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Establishing Post Spill Environmental Monitoring Processes: Experience from the United Kingdom Premiam Initiative

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The Pollution Response in Emergencies: Marine Impact Assessment and Monitoring (Premiam) programme was initiated in 2009. It started life as a 3-year government funded developmental programme and has subsequently developed into a UK wide focus for the improvement of post spill monitoring with wide engagement from both government and industry stakeholders.

In this paper an update of the achievements under the initiative is presented including the development of scientific guidelines, processes for managing and coordinating the mobilisation of monitoring expertise and systems for evaluating preparedness. Inclusion of post-spill monitoring into the UK National Contingency Plan and national response exercises are also discussed.

This paper will also reflect on the most challenging aspects of establishing effective post-spill monitoring including accessing skills and expertise, establishing funding, stakeholder support and consistency of approach across all relevant sectors. Finally, experience from the UK will be used to consider the status of post-spill monitoring in the context of the International Oil Spill Conferences four key areas of Prevent, Prepare, Respond and Restore.

For more information see: *www.cefas.co.uk/**premiam***

INTRODUCTION

It is generally agreed by most authorities that the occurrence of major oil spills has been in decline over recent decades (e.g. Schmidt-Etkin, 2011). The figures of spills from shipping has shown very clear evidence of this as demonstrated by the time series data maintained by ITOPF (ITOPF 2017). Nevertheless, it is critically important to be able to respond effectively to spills as and when they occur to minimise the environmental and societal impact. An important, but often overlooked, part of the overall response is the ability to be able to conduct post-spill monitoring and impact assessment.

The conduct of post-incident marine monitoring involves the practical application of scientific process and technique under potentially difficult and unforeseen circumstances with potentially limited resources and short notice and tight delivery deadlines. Understanding what scientific methods are necessary, how they are best applied in-situ, with due regard for QA/QC processes, and having access to appropriately skilled scientists is clearly a pre-requisite of any scientifically robust monitoring system. However, the circumstances of marine spills can be complex, potentially involving the measurement of several hazardous components and a need to assess impacts in many receiving environments and at multiple trophic levels. Therefore, co-ordination of the response and the management of logistics, financial aspects, communications and reporting can be equally as important as the science. Finally, although marine emergencies occur without warning, there is still a need to be able to initiate monitoring activity in a timely manner, especially if there is an opportunity to collect samples to inform a baseline dataset before an area is impacted. This essential element of responsiveness is often overlooked and has resulted in delays of days, weeks or even months for monitoring programmes to be fully in place (Kirby and Law 2010) in the absence of a preparedness strategy.

So, why is it important to implement a pre-considered and effective post-spill monitoring programme? Below are six basic reasons but there will be many other incident-specific examples.

1. ***Primary impact***: The need to provide early evidence of any environmental and economic impact (and to document areas not impacted) to key stakeholders (e.g. government and the general public).
2. ***Wider effects:*** The need to apply an appropriate and effective method of investigating the potential impact on the wider marine environment and its resources.
3. ***Best methods***: Impact assessment methodology needs to be considered to not only assesses the short-term impacts, but also allow the prediction of potential longer-term impacts.
4. ***Efficient resource use:*** The need to ensure effective use of resources during monitoring so that unnecessary procedures are avoided but that potentially useful ones are not overlooked.
5. ***Mitigation effectiveness:*** The need to provide an assessment of the effectiveness, or not, of spill response clean-up and reinstatement measures, including the use of dispersants.
6. ***Compensation/Liability:*** The need to provide monitoring and assessment input to the determination of compensation and/or liability issues as necessary.

The improvement of post-spill monitoring and impact assessment, through the consideration of core principles, is the ongoing subject of a cross-government programme in the United Kingdom called Premiam (Pollution Response in Emergencies: Marine Impact Assessment and Monitoring, see www.cefas.co.uk/premiam). This programme was initiated in 2009 and has involved a partnership across UK government departments and agencies with an interest in the effective conduct of post-spill monitoring. Through the Premiam initiative eight principles of effective post-spill monitoring have been identified (Kirby and Law, 2014)

which include core scientific guidance but also highlight the need for effective coordination, integration and funding.

While substantial progress has been made in the UK, with some notable achievements, there are also ongoing challenges. These are highlighted in the following sections.

THE PREMIAM INITIATIVE

The Premiam initiative was established in 2009 as a project funded (for three years) by the UK Department for Environment, Food and Rural Affairs (Defra) to develop primary approaches, networks and guidance but has since attracted further government funding to maintain the project network and promote best practice. The initial project was conceived following the post-spill monitoring programme developed as a result of the MSC Napoli (a container vessel) incident on the south coast of the UK in 2007. This was a complex incident with both oil (fuel oil) and chemicals (from containerised cargo) spilled in an area of high ecological and societal importance. An effective monitoring and impact assessment (Law et al. 2008) was successfully conducted, but the lack of significant pre-consideration for the conduct of the monitoring programme made it more challenging than might have been the case.

The Premiam project was developed with a number of simple overarching objectives:

- To work collaboratively to review and improve post spill environmental monitoring and impact assessment practices.
- Develop, maintain, review, improve and supplement post-spill monitoring guidance documents and databases.
- To provide a coordinating framework for the UK, to be able to support and promote best practice in science, co-ordination of post spill monitoring and impact assessment practices following marine spill incidents.

- To promote the generation of high quality evidence and guidance to responders, policy advisors and decision-makers.
- To share information across government departments to provide consistency and expertise, to reduce costs to the public.
- To promote collaboration and discussion between the relevant parties and wider stakeholders including industry representation and other non-government organisations.
- To provide a forum in which emergency response and preparedness evidence gaps can be identified, research needs considered and communicated to government and other stakeholders.

Substantial achievements have been made since the projects inception but these fundamental objectives remains relevant today as authorities attempt to maintain and improve preparedness in the absence of a recent major incident to focus the minds of funders and policy makers. Some of the most noteworthy developments are described below:

Post-spill Monitoring Guidelines

A core output from the programme has been the Premiam 'Post-incident Monitoring Guidelines (Cefas, 2011) which were developed to establish a basic framework and scientific principles for the conduct of post spill monitoring. They include a range of key questions that need to be addressed when developing a monitoring programme and go on to describe key approaches and methods and how they should be used as part of an integrated plan. Importantly the guidelines advocate the use of methods and approaches on a case by case basis ensuring that the programme is specific to marine spill scenarios. The guidelines cover aspects such as survey design, sampling strategies/methods, transport & storage and key methods such as chemical analysis (e.g. PAH analysis), ecological impact assessment for a range of habitats and ecotoxicology (e.g. water/sediment bioassays and exposure biomarkers).

The guidelines were distributed to all relevant agencies across the UK and have been downloaded from the Premiam website over 300 times. While not a standard protocol nor covering all the detail required for incident specific approaches these guidelines provide a scientifically robust basis on which responders can design their protocols. They are also widely referred to by internationally respected response organisations such as ITOPF (Nicky Cariglia, *Pers. Comm. ITOPF*).

The Premiam guidelines are currently undergoing a review and refresh and the updated version is planned for publication in the summer of 2017.

Management and Coordination

Even with the guidelines available the monitoring response programme still needs to be effectively coordinated. Therefore, as well as establishing robust scientific guidance the Premiam initiative has also established the concept of a PMCC (Premiam Monitoring Coordination Cell).

The PMCC (or equivalent) is an expert group responsible for the overall conduct and integrated co-ordination of monitoring and impact assessment activities following a marine incident.

Its specific responsibilities include:

- The initiation and development of a co-ordinated monitoring programme in line with the Premiam post-spill monitoring guidelines.
- The formation and management of a 'monitoring team' to undertake the monitoring activities.
- The maintenance of strong communication links to any formed groups as part of the response process (E.g. Environment Group (EG) or Scientific Advisory Group for Emergencies (SAGE) in the UK).

- The management and maintenance of financial and expenditure records pertaining to any initial monitoring activities (including liaison with and payment of any sub-contractors used).
- Overseeing the generation and publication of reports as necessary. These will include i) regular/routine updates, and ii) interim and final monitoring and impact assessment reports.

The PMCC (or equivalent) has been established in all four countries of the UK. The exact process for initiating and managing the group activities varies slightly depending on local/national circumstances but the concept introduces some important benefits:

i) Clear line of responsibility for initiating and conducting monitoring activities.

ii) Chaired by a pre-named expert in marine monitoring (the PMCC chair) ensuring the necessary level of scientific rigour.

iii) The chair is tasked with ensuring the costs of the monitoring programme are captured and that it is conducted in an integrated and cost-effective manner (this includes when to cease certain monitoring activities).

iv) Pre-named chair also enables a core expert group to undertake preparedness activities and training in the absence of any incidents.

A guidance document regarding the initiation, management, coordination and funding of the monitoring coordination cell has been developed (one each for England, Scotland, Wales and Northern Ireland to reflect national differences in implementation).

Dissemination and profile raising

Prior to the Premiam initiative, the issue of post-spill monitoring and the capability for national authorities to undertake such activities was rarely considered until such time that it was necessary. This resulted in delays in monitoring initiation and less than optimal coordination and cost-effectiveness because of a lack of pre-preparedness.

An important aspect of the Premiam initiative has been to raise the profile of the importance of effective post-spill monitoring and to act as a national (and international) focus for government and industry representative bodies with an interest. The initiative helps to maintain a focus on post-spill monitoring in several ways including the convening of an annual steering group of all relevant UK government departments and agencies and, more recently, a Premiam/industry sub-group with representatives from the oil & gas, shipping, salvage and insurance/compensation sectors.

Outputs from the initiative are disseminated via a website (www.cefas/co.uk/premiam) and through scientific publications and conference presentations. A biennial conference, with a range of expert speakers, is also held (so far in 2012, 2014 and 2016) to provide a forum for discussion and networking.

Integration of Premiam into the UK National Contingency Plan and Exercises

The UK National Contingency Plan (NCP) is maintained by the UK Maritime and Coastguard Agency (MCA). Its overarching purpose is to provide a framework and process to ensure there is a timely, measured and effective response to incidents of, and impact from, marine pollution from shipping and offshore installations. At the time of the MSC Napoli incident (2007) the current NCP made only cursory reference to impact monitoring since there was no agreed structure or process to initiate and manage the process prior to Premiam. In the light of the Deepwater Horizon/Macondo incident, the UK NCP was refreshed and reissued in 2014. Under a new section entitled 'Environmental Monitoring and Impact Assessment' specific reference is made to the Premiam guidelines and the establishment of a PMCC (or equivalent) as part of the response.

The UK holds national response exercises every three years and the most recent, Exercise Grey Seal, was held in November 2016 and simulated a major oil spill from a shipping collision off the east coast of England. The PMCC process was fully exercised as

part of the operation, the first time in the UK that post-spill monitoring was fully included within a national response exercise. Important lessons from the national exercise, especially regarding communications and reporting processes, are being taken account of in the Premiam guidelines update.

CHALLENGES

As is evident in the previous section the Premiam initiative has resulted in significant improvements in the UKs preparedness for conducting post-spill monitoring. However, maintaining an appropriate level of preparedness offers several challenges which are subjects of ongoing attention by the Premiam steering group. In this section four examples are highlighted.

Skills and expertise

The maintenance of scientific guidance and the establishment of coordinating roles and frameworks are essential elements of an effective post-spill monitoring plan. However, without the availability of personnel with the necessary skills and expertise to implement a monitoring plan the benefits of a coordinated and integrated approach cannot be realised. The environmental impact monitoring of a complex spill scenario will require a broad range of expertise. Skills required might include; survey managers, chemists, ecotoxicologists, marine ecologists (of several types), fisheries scientists, oceanographers and modellers. Experts with direct experience in the use of techniques in actual spill scenarios are also at a premium. In addition to these scientific disciplines, individuals with other key skills, such as navigation, equipment deployment/maintenance, communications, data and project management will be equally important.

Activity during the early phases of the Premiam project helped to develop a database of service providers that was searchable by skill and geographic region. Such databases can

provide a useful tool for the monitoring planning team during initial response phases to provide prompt options for essential service providers to assist with sampling and analysis. However, unless resources are constantly available the information on such databases quickly goes out of date. Key expertise also generally resides in experienced personnel a proportion of which retire between major incidents (especially when there can be 10+ years between them). Furthermore, the types of skills required for post-spill monitoring are generally available in key scientific institutions but as funding is reduced for other relevant activities (such as national environmental quality monitoring) that maintain their expertise their availability becomes a higher risk factor.

There is a real challenge to maintain the necessary skills base for spill response during times when no major spills occur and securing access at short notice when an incident does happen cannot be guaranteed without appropriate contractual arrangements in place. While this happens for major response and clean-up operations it is not a common situation for scientific environmental monitoring.

Funding

The conduct of environmental monitoring programmes can require significant financial resource. The question of 'who pays' (for environmental monitoring) is one that is not straight forward to resolve. Firstly, mobilisation of sampling operations must be committed to early if baseline samples are to be collected before an oil spill impacts an important coastline or resource so discussions about who is liable for the cost can cause unacceptable delay. In the UK (specifically England) several key government agencies have agreed to make available a limited sum to enable the initiation of monitoring to take place. Importantly, authority to commit this spend in the first hours of an incident is delegated to the chair of the monitoring coordination cell. Exactly where the ultimate costs fall can be discussed later and even amongst associated government departments there can be

uncertainty about who has ultimate responsibility depending on the type of resource the monitoring is aimed at protecting/assessing (e.g. tourism, water quality, conservation, human health, marine food-sources, fisheries, etc.) or what the source of the pollution is (e.g. shipping, offshore industry, land-based, etc.).

In general, most agree in the polluter pays principle and through various insurance and compensation schemes relating to spill incidents funds are often available against which to file claims for monitoring activity. However, the speed at which these act and uncertainties about where liability lays mean they are of little use when committed resources for initial monitoring are needed almost immediately. In the UK an Industry Premiam sub-group, with representatives from the shipping, oil and gas, insurance and response communities has been formed to help address some of these issues. However, in these ongoing times of austerity it can be difficult to get commitment to spends to support improved preparedness so this remains an ongoing challenge.

Stakeholder Support & Consistency of Approach

An effective monitoring programme is one that is fully supported by all relevant stakeholders. Major marine spills are not only highly emotive but generate interest both directly and indirectly from many stakeholder organisations. Taking account of government, industry, local and NGO interests alone the number of organisations with an interest in post-spill monitoring and impact assessment is likely to exceed 50 entities. Each stakeholder may advocate different approaches and priorities for the monitoring activities dependent on their specific interests. This provides a challenge in deciding the appropriate approach and priorities but through the Premiam initiative the guidelines and other approaches have been disseminated and widely consulted upon in advance and, in this way, as much consensus as possible is sought. Ultimately, however, having an expert PMCC chair should ensure that any priority decisions are based on sound scientific understanding.

CONCLUSIONS

This paper has described the benefits and importance of effective post-spill monitoring and impact assessment. A wide range of government agencies and other stakeholders (including the public) have a direct interest in the outcomes of an effective programme to understand what the detrimental effects have been to marine and coastal resources, to establish the risks associated with using the marine environment or eating marine derived food and in understanding the effectiveness of clean-up operations and when any risk have diminished to acceptable levels. These aspects are informed via effective environmental monitoring.

The theme for this year's International Oil Spill Conference is ***Prevention, Preparedness, Respond*** and ***Restore***. The establishment of effective post-spill monitoring may not contribute substantially to the ***prevention*** of spills but there is a close link to the other three elements. Through initiatives such as Premiam in the UK the level of ***preparedness*** to undertake prompt marine monitoring has been improved. A heightened level of ***preparedness*** enables a quicker and more effective ***response***. Indeed, faster delivery of monitoring data can help to direct ***response*** and clean-up operations more effectively. Finally, it is only through the collection of effective monitoring data, compared against pre-collected (if possible) baseline data, that the full impact of a spill be ascertained. The effectiveness of clean-up and other ***restorative*** activities can only be assessed through the application of effective and scientifically robust environmental monitoring and assessment techniques to understand recovery.

In summary, the UK Premiam initiative has generated several outcomes that has enabled an improvement in the preparedness to conduct prompt and scientifically robust post spill monitoring. Primary amongst these have been the scientific guidelines but also the

implementation of a coordinating framework with clear lines of responsibility to enable the guidance to be used effectively. Nevertheless, it is recognised that maintaining preparedness and the ability to respond is a challenge that requires an ongoing commitment. Maintaining an appropriately trained and experienced skills base that is accessible at short notice is a significant issue, especially during periods when no major spills have occurred for some time. Regular inclusion of post spill monitoring activities in response exercises is important in this respect. The generation and acceptance of a common approach across a range of stakeholders is also an ongoing challenge.

The Premiam initiative continues to promote best practice in post-spill monitoring and has demonstrated some success at a national level. However, the need to access a prompt and effective monitoring and impact assessment capability is an international requirement and, therefore, the scope for cooperating across international boundaries in terms of sharing best-practices, agreeing common approaches and offering appropriate expertise is something that should now be given greater attention.

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