

North Sea RAC Fishermen’s Information Mapping (NSFIM) project

Context

The fishing industry confronts both a short and long term need to demonstrate the spatial dimension of its activities. In the short term, the hurried establishment of a network of marine protected areas and large scale offshore windfarms threaten to displace fishers from their customary grounds. In the longer term, the arrival of marine spatial planning will demand that the fishing industry is in a position to indicate the location of its most important fishing areas in order to defend them from a range of offshore developments.

By comparison with other offshore activities the fishing sector faces particular problems in mapping its activities. Its dispersed, intermittent and international characteristics have only partially been captured by modern technologies such as VMS. Some types of spatial information about fishing activity are commercially sensitive, especially at the higher levels of resolution.

The North Sea Regional Advisory Council has recognised the need for the fishing sector to provide credible, comprehensive spatial information on fishing activities in a form that the sector is comfortable with but that can also play its part in influencing marine planning decisions. Given that the RAC is the only international stakeholder body in the North Sea capable of coordinating the mapping of fishing activity at the quality desired it proposes the project described below. Today, the Fishing Industries of the North Sea Member States (and non-Member States) collectively represent a complex mix of fisheries, gears, techniques and stocks. Subject to a range of management measures these fleets still have a large degree of flexibility as to where and when they can fish. Fishermen need flexibility in fishing areas so as to pursue stocks which have fluctuating distributions, adapt to management measures, mitigate against high fuel costs and to make best available use of the resource. It is essential that this point is taken into account when mapping their activity.

Background

For many years the Fishing Industries of North Sea Member States have to a large degree co-existed with spatial restrictions resulting from Oil and Gas exploration and production. More recently though further developments in the North Sea such as the Marine and Coastal Access Act in the UK, the implementation of Natura 2000 (Habitats and Birds Directives), the EU Marine Strategy Framework Directive, the increasing use of spatial & temporal management measures in fisheries conservation and the issuing of sites for renewable energy development (wave, wind and tide) all point towards the need for comprehensive Marine Spatial Planning.

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The Commission has recognised this and has clearly captured the aim of this process in the following statement: *Marine Spatial Planning is a tool for improved decision-making. It provides a framework for arbitrating between competing human activities and managing their impact on the marine environment. Its objective is to balance sectoral interests and achieve sustainable use of marine resources in line with the EU Sustainable Development Strategy* – European Commission, 2008.

The North Sea RAC first identified Marine Spatial Planning as an important emerging issue in 2005. In response it established a Spatial Planning Working Group (SPWG) tasked with developing policy and projects to ensure that the fisheries sector was fully engaged and represented. Working jointly with DEFRA and CEFAS the SPWG convened a two-day workshop in London to proactively explore the issues and processes involved in accessing and recording fishermen's knowledge and information for this purpose.

A critical element of Marine Spatial Planning is access to accurate data and information covering the use of the resource. Clearly, with modern fishing plotters, sonars and ARPA radar many skippers have fishing data sets with a high degree of spatial detail (i.e. track plots etc) covering many years of fishing activity by areas fished. With 3-d mapping software commonplace in the wheelhouse of almost any vessel there is also now an un-paralled information resource held by industry into seabed morphology, topography and geology. In a knowledge driven economy this information is highly valued, is sensitive and often closely guarded, although data sharing seems more widely accepted amongst some fleets.

This proposal seeks to steer a course through these issues to provide an accurate means of capturing, recording, plotting and sharing fishermen's information and knowledge in a way which allows the RAC to proactively engage in Marine Spatial Planning and to defend fishing areas throughout the North Sea whilst protecting the confidentiality of individuals.

Introduction

This project builds on previous work by the SPWG and is fuelled by growing concern from working fishermen of the need to be proactive in mapping fishing activity spatially to enable the industry to engage and, where necessary, defend clearly defined areas of significance to the fishing industry. It is also hoped that accurate spatial activity data will further strengthen the links between industry, scientists, NGOs and other relevant stakeholders providing a foundation for the development and delivery of a CFP which has greater spatial and regional dimensions.

To achieve this aim the project seeks to develop and implement methodologies and processes which put fishermen's experience, knowledge and information at the heart of the process in a transparent way which assures confidentiality and builds trust. Given that the project is the first of its type at this scale mistakes and a degree of learning are inevitable and therefore the project will need to be adaptive and flexible as it progresses.

As has been described above a crucial element in the successful delivery of the project will be access to accurate data from a range of different auditable sources. The project will capture spatial fishing information in a number of ways:

- i) Satellite VMS data – held by each Member State for vessels > 15m
- ii) Non-Satellite data – to fit low-cost VMS system to a sample of <15m vessels
- iii) Fishermen's knowledge and plotter data – held by every skipper

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(Further details on data sourcing, processing and display are covered later).

Each data stream will then be validated and, if necessary, amended by experienced skippers before conversion into a common format used on Geographical Information Systems (GIS) and stored on a 'master system' which should be held under strictly controlled access by a technical partner. How or where the master system is based remains for discussion but factors such as key users, security, technical ability, costs and trust should all be considered as key factors in this debate.

Once established on a recognised GIS platform updating of the master system should be undertaken every year to reflect any changes in fishing patterns. Further non fishing data layers such as habitat data, shipping traffic data, could also all be added to the master database at anytime.

Funding for projects of multi-partner, multi-contractor projects from a range of Members States can be complex, but as a truly trans-national project it is thought that Interreg funding would be applicable. Equally, the project can be seen as a group of discrete data modules which could be funded by different funders in different Member States and then collated on completion. In addition, once fully agreed and budgeted a direct approach for funding to the Commission could also be made.

Although not explored here in depth, in parallel to the technical, data-mining aspect of the project, SPWG and wider NS RAC will need to consider principles and procedures for the use of the NSFIM data.

Methodology

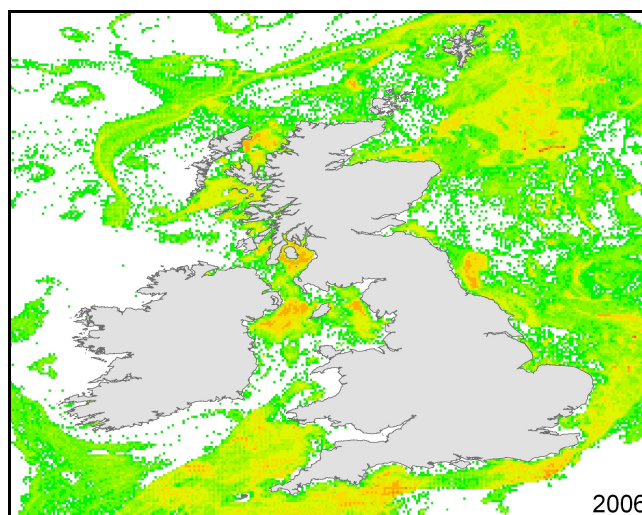
1. Satellite VMS data:

Since the introduction of Vessel Monitoring Systems (VMS) first on > 24m vessels in 2002 and then over 18m and more recently over 15m vessels, each Member State has been required to record the 2-hourly VMS reports from every vessel on its fleet register.

Therefore, across EU Member States there is a wealth of raw satellite position data. In the UK this data has been filtered through computer algorithms and linked to vessel logsheet entries to refine plots to when vessels are 'engaged in fishing' (i.e. not steaming) and linked to the gear code at that position point. An example of the data that can be recorded in this way is shown in figure 1 – see below:

In the UK this data is readily accessible from CEFAS for all UK vessels wherever they fish in the World and also for any non-UK vessel that is fishing in UK waters. The availability and format of corresponding data from other Member States has not yet been investigated. But, CEFAS have collaborated with other Member States on similar EU-funded projects (Lot 7) and feedback suggests that most Member States would have at minimum the raw data for processing and possibly the capacity to refine data to fishing positions as produced by CEFAS.

Figure 1: Sample data: > 18m VMS plots for UK Vessels



Understanding accessibility, availability and format of this data from all project partnering Member States will be an important area of work to complete before a final budget can be prepared. However, in order to calculate a meaningful cost estimate for this work it has been assumed that these will be broadly similar to those quoted by CEFAS (on a *pro rata* basis depending on size of fleet).

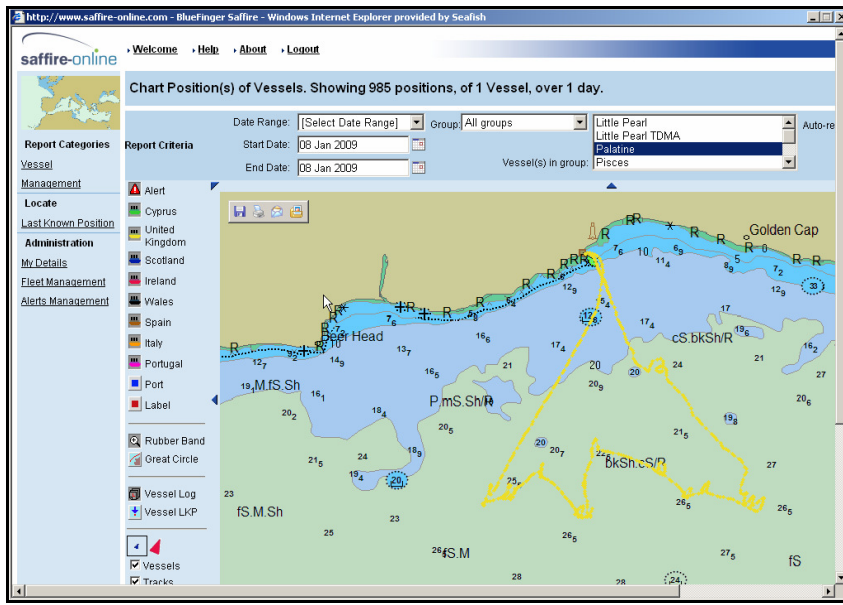
2. Radio VMS data:

Despite the introduction of mandatory satellite VMS for vessels > 15m Length Over All (LOA) there are large numbers of vessels fishing in the North Sea which are not required to carry VMS systems. Even if there was widespread agreement from skippers the installation of VMS systems throughout the under 15m fleet would simply not be economically feasible at this stage. As a result there is no existing VMS data for these fleets and therefore a different approach of pro-actively establishing a dataset for the < 15m fleets is required.

In the UK, Seafish have conducted a number of trials on inshore vessels with so-called 'low cost' VMS – essentially through the fitting of road vehicle logging and tracking systems to fishing vessels. These systems send regular (at intervals down to 30secs) lat/long positions using the mobile telephone network meaning that such systems are much cheaper to run than the equivalent 'air time' for the satellite VMS mandatory for the > 15m fleet. As a result a greater frequency of position data can be provided giving greater accuracy and finer scale mapping at a much lower cost. When a connection to the mobile phone network is lost these systems simply store the positions data until re-connected when the stored points are then transmitted in data bundles.

The radio VMS uses well tried and tested technology to provide meaningful results at a significantly lower cost than satellite VMS with each unit costing approx. 1500 euro including installation and an annual 'airtime' charge. It is proposed that, by fitting radio VMS in a sample number of vessels from each metier containing a high percentage of < 15m vessels then the VMS data void for the < 15m fleet could start to be filled. As not all of the < 15m fleet can be fitted with this VMS system the data will have to be closely validated and analysed by a range of skippers through a structured interview process and through referencing with supplementary plotter data (see below).

Figure 2: Sample data: < 15m radio VMS plots for UK inshore vessel (courtesy Seafish)



3. Fishing plotter data, information and knowledge

Due to the 2 hourly reporting intervals of satellite VMS data the accuracy of activity charts are relatively coarse scale, so where finer scale (i.e. < 1km) planning is needed additional data will be required to meet this demand. This will be provided in two forms: i) through the conversion of highly accurate vessel fishing plotter data and ii) through structured interviews with fishermen equipped with electronic charting tools.

Since the introduction of the first 'video plotters' in the 1980s and GPS in the 1990s technology has advanced at an incredible rate so that today even recreational angling vessels are often now fitted with highly accurate GPS chart plotting and echo-sounding equipment providing detailed 3-d charts of the seabed. Such systems are produced by a range of manufacturers (Maxsea, OLEX, Trax, Sodena, Fishmaster, WASP etc) for commercial fishing applications and are commonplace in the wheelhouse of vessels, even down to those of 10m or less. Consequently, across the fleet a vast amount of highly detailed seabed and spatial data is collectively held by the fishing industry.

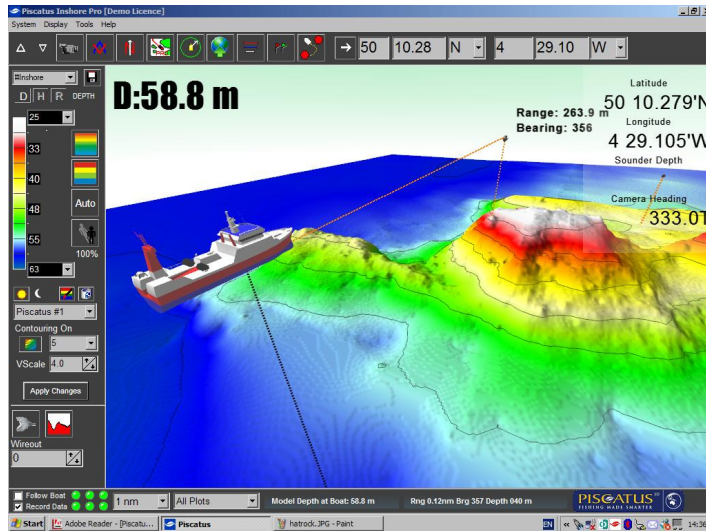
In the past, a skipper's historic plots, tracks or marks were seen as highly valued information equivalent to his Intellectual Property Rights (IPR) and were consequently highly guarded. Although this attitude still exists today there is growing recognition that through technology like ARPA radar (which allows a skipper to track other vessels on radar) there are 'no secrets' and there is 'nowhere to hide'. In some countries and some fleets this has resulted in a more liberal attitude to information sharing. This project seeks to work with skippers with this attitude and through strict confidentiality safeguards encourage them to share information from their plotters. Initial software tests indicate that 'tracks' or 'plot' data from virtually any PC-based, vessel electronic plotting system in common use can be backed-up onto a memory stick and then converted into a format that can be displayed on a GIS database.

Guided by an initial scoping exercise involving fishing professionals and fishing organisations from the project steering group a number of skippers will be approached for plotter data. This will be used to validate information gained and also to supplement

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other areas where data from the other sources is poor or even non-existent. Each Member State will be tasked with proposing active or semi-active skippers and owners to engage in this process. The key role of this group will be to validate charts produced by the plotting of data sourced through the data sources above and, with the aid of a laptop, also map out any additional areas of past or present importance that are not apparent from these means.

Fig 3 – Sample of electronic plotter data



Data issues:

i) Formatting, transfer, analysis & presentation

In the UK CEFAS have experience of converting, manipulating and analysing data from both satellite VMS and radio VMS. They have no experience of accessing fishermen's plotter data they are confident that this data can also be integrated and are keen to do so.

For the UK fleet, therefore, CEFAS seems the obvious data partner and, on this premise, data collected from all sources would be sent to CEFAS for processing. The resulting charts would show fishing activity spatially - by area, temporally - by quarter, and gear type - by fleet segment. Additionally, the data from the radio VMS sample fleet can be accessed real-time through a password-protected web portal.

Other Member States may be equally advanced but again this area needs further investigation to understand the degree of compatibility between information systems operated by different Member States.

ii) Management & storage

In the short-term to enable the project to start delivery almost immediately data will either be held by the administration / scientific partner in the flag Member State or exported to CEFAS. While this process is underway the NS RAC will need to consider the best location for all of the collected information to be stored and managed. In the medium term this could be under suitable tender to a Government agency, marine laboratory or academic institute. For the longer term the NS RAC should consider setting up and managing its own GIS database (subject of course to suitable funding).

iii) Ownership & confidentiality

Being trusted as the custodians of potentially sensitive data will be the defining test of industry support for the project. Confidentiality must be assured so a rigorous agreement and data handling protocol will be drafted to cover all aspects of data handling from the fishermen to the data handling partners and managing organisation.

The data will be 'owned on trust' by the NSRAC on behalf of and for the benefit of the Fishing Industry and other legitimate stakeholders. The NSRAC will therefore have TO develop criteria for when, where, how and with whom data will be displayed / shared.

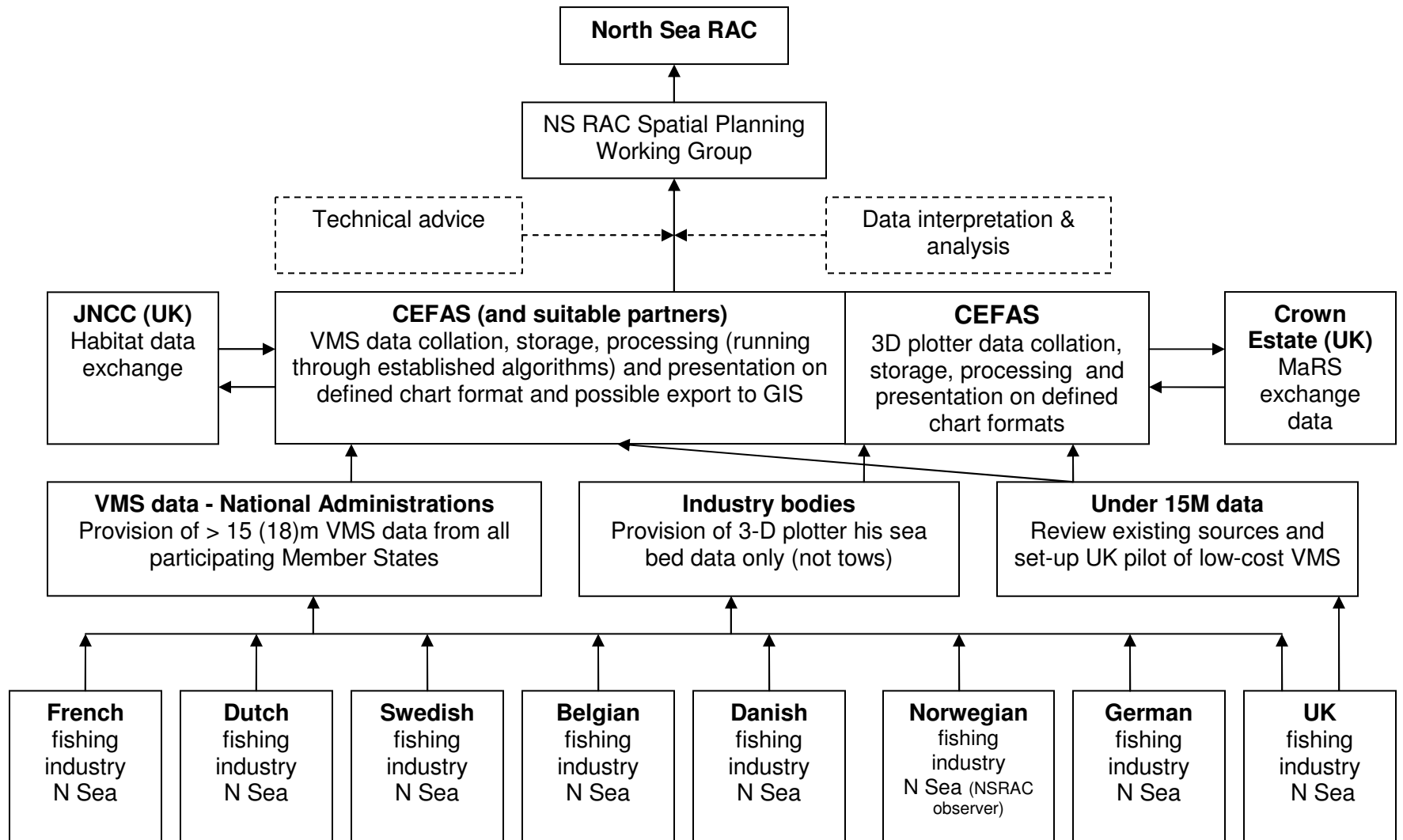
Governance

It is proposed that the project will be managed by the NS RAC Spatial Planning Working Group with the addition of a small number of working fishermen and technical advisers. The project steering committee which will report back at regular intervals to the RAC Exec (see Fig 1 below).

The project could be hosted by the NSRAC Secretariat based currently within Aberdeenshire Council who will provide financial support in the form of accountancy and contract management.

Delivery of the project will be through a project management team consisting of a part-time, but flexible project manager, supported by a part-time liaison officer, administrative back-up and freelance PR support as and when necessary.

Fig 4 : North Sea Fisheries data mapping project – Governance & data streams flowchart



Communication & Outreach

In order to achieve trust and ‘hands on’ engagement of ‘grass roots’ fishermen the project must clearly be explained to, and be well understood by, fishing skippers and owners. For that reason the project will develop a focussed, multi-channel communications strategy for which a small budget will be allocated. Responsibility and participation for communicating the project to industry will also need to be shared with fishing industry bodies represented on the RAC.

Policy context

There are a number of EU and Member State policy initiatives that intensify the need for the fishing sector to map its own activity:

- At the broadest level the Marine Strategy Framework Directive calls for marine spatial planning and the achievement of Good Environmental Status of the EU’s regional seas by 2020. The Common Fisheries Policy (CFP) is required to comply with these objectives.
- Although the Habitats and Birds Directives do not permit socio-economic considerations to influence site selection, fishing activity can be taken into account in the design of management measures
- National networks of marine protected areas such as envisaged by the UK’s Marine and Coastal Access Act make provision for MPAs to be introduced through an evidence based process which includes consideration of fishing activity. The quality of this process is heavily dependent on the status of information held on where and when fishing takes place as well as the gear deployed
- Implementation of the Common Fisheries Policy increasingly has a spatial dimension, from real time closures, to regional management. Correspondingly, the success of such policies are increasingly dependent on comprehensive high resolution spatial data on fishing activity
- Likewise, the development of long term management plan for specific stocks and specific fisheries often contain a spatial dimension that demand accurate information
- In the longer term, as marine spatial planning becomes a major determinant in the location of offshore activity fishing, the defence of fishing space against competing demands from other economic and recreational marine activities, will require the provision of accurate and verifiable information.

All this suggests that the fishing sector must adopt a different approach to providing spatial information about its activity. Whilst in the past commercial confidentiality in a highly competitive sector took precedence, there is a growing recognition that the changed policy context means that this must be moderated and qualified by the provision of spatial data, albeit with important safeguards.

Risk assessment

A preliminary project risk assessment has been conducted and summarised in Table 1 (see below). The table highlights the main risks that threaten the ability of the project to delivery its aims successfully, the risk threat level (calculated by standard principle of severity of risk x probability of risk) and, where possible, preventative action(s) that can be taken to nullify and minimise these risks.

Table 1: project risk analysis

Risk	Risk level	Preventative Action
Industry dis-engaged and un co-operative		<ul style="list-style-type: none"> - clear communication of objectives, benefits and (especially) data confidentiality safeguards - shared responsibility - on-going communication & feedback
Project is 'overtaken' by initiative with same broad aims by Govt administrations (UK and/or other Member States) or commercial consultants		<ul style="list-style-type: none"> - a real possibility but requires well articulated position of why NSRAC origins confer benefits – initiative from and other source will result in a different 'product' as will not capture fishermen's information in same way and with same level of 'buy-in' as for NSRAC initiative - close co-operation and communication (including early announcement by NSRAC of intent) with Govt departments, bodies & institutions
Funding package: match funding, timescale & complexity not delivered		<ul style="list-style-type: none"> - Work closely with Commission to understand 'fit' of project to available sources of funding
Confidentiality breach		<ul style="list-style-type: none"> - detailed data handling protocol should re-assure industry and build trust; any breach would be dealt with swiftly and decisively
Technology – data transfer, conversion and sharing between administrations are inadequate or lacking		<ul style="list-style-type: none"> - although not used on this scale, none of the technology being used is new so low risk - clear communication and objectives from start
Timescale of delivering maps & charts over-runs consultation windows on key offshore developments (e.g. UK Marine Conservation Zone (MCZ) network)		<ul style="list-style-type: none"> - timely approval of project proposal and its implementation - work closely with Govt administrations to explain constraints

Budget (costs & funding)

i) Costs

Table 2: outline costings for UK element of data

Data required	Data collection, processing	Estimated cost (Euro)
>15m VMS data vessels (linked to gear code and 'filtered' to fishing time where possible)	CEFAS / Member State equivalents	50000 (Range 35-70k euro)
> 15m Interviews with skippers to validate VMS plots and to provide underpinning knowledge on fisher strategy & behaviour. (Includes T&S)	Industry body project partners (i.e. RAC members)	20000 (Range 15-25k euro)
< 15m low-cost VMS sample fleet data (50 vessels)	Selex / other approved technical partners	70000 (Range 60-80k euro)
<15m Interviews with skippers to provide additional mapping of fishing activity and underpinning knowledge on fisher strategy & behaviour	Industry body project partners (i.e. RAC members)	20000 (Range 15-25k euro)
> 15m and < 15m Supplementary high-res fishermen's plotter data conversions (in multiple formats)	Suitable / approved technical partners	10000 (Range 8-15k euro)
Project management & administration (incl T&S)	tbc – to tender	45000 (Range 30-45k euro)
Communication and outreach	tbc – to tender	10000
Financial management & administration	Aberdeenshire Council	10000
Total (Euro)=		235000

ii) Funding options:

As can be seen from the table above the project is essentially a collection of discrete 'data modules', some of which can be run simultaneously and others sequentially. This means that the project has some flexibility in how it is funded, for example - either as one overall project, funded by a trans-national funding stream such as INTERREG from the EU, or with the individual data modules being funded differently in each Member State. The advantage of establishing one total budget is that project can be more readily monitored and delivered as one project; however, developing and securing a funding package to do this could take in excess of 12-months to deliver. Therefore, the alternative 'modular' approach offers 'parts of the puzzle' to be put in place, potentially with a mix of funding arrangements from EU (EFF), National Governments, eNGOs and possibly even the private sector. In the UK the Crown Estate are keen to engage industry on such a project to inform the Round 3 windfarm sites Zonal Analysis Process (ZAP) – an intra-zonal planning tool. This would facilitate a much swifter start to work, defend the industry's interests and could be used as a pilot for other areas. A potential downside of this would be the project becoming dis-jointed and less cohesive as an overall project.

Timeline

See outline Gantt chart below.

The limiting factor is running the under 15m radio VMS element of the project and waiting for 12-months to collect meaningful data as both the satellite and plotter data already exists, requiring only conversion and interpretation. This allows the project to be split into two-phases which will a) mean there is partial project delivery after 14-months and b) means that workload of project team will be more manageable.

Timeline (outline)

NS RAC Fishermen's Information Mapping project : Outline Gantt chart

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Scoping phase	█	█	█																					
Sat VMS collection				█	█	█	█	█																
Radio VMS set-up				█	█	█																		
Interviews > 15									█	█	█	█												
Interviews < 15												█	█	█	█									
Data processing											█	█	█											
Radio VMS reporting																	█	█	█					
Radio VMS processing																			█	█				
Verification												█	█							█	█			
Presentation															█	█						█		
Buffer																							█	█