom described an ocean-modelling example in which an AI system identified areas of greatest uncertainty, generated missions for an autonomous platform to collect additional observations, and fed those observations back into the model. Repeating the cycle reduced uncertainty and improved model accuracy.
- **Three-Layer Architecture:** The proposed architecture consists of a data-lake layer containing discoverable, machine-readable and standards-aligned data; a digital-twin engine connected to computing infrastructure for running models; and a user-interface layer such as a map or portal through which users can select scenarios and view results. The layers are intended to exchange data and model outputs.
- **ValMAS Alignment:** The team linked the architecture to existing ValMAS activities: improving the quality and timeliness of data collection aligns with the data-lake layer, while decision-support tools align with the user-interface layer. The exploration may package existing work into a demonstrable ValMAS digital twin and help ensure that modelling outputs drive real-world decisions and subsequent monitoring.
- **Future Co-Design:** The planned process is to gather stakeholder feedback, narrow the broad digital-twin scope to a valuable focus area, implement and test a selected capability, and use the results to inform future UK and European digital-twin infrastructure. Jack noted that existing platforms and tools have often been released without sufficient user-led requirements gathering.

Fantasy Digital Twin Priorities: Participants evaluated digital-twin capabilities within a 100-credit exercise and repeatedly prioritised partner-data integration, scenario testing,

uncertainty and explainability, interactive or stakeholder-specific interfaces, and impact monitoring.

- **Data Integration Priorities:** Groups commonly selected automated data-ingestion pipelines, integration of all partner datasets, fair metadata standards, and data-quality or validation checks. Participants differed on whether metadata standards should be part of the digital twin or should already be addressed by teams at the point of data collection.
- **Modelling Capabilities:** Scenario testing was the most consistently selected engine capability, including testing alternatives such as more or fewer artificial structures and assessing effects on users such as fishermen. Some groups treated forecasting, prediction, machine-learning models, and data fusion as components or extensions of scenario testing rather than separate priorities.
- **Uncertainty And Explainability:** Participants argued that quantifying uncertainty is essential because policymakers may not use model outputs if uncertainty cannot be understood. Explainable outputs were also treated as a core feature that could support transparency and encompass related interface functions.
- **User Interfaces:** Groups selected interactive dashboards, stakeholder-specific views, geospatial visualisation, and collaborative workspaces. The discussion distinguished an interactive interface that lets users change assumptions or scenarios from a visualisation that primarily displays selected data, while noting that several functions overlap.
- **Impact Feedback:** Impact monitoring and feedback loops were selected as important because they close the connection between the digital system and real-world decision making. Stakeholder engagement was also proposed to gather feedback, improve the tool, support adoption, and ensure that the system remains useful to its intended users.
- **Group Configurations:** One group selected automated ingestion, validation checks, scenario testing with machine learning, interactive dashboards, and stakeholder engagement. Other groups selected combinations including fair metadata, partner-data integration, forecasting, stakeholder-specific views, explainable outputs, decision-support recommendations, independent validation, and impact monitoring; one group intentionally overspent by five credits to retain both scenario testing and forecasting.

1000-1100: Evidence Synthesis & SWOT Analysis

- **Evidence Synthesis Paper:** Steve and Andy gathered feedback for a collaborative, inclusive multi-author paper on decommissioning evidence across

carbon, fisheries, and biodiversity, with the team invited to refine SWOT findings, identify key and cross-cutting messages, and contribute ideas to the paper structure and its central theme.**Paper Objectives:** The paper will identify the most important SWOT findings, patterns across carbon, fisheries, and biodiversity evidence, the meaning of trade-offs between ecosystem services, and a central argument. All ValMAS team members are expected to be eligible for co-authorship, with contributors asked to provide names, affiliations, and ORCID details.

- **Carbon Evidence:** The carbon evidence indicates that structures can alter carbon cycling and biogeochemical processes, create habitat, and affect local fluxes and accumulation across multiple parts of the carbon life cycle. Participants identified weaknesses in evidence for persistent or long-term storage, limited understanding of sequestration processes, and difficulty quantifying persistence, disturbance, spatial scale, and decommissioning effects; the paper should distinguish benthic from pelagic pathways and clarify where carbon accumulates.
- **Carbon Opportunities and Threats:** Potential opportunities include standardised carbon accounting aligned with public accounting requirements, monitoring stocks, burial, fluxes, disturbance, and persistence through construction, operation, and decommissioning, and linking carbon cycling evidence to ecosystem-service valuation. Participants cautioned against premature carbon-credit claims and noted that removing platform material may send carbon-containing material to land disposal rather than returning it to the marine system.
- **Fisheries Evidence:** The fisheries discussion highlighted displacement, catches, socioeconomic effects, access restrictions, and the weak evidence linking biological responses to catch productivity and human benefits. The group noted that shallow areas targeted for offshore wind overlap with heavily trawled areas, meaning structures may displace fishing activity and affect fishing communities; the paper should address cultural, economic, policy, and regional implications rather than treating fisheries only as a biological response.
- **Fisheries Governance:** Participants identified the separation between fisheries management and environmental management as a governance weakness. Fishing organisations are important consultees in decommissioning environmental assessments, and the paper should incorporate their influence, the policy context, cumulative impacts, spatial scale, and the need to distinguish research gaps from actual threats to fisheries.

- **Biodiversity Evidence:** The biodiversity discussion focused on distinguishing ecological change from biodiversity benefit or loss when hard structures are introduced into previously different habitats. Suggested priorities included assessing nature-inclusive design, clarifying whether attraction represents habitat creation or temporary use, defining appropriate baselines, and recognising that the answer may differ across taxa and habitat types.
- **Baseline And Cumulative Effects:** The team discussed whether biodiversity baselines should reflect current conditions, pre-development conditions, historical reference states, or requirements under different legal regimes. Participants also stressed that environmental impact assessments may examine individual platforms separately even though multiple developments can create cumulative effects, so the paper should address cumulative impacts and spatial scale.
- **Paper Development:** Steve and Andy will revise the SWOT statements, incorporate detailed supporting statements, potentially analyse how services change specifically during decommissioning using the ORIES database, and include evidence-quality criteria such as study design, transferability, and confidence. Participants were invited to suggest figures, narrative diagrams, journal targets, and further comments; a substantial draft was expected by around mid-next year, with additional review points.

1130-1230: Just Transitions

Just Transition Framework: Sam and Anne-Michelle explained just transition as a justice-based framework for VALMAS, covering distribution, procedure, recognition, climate responsibility, energy-system impacts, governance, and multi-species considerations.

- **Justice Dimensions:** The framework uses distributive justice to examine who benefits or is harmed, procedural justice to examine participation, transparency and influence in decision making, and recognition justice to examine whose values, knowledge, vulnerabilities and existing marginalisation are acknowledged.
- **Climate Justice:** Climate justice addresses historical responsibility for emissions, unequal exposure to climate harms, and the need for common but differentiated responsibilities. The discussion connected this to the possibility that the UK should pursue net-negative emissions after net zero and warned that delays or renewable-energy supply chains can reproduce exploitative relationships.

- **Energy-System Lens:** Energy justice applies justice questions across the full energy lifecycle, including raw-material extraction, manufacturing, site selection, design, construction, transmission, consumption, pricing, energy poverty, and decommissioning. For VALMAS, this could include material supply chains, labour conditions, nature-inclusive design, community impacts, and the distribution of transition benefits and losses.
- **Multi-Species Justice:** The proposed framework extends beyond human stakeholders to consider other species, ecosystems, future generations, gender relations, and Indigenous peoples where relevant. The discussion questioned whether marine space is being treated primarily as a resource and whether projects restore ecosystems or replace newer ecosystems that have developed since an earlier baseline.
- **Practical Transition Principles:** The practical framework includes discouraging continued carbon-intensive development, avoiding new carbon lock-in and additional losers, supporting affected regions and workers, ensuring that cleanup costs do not shift from private actors to the public, addressing existing inequality, and maintaining inclusive and transparent processes. Participants noted that the framework could be strengthened by adding more explicit nature-positive and multi-species considerations.
- **VALMAS Integration:** The just-transition framework was linked to VALMAS stakeholder analysis, legal and policy work, narratives, the natural-capital and values frameworks, knowledge-production processes, nature-inclusive design, and the accessibility and usefulness of project tools. The team identified perceived fairness and equity as likely issues for later social and values research, while noting that this remains to be tested.

Just Transition Governance: Anne Michelle outlined the existing UK and Scottish legal framework and possible future governance arrangements, emphasising fragmented institutions, judicial review, public participation, accountability, and the challenge of maintaining legitimacy across complex energy decisions.

- **Current Legal Structure:** The current system translates international commitments into regional and domestic legislation, regulations, licensing processes, and ministerial decisions. It includes parliamentary lawmaking, detailed secondary legislation, institutional expertise, public-interest litigation, and judicial review, with the Finch case discussed as an example relevant to environmental-impact assessment and offshore developments.
- **System Limitations:** The governance system is fragmented, politically uncertain, and influenced by broader geopolitics. Stakeholder engagement can be difficult for NGOs, affected individuals, and interest groups, and the UK lacks

a constitutional right to a healthy environment or energy security, creating a different starting point from countries with such rights.

- **Emerging Governance:** The discussion suggested a possible movement away from a single ministerial chain of command toward networks of legally defined institutions, including bodies such as GB Energy, with stronger statutory and environmental accountability, regulatory independence, devolution, public participation, and energy-security obligations.
- **Democratic Legitimacy:** Future governance must coordinate multiple actors and specialised institutions while maintaining both local and parliamentary accountability. The team was asked to consider how participation and legitimacy can be preserved as the North Sea energy system becomes more complex, decentralised, and decarbonised.

Justice Case Study Findings: Case-study groups applied the just-transition framework to an Aberdeen-area energy transition zone, Dutch North Sea nature-inclusive design, and a North and South Moray Firth wind-development example, identifying procedural, distributive, recognition, environmental, and multi-species concerns.

- **Aberdeen Energy Zone:** The Aberdeen case involved a proposed industrial or energy-transition zone affecting a community park in Torry, adjacent to a coastal path, harbour, football pitches and limited accessible green space. Participants identified impacts on residents, tourists, local businesses, older people, families with buggies, views, recreation, wellbeing, property values and seascape identity.
- **Power And Procedure:** Participants described the case as involving limited access to information, weak consultation, and a plan change that could subsequently be used to justify the development through the environmental-assessment process. They also identified discursive power, where residents opposing the development might be labelled as obstructive or anti-economic-development, reducing the legitimacy given to their views.
- **Benefits And Compensation:** The group identified a potential mismatch in which local residents bear concentrated losses while energy benefits accrue broadly or to a narrow set of developers and investors. Suggested remedies included compensation, community funds, mitigation, replacement green space and other benefits, but participants cautioned that compensation can fail if replacement spaces are farther away or less accessible to the people who lost the original space.
- **Nature-Inclusive Design:** The Dutch North Sea case concerned an experimental artificial reef. Participants questioned whether the mitigation hierarchy had been

followed or whether the project moved directly to a technically impressive intervention, whether its additional materials and carbon impacts were justified, who would pay, and whether the intervention could make renewable energy more expensive.

- **Ecological Trade-Offs:** The artificial-reef discussion raised multi-species justice questions about whether restoring a historical ecosystem might damage the ecosystem that developed more recently. Participants also called for appropriate consultation, better evidence, and comparison with alternative measures before treating the intervention as beneficial.
- **Actionable Governance:** The case-study feedback suggested that projects may be difficult to stop once established within existing planning and economic systems, so practical influence may come from requiring compensation and mitigation strategies to be designed, approved, and agreed before development proceeds. The groups also recommended assessing alternatives and considering wider land use, accessibility and cumulative community effects from the outset.

1330-1500: Modelling Breakout Session and WP Meetings

MISER Model Capabilities And Analysis Priorities: Sevrine introduced MISER as a size-based higher-trophic-level model driven by FVCOM-ERSEM outputs, and Jack and other participants discussed how to prioritize its analyses and integrate them with fisheries, ecosystem, and stakeholder work.

- **Model Structure:** Sevrine explained that MISER uses primary production, phytoplankton, zooplankton, temperature, and water-column information to estimate energy distribution across organism size classes. The model uses the FVCOM-ERSEM grid and domain, produces biomass in grams of wet mass per square kilometre, and can provide total biomass or separate size-class outputs.
- **Available Outputs:** MISER can produce monthly maps, graphs, and statistics for selected areas, time periods, scenarios, and size classes. Analyses can include total biomass, changes in individual size classes, size-spectrum intercept and slope, spatial patterns, seasonal variation, and decadal change.
- **Fishing Pressure:** In response to Astley's question, Sevrine confirmed that MISER includes fishing pressure and can use partially variable historical fishing information developed by Helen and Rebecca. For infrastructure scenarios, the team may need to remove or modify fishing pressure around structures, apply a low baseline pressure, or use a spatial multiplier based on structure presence. A simple multiplier would not represent redistribution of displaced fishing effort, so Mike and Sevrine agreed to discuss this further.

- **Species Interpretation:** Sevrine clarified that MISER classifies organisms by size rather than species, so it can identify changes in groups such as small or large fish but cannot determine the proportions of sardines, anchovies, mackerel, or other species within a size class. Species-specific interpretation could be supported by linking MISER outputs to a coarser species-based Necton model or to other ecosystem models such as EcoPath with EcoSim, with appropriate limitations stated.
- **Analysis Prioritization:** Sevrine asked the wider team to identify the MISER outputs most useful for ValmaS, because the model generates very large datasets. Participants were invited to request specific maps, graphs, size-class comparisons, locations, and time periods so Sevrine can tailor the analysis to WP needs rather than explore all possible outputs independently.

Model Integration And Scenario Design: Jack, Molly, Sevrine, Tiziana, Oceane, and other participants mapped how the models exchange information, what spatial and temporal resolutions they support, and how climate, fishing, infrastructure, and stakeholder scenarios can be combined.

- **Model Coupling:** Molly explained that FVCOM is a high-resolution unstructured-grid hydrodynamic model, with finer triangular resolution around coastlines and structures, while ERSEM is the coupled biogeochemical model. FVCOM and ERSEM exchange information in a two-way online coupling; most other models use their outputs as forcing without feeding information back. Sevrine confirmed that MISER reads FVCOM-ERSEM forcing rather than being coupled to it.
- **Spatial Alignment:** MISER, PyLag, and related models using the FVCOM grid can be overlaid spatially. StratE2E uses larger boxes, while EcoPath with EcoSim focuses on a particular site, so their outputs can be combined but will have different spatial detail. Participants confirmed that MISER can zoom into case-study areas and produce outputs for specified locations or polygons.
- **Species And Invasive Species:** EcoPath with EcoSim can represent many food-web species, while MISER provides size-based rather than species-level information. Molly explained that PyLag can be made species-specific when sufficient biological parameters are available, including for invasive species, and can simulate dispersal and spread through the modelled domain.
- **Scenario Runs:** Oceane asked whether the models would be run for scenarios such as Island Nation, Money Matters, and Green Growth. Molly confirmed that this is the plan for PyLag. Sevrine said MISER can map onto climate scenarios and vary inputs such as fishing pressure, but its available scenarios depend on FVCOM-ERSEM climate runs and the parameters supplied by the model team.

- **Stakeholder Outputs:** Sevrine said MISER can provide stakeholder-facing maps, pie charts showing size-class proportions, time series for selected locations, and comparisons across present-day, 2050, and 2100. These outputs can be averaged over areas such as 10 or 100 square kilometres or tailored to the grid. PyLag can provide more targeted outputs, such as connectivity from selected structures or areas and changes in larval supply under different scenarios.
- **Infrastructure Representation:** Molly explained that FVCOM represents structures as physical features affecting hydrodynamics, while ERSEM accounts for associated biogeochemical effects. These structure effects are inherited by models using the same grid. Sevrine said MISER should therefore capture changes in higher-trophic-level distributions and size classes associated with the presence of structures, while PyLag can release particles from structure locations or other specified areas.
- **Scenario Priorities:** Jack noted that the project needs to agree which climate scenarios and time slices to prioritize. The current planning includes one climate scenario with present, mid-term, and longer-term periods, while some scenarios may receive lower priority. Present-day deployment scenarios represent existing infrastructure, and a future no-deployment scenario could also serve as a full decommissioning scenario. Further work is needed to define realistic future fishing pressure, marine protected areas, biodiversity measures, and partial rather than complete decommissioning.

Work Package Data Requirements: Gennadi asked each work package to document the model outputs they need so the modelling team can align spatial resolution, temporal resolution, variables, and delivery formats with project analyses and decision-support tools.

- **Requirements Table:** Participants were instructed to use the VALMAS SharePoint presentation and complete the shared model-requirements table. They should state what they expect from each model, including required variables, spatial resolution, temporal resolution, time steps such as monthly or yearly, and their name or work package so modelers can follow up.
- **Model Constraints:** Gennadi explained that model outputs have temporal and spatial constraints. Examples include high-resolution North Sea coverage from FVCOM, box-based coverage from StratE2E, and site-specific outputs from EcoPath with EcoSim. Participants should request outputs within these capabilities and identify where different model scales may affect downstream analysis.
- **Data And Metadata:** Work Package 6 discussed placing model data and metadata products into Tom's FAIR data architecture. This would support

decision-support tools, relevant-data discovery, and version control. Potential products include present and future condition maps, MISER higher-trophic-level biomass and size-distribution maps, StratE2E outputs, and additional metadata or formal GIS layers.

- **Follow-Up Coordination:** Gennadi asked work packages to self-organize, appoint representatives, and use the breakout period to discuss requirements with modelers. Representatives would report back to the wider group, and participants were asked to email any additional notes that were not captured in the shared table.

1530-1600: Case Studies

Case Study Selection And Coordination: Sam and Emma discussed developing a manageable set of shared case studies that combine modelling, fieldwork, governance, stakeholder analysis, and contrasting legislative contexts.

- **Case Study Purpose:** Sam explained that case studies can add local depth and context to North Sea-wide analyses, including place-specific histories, stakeholder perspectives, species and physical features, governance structures, and grounded examples of theoretical concepts such as value frameworks.
- **Scottish Case Study:** Participants identified the Moray Firth area as a strong candidate because it includes offshore wind, oil and gas infrastructure requiring decommissioning, marine mammal research, fisheries, existing fieldwork, and multiple interacting uses. Its concentration of wind farms and available research could support common work across modelling, governance, and fieldwork.
- **English Comparison:** The group considered adding an English case study to contrast with Scotland's legislative and management context. Potential areas included the Humber, East Anglia, Norfolk, and the southern North Sea. The Humber may offer synergies with the TransX project, but the team must avoid overburdening stakeholders already involved in multiple projects.
- **Cross-Work-Package Alignment:** Oceane suggested contrasting English and Scottish locations to examine differences in how stakeholders value places and understand justice. Claire noted that fishermen and other industries are managed under different rules in Scotland and England. Jasper suggested using one broad coastal area for multiple policy case studies, such as oil and gas and offshore wind, to reduce travel and engagement demands.
- **Coordination Actions:** The team will continue discussions with Karen and related projects to identify collaboration opportunities, particularly around energy transition and governance analysis. Case-study choices should consider

existing evidence, fieldwork and modelling coverage, stakeholder capacity, and whether a location fills a research gap rather than duplicating existing work.

1600-1715: Fieldwork Prioritisation Discussion

Industry Engagement And Offshore Wind Access: Astley, Rebecca and the team reviewed data and vessel support from oil and gas stakeholders, continuing difficulty obtaining offshore-wind access, and possible incentives and contacts for improving industry collaboration.

- **Oil And Gas Support:** Rebacca and Astley reported that CNOOC and CNR have offered boat access, historical biomass and infrastructure data, acoustic data, and other measurements, with activity expected to begin in the first quarter of the following year. The project still needs project-specific confidentiality and NDA arrangements, although existing agreements may provide a starting point.
- **Offshore Wind Barriers:** The team has received interest from RWE, Orsted, Marine Energy Wales, The Crown Estate contacts, and others during workshops, but follow-up on site access, ROV footage, and operational constraints has largely stalled. Operators indicated that vessel access may require a project-hired vessel and inspection, while access to operator-held footage and data remains restricted.
- **Decommissioning Evidence:** Participants discussed linking OSPAR clean-seabed requirements and decommissioning evidence to offshore wind rather than relying only on oil and gas analogues. Jack emphasized that offshore-wind operators want evidence specific to their industry, so access could support research on marine growth, fisheries impacts, natural capital, and whether structures should be retained or removed.
- **Engagement Strategy:** The team will consider using existing personal and institutional contacts, including industry committees and Marine Energy Wales, to reconnect with operators. Potential approaches include presenting the project's relevance to offshore-wind questions, offering anonymized comparative evidence, and demonstrating how collaboration could help operators address their own evidence gaps.
- **Alternative Fieldwork:** If direct offshore-wind access cannot be obtained, the team may use oil and gas sites, Dutch North Sea wind sites, Welsh wind sites, laboratory experiments, or existing sediment and organism material as alternatives. The Moray Firth was highlighted as a potentially valuable mixed-use experimental setting, although limited vessel time requires prioritization.
- **Floating Wind Opportunity:** Paul described stored NIRAS equipment designed to test organism settlement on concrete, chain, steel, coatings, and plastic

surfaces. Discussions with Offshore Renewable Energy Catapult and floating-wind representatives may create an opportunity for a PhD or industry-supported deployment, although this remains exploratory.

Field Sampling And Model Data Needs: The team identified potential temperature, nutrient, sediment, biological, and grab-sample data that could support model validation and analysis, while noting that access and vessel capacity remain limiting factors.

- **Requested Measurements:** Rebecca and Astley asked modelers whether additional field data were needed, including temperature, salinity, nutrients, sediment, and water-column samples. Temperature can be measured at instrument deployments, while nutrient and sediment requirements depend on the sample matrix and whether modelers need depth profiles, surface samples, or benthic material.
- **Planned Grab Samples:** Oil and gas partners may collect grab samples around the Golden Eagle and Scott platforms during a future vessel survey, covering approximately 100 kilometres. The partners expect to collect several samples and provide one to the project for analysis of carbon, nutrients, or other variables.
- **Linking Field and Model Work:** The team wants in situ measurements and organism or sediment observations to connect field biology with model outputs. If offshore-wind access remains unavailable, laboratory experiments using wind-farm sediment or material may reproduce parts of the field investigation and provide an alternative for testing contaminant availability.

Day 2 Actions

- **Digital Twin Prioritization:** Analyse the workshop outputs and recommend which digital-twin components VALMAS should implement and test as a branded prototype. (Tom M)
- **Digital Twin Infrastructure:** Use the workshop feedback to provide recommendations to organizations developing digital-twin data, modelling, and decision-support infrastructure. (Tom M)
- **Evidence Synthesis Paper:** Revise the evidence-synthesis paper using the workshop feedback, including clearer treatment of carbon persistence, benthic versus pelagic carbon, fisheries displacement and socioeconomic effects, biodiversity baselines, cumulative impacts, and trade-offs. (Steve, Andy)

- **Paper Contributions:** Review and contribute to the draft evidence-synthesis paper when it is circulated, including checking that the key findings and caveats are accurately represented. (the VALMAS team)
- **Authorship Information:** Complete the authorship information document with each contributor's name, affiliation, and ORCID. (the VALMAS team)
- **Paper Figures and Journals:** Submit suggestions for figures, narrative diagrams, and suitable journals for the evidence-synthesis paper. (the VALMAS team)
- **Workshop Worksheets:** Save completed online worksheets to the shared folder and return the completed in-person worksheets for collection. (the VALMAS team)
- **Just Transition Paper:** Continue developing the just-transition concept paper and circulate it for feedback and potential authorship contributions. (Sam)
- **Just Transition Application:** Incorporate justice considerations from the case-study discussions—distributional impacts, procedural inclusion, recognition of local and more-than-human values, compensation, mitigation, and alternatives—into the VALMAS analysis. (Sam)
- **MISER Analysis Priorities:** Provide Sevrine with prioritized requests for MISER outputs, including target size classes, locations, scenarios, maps, graphs, and temporal comparisons. (All work packages, Sevrine)
- **Fishing Pressure Representation:** Agree how fishing pressure should be redistributed or parameterized around artificial structures, including displacement of fishing effort and protected areas. (Sevrine, modelling team)
- **Model Integration:** Define how MISER, EcoPath/Ecosim, and other ecosystem-model outputs can be combined to provide species or fisheries-value interpretations from size-based results. (Gennadi, WP3 team)
- **Model Output Requirements:** Complete the shared model-output table with required variables, spatial and temporal resolutions, model-user names, and expected deliverables. (Each work package)
- **Scenario Priorities:** Agree the priority set of climate, deployment, fishing, conservation, and decommissioning scenarios, including whether a complete future no-deployment case is a realistic decommissioning proxy. (Work-package leads and modelling team)
- **Data And Metadata:** Provide model data and metadata products to Tom M for inclusion in the FAIR data architecture and decision-support tools. (Modelling teams, Tom)

- **Spatial Output Alignment:** Check that model outputs at different spatial scales cover the areas needed for the planned fisheries and case-study analyses. (Modelling team and work-package 5)
- **Economic Scenario Design:** Determine which decommissioning scale and scenario comparisons are sufficiently realistic for the economic appraisal. (Economic appraisal team, modelling team)
- **Case Study Register:** Maintain the shared case-study spreadsheet with candidate sites, purposes, stakeholder groups, governance questions, and links across project work packages. (Nicky and case-study leads)
- **English Case Study:** Select an English North Sea case-study location while checking for overlap and collaboration opportunities with TransX and other existing projects. (Case-study team, Jasper)
- **Cross-Border Comparison:** Develop contrasting Scottish and English case studies that account for differences in stakeholder values, governance, and regulatory arrangements. (Case-study and stakeholder-analysis teams)

Day 3

0900-0930: COP Programming

Community Of Practice Webinar Programme: Emma, Sam, Tom, and other participants developed the community of practice's online discussion programme, confirmed the initial schedule and interactive format, and assigned follow-up work to identify speakers, chairs, conveners, and additional topics.

- **Initial Programme:** The first four planned sessions are Clear Seabed on 5 November, governance of marine artificial structures on 20 January, nature-inclusive design and marine artificial structures in March, and fisheries and marine artificial structures around May. March and May dates and detailed questions remain to be confirmed.
- **Session Format:** The sessions will be recorded, uploaded to the website, and promoted through the newsletter, LinkedIn, mailing lists, and participant networks. Each hour-long session is expected to include three or four speakers, approximately five-minute introductions, and an interactive panel discussion with audience participation rather than a webinar-only format.
- **Speaker And Chair Recruitment:** Antony Firth and Oliver Goldsmith were identified for the Clear Seabed session, with two additional speakers still needed. John Patterson is expected to contribute to the January governance session, and Paul volunteered to speak in the nature-inclusive design session. Participants were asked to suggest contacts, volunteer as speakers or chairs, and help convene sessions; chairs do not need to be speakers.
- **Promotion And Diversity:** Tom and El will prepare newsletter text inviting expressions of interest for future panel discussions. Recruitment should seek diversity across gender, career stage, background, and sectors, including government, research, industry, and NGOs. Emma will circulate the working document and SharePoint tracking spreadsheet, and the topic will remain a standing item for monthly meetings.
- **Immediate Priorities:** The team must secure the remaining Clear Seabed speakers promptly and begin inviting January governance speakers in November so the next session can be promoted at the end of the November event. Participants were asked to respond to emails and provide suggestions rather than leaving delivery to one person.

0930-0945: Engagement Planning Session

Communications And Publication Processes: Nicky and the team agreed to retain individual or organisational consultation responses, promote VALMAS through

appropriate attribution, use a shared publication register, and review common communications guidance and terminology.

- **Consultation Responses:** Nicky proposed that VALMAS should generally not submit collective consultation responses because institutions may disagree, a collective response could undermine individual institutional positions, and developing consensus would require substantial effort. Participants should continue responding as individuals or organisations and reference VALMAS where appropriate, particularly when the response uses VALMAS-funded work or time.
- **Sharing Consultations:** When a project participant identifies a relevant consultation, they should circulate it to the wider team so members have the opportunity to respond independently.
- **Conference Participation:** The project will use a flexible approach to conferences and abstracts. Participants should share VALMAS presentations and may circulate draft abstracts for feedback, but there is no requirement to obtain central approval or follow a controlled allocation process.
- **Publication Register:** Participants should record publication ideas, drafts, academic papers, and external reports in the shared spreadsheet at an early stage. The purpose is transparency, early identification of potential contributors, and prevention of disputes about authorship near completion; entries are not commitments to deliver a publication.
- **Additional Outputs:** Justine agreed to help transfer the proposed publications from the original project proposal into the register. Nicky confirmed that reports should be included and that blogs and other informal outputs can be tracked in a separate tab. The team also noted that publication guidance should be made available alongside the register.

0945-1015: Contentious Issues, Key Messages, and Glossary Update

Communications Guidance And Project Glossary: Tom, representing El, presented draft guidance on contentious issues and key project messages, while the team reviewed the shared glossary and agreed to preserve differing definitions for later consensus-based review.

- **Draft Communications Guidance:** The draft materials address difficult interactions involving biodiversity and environmental objections to offshore wind, commercial fishing impacts, marine spatial planning, pollution and metal release, ecological impacts, shipping, and just-transition or inequality concerns. Participants were asked to review the emailed documents, add comments, and identify any additional issues requiring guidance.

- **Common Messages:** Project communications should consistently present VALMAS as independent, evidence-led, collaborative, cross-sector, focused on informing rather than advocating, supportive of transparent and balanced nature-positive decision making, and intended to assist policymakers. Participants must also follow their own organisations' communications policies.
- **Glossary Maintenance:** The glossary is intended to resolve terminology and acronym differences in this multidisciplinary project. Work-package leads were asked to make it a standing item in monthly meetings, while all participants may add terms or definitions at any time.
- **Handling Different Definitions:** Participants should not overwrite another person's definition. If they disagree, they should add a separate row or column, retain the contributor's name, and discuss the difference with that person so the review process can compare alternatives and establish project-wide consensus.
- **Ongoing Support:** The communications team will continue updating the guidance, glossary, and key-message documents. Participants can seek support when dealing with difficult stakeholders or media interactions, in addition to using their own organisational communications teams.

1045-1100: ECR/PhD Network

Early Career Researcher Network: Keila presented a proposed VALMAS early career researcher network, reported initial survey interest, and asked both early career and senior colleagues to complete the survey and contribute mentoring, training, networking, and professional-development ideas.

- **Network Eligibility:** For VALMAS, an early career researcher is anyone who considers themselves still developing their research career and would benefit from networking, mentoring, training, or professional development. The group commonly includes people within ten years of their highest qualification, but the definition is not exclusive and PhD students are welcome.
- **Initial Survey Results:** The initial survey produced 12 responses: nine from early career researchers and three from colleagues willing to support the network. Proposed activities include proposal-writing workshops, career-development discussions, funding and training opportunities, scientific-publishing support, mentoring, and quarterly early career meetings.
- **Supporter Contributions:** Non-ECR colleagues expressed willingness to provide mentoring, training or seminars, share career experiences, and support networking. Keila emphasised that the network requires participation from the wider project, not only people who identify as ECRs.

- **Example Activities:** Keila described previous activities at PML, including an external proposal-writing workshop covering UK funders, proposal structure, technical level, and language, and a Canva infographic workshop delivered by a communications professional. The network could also include non-academic career perspectives, such as consultancy, and potentially a writing retreat.
- **Next Steps:** Keila asked anyone who has not responded to complete the short survey, including people who do not consider themselves ECRs, so the team can measure interest and gather ideas. The group also discussed connecting with external ECR networks and conferences, and circulating information about relevant networks and contacts.

1100-1145: Management Scenarios Questions

Scenario and Modelling Integration: Emma, Gennadi, Jasper, Steve, Sam, Mike, and others examined how narrative scenarios, model runs, decommissioning, climate assumptions, fisheries, protected areas, contaminants, and decision-support tools should be integrated, with follow-up work needed to align research questions and model capabilities.

- **Scenario Architecture:** The project has five narrative storylines linked to policy environments and sets of modelling 'Lego bricks' covering deployment, MAS and no-MAS cases, future timelines, and decommissioning. The scenarios are not expected to be represented identically in every model; each model provides a component that contributes to the wider narrative and decision-support process.
- **Priority Model Runs:** The modelling teams prioritised present-day baseline cases and future cases involving no-MAS, current MAS, and maximum or planned MAS deployment. The priority list is intended to sequence work rather than permanently restrict the project to a fixed number of runs. Gennadi and Ian will compare the modelling and economic-valuation priorities, which differ only in a small number of cases.
- **Decommissioning Limits:** Complete removal of all structures was recognised as unrealistic, while oil and gas structures are relatively few and small compared with offshore wind structures. FVCOM and ERSEM lack the spatial granularity to show strong differences from individual oil and gas decommissioning choices, so those details must be supplemented with evidence outside the model outputs. Existing decommissioning data and a possible update to the Martin database may provide a more current evidence base.
- **Model Data Flow:** Gennadi explained that each model takes the inputs it needs from the scenario outputs: for example, EcoSim may use temperature and

primary productivity, while physical and biogeochemical models provide information on structure-related changes. Model runs should therefore be understood as separate evidence components rather than complete representations of the five narratives.

- **Climate Scenarios:** The main FVCOM and ERSEM work is currently based on one climate prediction because additional climate forcings would require repeating slow model runs. The team discussed using the mid-century SSP3-7.0 results as a reasonable higher-impact case and framing them with explicit caveats, while Mike confirmed that other climate outputs could potentially be used in downstream models such as Strath E2E if needed.
- **Fisheries And Protected Areas:** The team identified unresolved questions about fisheries-management scenarios, displacement, marine protected areas, compensation, nature-inclusive design, and how different fishing types would be restricted. These issues may be explored through Strath E2E, EcoPath/EcoSim, decision-support tools such as ASpace, evidence synthesis, and the November visioning workshops.
- **Structure Typology And Effects:** Steve proposed developing a shared typology covering oil and gas, offshore wind, floating and fixed structures, and other relevant categories. The team must then map effects such as noise, electromagnetic fields, litter, toxins, aggregation, and habitat changes to model parameters, potentially representing uncertainty through probability distributions and Monte Carlo simulations.
- **Contaminant Evidence:** Jasper asked whether the project could provide a granular assessment of oil and gas decommissioning effects, including mercury bioaccumulation and health implications. The discussion noted that EcoPath/EcoSim could offer a localised Moray Firth assessment using available cuttings-pile and monitoring data, but broader extrapolation would rely on substantial assumptions; hydrocarbons and plastics may require consideration alongside mercury.
- **Research Questions and Follow-Up:** The group concluded that scenario selection should be driven by the project's fundamental research questions, not only by model contrasts or economic-valuation needs. The November visioning workshop should help clarify those questions, while Tom will coordinate follow-up meetings on fisheries, MPAs, displacement, nature-inclusive design, compensation, typologies, climate assumptions, and other gaps; evidence-synthesis material and existing detailed scenario documents will be circulated to support the work.

Day 3 Actions

- **Webinar Promotion:** Share the 5 November Clear Seabed session registration post across personal, organisational, and relevant newsletter networks. (The team)
- **Webinar Speakers:** Confirm the remaining speakers for the 5 November Clear Seabed session and circulate existing outreach details to support further contacts. (Webinar Team)
- **Webinar Planning:** Identify speakers, chairs, convenors, and discussion questions for the Governance, Nature-Inclusive Design, and Fisheries sessions, and record commitments in the shared planning documents. (The team)
- **Newsletter Recruitment:** Prepare newsletter text inviting contributors and speakers for the upcoming panel discussions. (Tom)
- **Consultation Sharing:** Circulate relevant consultations to the project team and continue submitting responses individually while referencing VALMAS where appropriate. (The team)
- **Publication Tracking:** Add planned or developing academic publications, reports, and other outputs to the shared publication tracker, including the agreed proposal publications and a separate tab for blogs or informal outputs. (Justine, the team)
- **Communications Guidance:** Review the contentious-issues guidance and key-messages document and add comments or proposed additions before publication. (The team)
- **Project Glossary:** Add missing terms to the glossary without overwriting existing definitions, and flag differing definitions for later review and consensus. (The team)
- **ECR Network:** Complete the ECR network survey and provide input on potential activities, mentoring, training, external-network links, and support for the network. (The team)
- **Scenario Evidence:** Send the evidence-synthesis material identified during the meeting to support the scenario and modelling discussions. (Steve)
- **Scenario Follow-Up:** Set up follow-up discussions on fisheries, MPAs, displacement, nature-inclusive design, compensation, structure typologies, decommissioning, and related evidence while the issues remain current. (Tom, the team)

- **Scenario Research Questions:** Define and prioritise the project's research questions to guide selection and prioritisation of modelling scenarios. (Work Package 5, Ian, Gennadi)

Annex A: Attendance

Andrew Edwards Jones
Anne-Michelle Slater
Astley Hastings
Claire Szostek
Daisy Leadbeater
Emma McKinley
Gennadi Lessin
Ian Dickie
Jack Laverick
Jacob Bentley
Justine Saunders
Katerina Schiffnederova
Keila Guillen Onate
Kieran Tierney
Liz Talbot
Matthew Hatton
Megan Squire
Mike Bedington
Mike Heath
Molly James
Muchamad Al Azhar
Nicola Beaumont
Oceane Marcone
Paul Causon
Rebecca Von Hellfeld
Sam Saville
Saskia Rühl
Sevrine Sailley
Steve Watson
Thomas Mansfield
Tiziana Papa
Tom Fabian