INSITE

Influence of man-made structures in the ecosystem

The Influence of Man-made Structures on the North Sea Ecosystem

Synthesis and outcomes of Phase 1: (the Foundation Phase)

ISAB Independent Scientific Advisory Board

November 2017

INSITE Background & Scope

- **Oil & Gas UK** Decommissioning Baseline Study JIP (2011-2012):
  - Serious lack of data to describe the influence of man-made structures (MMS) on the North Sea ecosystem
- 2013**: Oil & Gas UK** facilitated **INSITE**, a JIP to improve knowledge of the influence of MMS on the North Sea ecosystem
  - Provide scientific evidence to understand the effects of MMS
  - Better information for the decommissioning decision process in future
- **Man-made structures** (MMS) includes…
  - Fixed steel and concrete **oil and gas installations & pipelines**
  - **Renewable energy structures** (e.g. windfarms).
  - **Shipwrecks**
  - (Shipping and fishing activity is only included if it has a direct impact on the influence of MMS).

INSITE specific objectives

SPECIFIC OBJECTIVE 1: ***'EFFECTS'***

Investigate the **magnitude of the effects** *of man-made structures compared to the spatial and temporal variability of the North Sea ecosystem, considered on different time and space scales.*

SPECIFIC OBJECTIVE 2: ***'CONNECTIVITY'***

To what extent, if any, do the man-made structures in the North Sea represent a **large inter-connected hard substrate system***?*

INSITE Phase 1 (2014-2017): the Foundation Phase

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Studies designed to focus on

- identification, **collection, synthesis, and analysis of available data**
- to a lesser extent **generation of new data**,
- **model development**, implementation, and testing,
- **preliminary model runs** with available data to address INSITE objectives

Time-line for Phase 1 : just two years of research

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- August 2011: :‘Long-term Environmental Study’ conceived from Decommissioning Baseline JIP
- April 2014: JIP Agreement signed by eight energy company sponsors
- July-October 2014: Pre Proposal and Full Proposal award process
- **December 2015: First research contracts awarded**
- **December 2017: Research Phase 1 concludes**

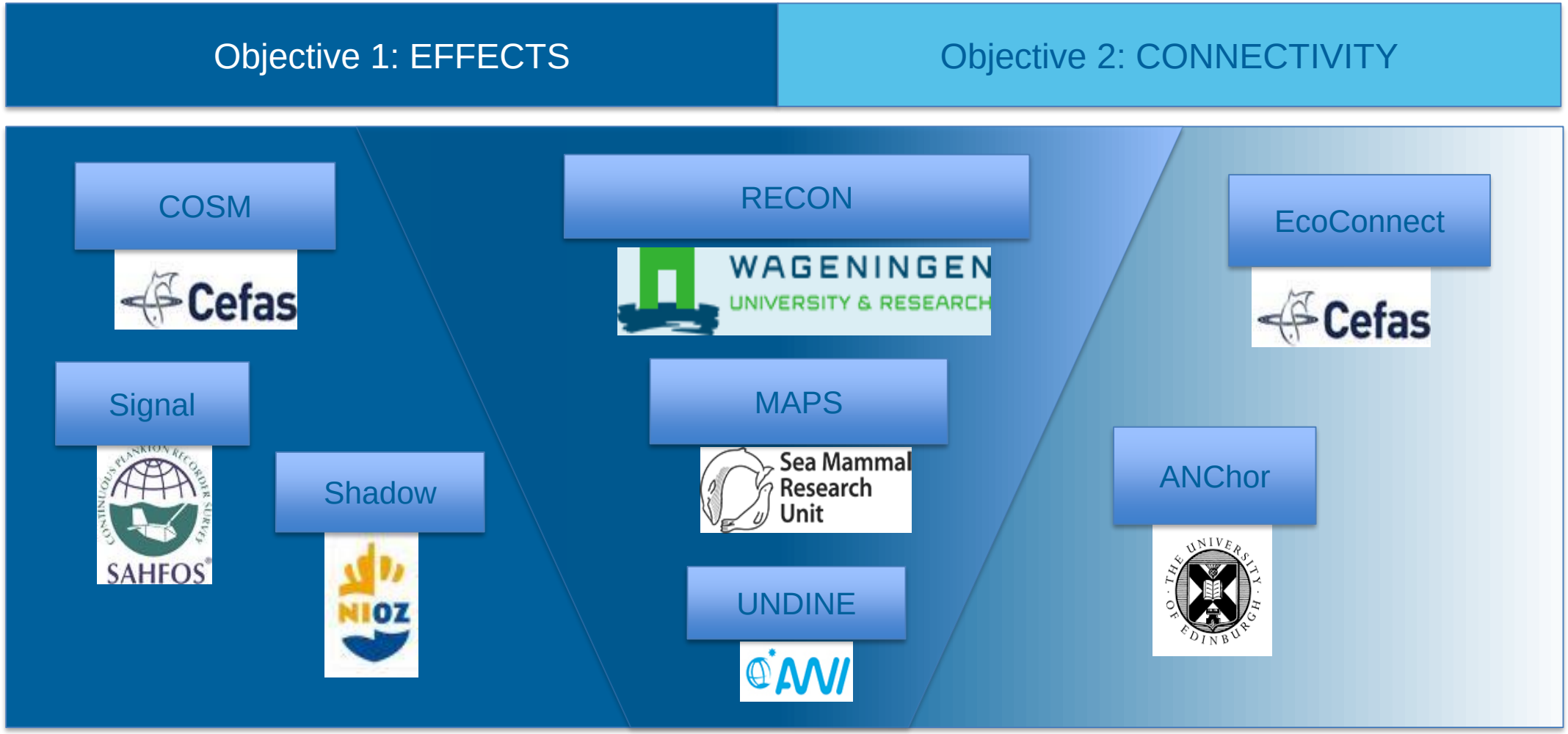
INSITE Phase 1 projects (1/2)

Primary Institution	Countries	Title of Research
Alfred Wegener Institute (AWI), Helmholtz Centre for Polar and Marine Research	**Germany**, Belgium, UK, Netherlands	UNDerstanding the INfluence of man-made structures on the Ecosystem functions of the North Sea (**UNDINE**)
CEFAS Laboratory	**UK**	Assessing the Ecological Connectivity between man-made structures in the North Sea (**EcoConnect**)
CEFAS Laboratory	**UK**	Coupled Spatial Modelling (**COSM**) – trophic effects due to structures and habitat change in the North Sea
IMARES	**Netherlands**	Reef effects of structures in the North Sea: Islands or connections? (**RECON**)
Royal Netherlands Institute for Marine Research (NIOZ)	**Netherlands** Norway	Measuring the shadow effect of artificial structures in the North Sea on the surrounding soft bottom community (**Shadow**)

INSITE Phase 1 projects (2/2)

Primary Institution		Country	Title of Research
University of Edinburgh		UK	Appraisal of network connectivity between North Sea subsea oil and gas platforms (**ANChor**)
Sea Mammal Research Unit (SMRU), University of St Andrews		UK	Man-made structures and Apex Predators: Spatial interactions and overlap (**MAPS**).
Sir Alistair Hardy Foundation for Ocean Science (SAHFOS)		UK	Influence of Man-Made Structures in the ecosystem: Is there a planktonic signal? (**Signal**)
University of Edinburgh		UK	**INSITE Data Initiative**

Mapping the Programme to the INSITE Objectives



Overall assessment of Phase 1

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- A major step has been made to **compile available data** on the **physical features** of MMS, their associated **fauna and flora**, and **biological characteristics** of the surrounding benthos. These are crucial for Phase 2, and should be extended. Need to add Norwegian data.
- **Still a major challenge to make existing environmental data available** to the projects
- Another major step has been to **identify, adopt, implement, test, and run a range of dispersion and ecosystem numerical models**, separately or in concert to achieve the INSITE objectives
- Studies of the available data have **improved our knowledge of the geographical and depth distribution of offshore hard bottom biodiversity** in the North Sea. Also new knowledge on **how MMS features regulate the epigrowth community structure and function**
- INSITE has provided **model and field evidence that the physical presence of MMS and their epigrowth may influence the surrounding benthos**, but only locally.

Overall assessment of Phase 1

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- INSITE has provided **the first estimates of the scale of ecological influence** of MMS on plankton communities and top predators. The influence is marginal relative to natural factors.
- In spite of different modelling approaches INSITE results indicate that **several common species do form interconnected networks** through larval dispersion
- The networks are **dependent on species specific reproductive traits** as well as oceanographic conditions
- INSITE has demonstrated the **value of DNA barcoding and population genetic fingerprinting** to support species specific connectivity modelling.
- The **connectivity and network analysis modelling tools** developed within INSITE are potentially **useful to support decommissioning decisions** (but need to be quantified).

Overall assessment of Phase 1

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- The **connectivity patterns** identified are **reasonably consistent** between projects, but there are inconsistencies e.g.
  - Opposite dispersal directions for *Lophelia* in the northern NS
- **Ground-truthing (validation) of model results** has been done in some instances, but needs to be encouraged. Validation is **hampered by insufficient field data**.
- **Phase 1 research is geographically unbalanced**.
  - Several projects have only dealt with the southern part of the North Sea.
  - Validity of extrapolation to the greater North Sea has not been assessed
  - Only two projects cover the whole North Sea (including the Norwegian sector)
- The **quantification of the project results** needs to be investigated more thoroughly, e.g.
  - Short-term vs long-term & local vs regional effects, and NS-wide influences of MMS.

Decommissioning: Is the MMS impact on the NS ecosystem sensitive to decommissioning options? (preliminary results from model predictions)

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- An important driver for industry engagement in INSITE is to **improve the knowledge base that can inform decommissioning strategy**
- Scenarios that remove more oil and gas structures have a larger negative impact on the connectivity network. (*as expected !*).
- **Generic derogation (leave in place) has little impact**, probably due to the small changes in the size of the hard substrate areas
- **Some clusters and sites of MMS are identified as more important** than others in keeping the networks connected
- **Bespoke derogation could be effective** to maximise ecological benefit (*but need to define this…*) based on the network role of an installation

Overall Conclusions for Phase 1

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- Phase 1 was intentionally designed as the **Foundation Phase**
- A **good foundation has been laid…**
- **Much relevant data** has been collected and collated
- **Appropriate models** have been developed and implemented
- Some ***preliminary* analysis** has been undertaken
  - **No major surprises**: impacts exist but appear to be small (+ve and –ve)
  - **Connectivity can be detected**, but significance is undetermined
- **No firm evidence** relevant to decommissioning yet
- Need to **proceed with Phase 2:** Data analysis & quantitative modelling
- Need **continuing industry support** to match NERC (science-led) funding
- and to maintain the **international nature** of the programme