MODULE 4, LESSON 5

ENVIRONMENTAL RISK ASSESSMENT AND IMPACT

ASSESSMENT IN A DSM CONTEXT

LECTURE NOTES

Hello everyone. Welcome to this lesson on environmental impact assessment in the deep sea. My name is Malcolm Clark. I've worked on lips ecology and fisheries for about 40 years. Much of my research has focused on evaluating effects of human activities such as commercial fishing and potential seabed mining in the development of ecological risk and impact assessments to improve our management of the environment.

In this lecture, I'm going to describe some of the basics of environmental impact assessment. The talk is fairly high level. The focus on bigger picture, primarily scientific issues and I won't be delving down into a lot of detail. The background to environmental impact assessment, the deep sea, is one of human pressures from activities such as fishing, oil and gas and potential seabed mining. There are a range of impacts from the surface through the water column to the seabed. Such impacts have effects both vertically over several thousand meters and horizontally in the open motion over possibly thousands of kilometers. Clearly, these impacts need to be assessed to determine if the benefits to society are important enough or if the activities pose too much risk to the sustainability of the environment. Providing all the necessary information for the decisions to be made is the role of the environmental impact assessment EIA for short. EIA is a process it identifies, predicts, evaluates and proposes mitigation measures to cope with the environmental effects of development, to inform a decision by managers of whether an operation should be permitted.

As you can see in this figure on the right there are a number of components to this process. Screening - are the impacts, enough to actually need an EIA? Scoping a very important component; This is planning in detail what needs to be done for the EIA. The assessment phase, identifying the impacts, analysing their nature and their extent. Then mitigation - what can be done to reduce the effect; this gets rolled into the EIA report. And that in turn provides the basis for review and decision-making, which is informed also by the planned management, what needs to be monitored as the operation proceeds. It's not a simple one-way flow; there is feedback between the components and also considerable stakeholder, including the public under UNCLOS involvement and engagement.

There are three main scientific components of the EIA process. The first is risk assessment. This is to identify the main threats and risks, determine their importance and inform what key baseline data and studies are needed to address those issues. Secondly, impact assessment - to describe and evaluate the impacts on the ecosystem, identify what can be mitigated and managed and what can't be and to produce options to consider further. This should focus on the main risks which are going to be the important ones for decision makers to consider. Thirdly, environmental management. The environmental management plan, which is often referred also as EMMP, which is environmental management and monitoring plan. This is to determine the specific mitigation measures, the monitoring actions, management decision points in order to effectively deal with impacts of the operation and achieve the required environmental goals and objectives. These are closely linked as an integrated package that can change with review. Note the two-way arrows in the figure as more information is gathered and understanding improves, it can affect earlier parts of the process. I

'll now go through each of these components just quickly and briefly. To give you a better idea of what they are like and how they are done:

- Firstly, environmental risk assessment ERA. This is about determining the risk to the environment from the planned operation and of not meeting various management objectives which are often related to the extent of permissible damage. So it looks at aspects going back to my first slide with things like physical damage from mining vehicles or from draw nets. Sediment plumes generated by seabed disturbance, discharge of waste into the water column, those sorts of things. It's a well established process. There are existing international standards and guidelines, but it's often taken too lightly, especially in the early stages of a proposal where developers might want to find out if the resource is sufficient before worrying about what they need to learn about the environment. That delay is the start of important baseline data collection. There are several phases to an ERA which you can see in the Flow chart here. Identifying the risks, then analyzing the nature and extent of them and evaluating what could be serious. And hence subsequently to inform how these risks could be treated and managed.

  There are different levels of ERA as you increase the amount of data and complexity of the scientific methods. Level 1 is largely qualitative. It's a first cut identification of risks and evaluating which might be significant. This is often based on, not a lot of data and literature search and expert opinion. Importantly, it identifies, though, where the major gaps in knowledge are, which need to be addressed and filled. In the baseline data collection stage, often during exploration in the case of seabed mining, that will better inform the EIA further down the track.

- Level 2 becomes more quantitative list driven by opinion, more by data. It uses more robust data and more formalized analysis methods. This is going to underpin whether the EIA in its report is focused correctly and whether it can do a good enough job to assess sufficiently the main risks.

- Level 3 takes this further using ecosystem type models. It requires a lot more data, becomes

more absolute rather than relative in its determination of risk. It's something we should strive for, but it might be very difficult in the deep sea. However, the point of this slide is that you can see there can be several ERA's during the course of development of an operation. As environmental data improves, and perhaps also as the technical specification of the operation makes it clearer what impacts can be managed and what can't.

My final slide on. ERA, is trying to simplify it. It's a really important concept which as I said earlier, is often not considered early enough in the process or taken seriously enough. An ERA is going to have various forms and which results will be shown and they can get really complicated. However, an ERA will always include considering Two key elements, the sensitivity of the system to impacts caused by the proposed operation and the magnitude of those effects. A simple matrix can show you how the risk profile can move along a gradient of these two aspects from negligible - which case we don't need to worry about it too much , through to major. The boundaries between such categories are always cause a debate, but with an ERA, it's generally the moderate and the major categories of risk that are going to be significant for the environmental impact assessment.

So, moving on to the EIA stage itself, this involves a lot of baseline data in scientific analysis. The EIA report with the environmental impact statement, as it's often referred to brings all this together. It describes the initial environment before there's any activity. It identifies the key sources of impact that will pose a risk to environmental sustainability. It will then predict the effects, the overall changes that impacts will cause from the full scale operation. And we will identify what mitigation and management measures could be used to reduce the risks. It's generally a comprehensive and integrated report covering many regulatory, geological, oceanographic, ecological, and sometimes societal elements, as you can see in this table in the bottom right hand corner.

A key outcome of this EIS or EIA report, is likely to be there is high uncertainty about a lot of the data and the nature and extent of impacts from a full operation, especially in the deep sea and especially where the industry is new, such as potential seabed mining. Whether this uncertainty is a reason to reject the application or whether the risks can be managed in an acceptable way is the critical role of the EMMP. It defines the measures to prevent and minimize the identified impacts from the EIS and very importantly, what monitoring is required in future to assess the actual impacts compared with what was expected and what resultant actions will need to take place. An important concept and formulation of the EMMP and for environmental management in general is the mitigation hierarchy, shown here as an inverted triangle to emphasize the most important things we want most of at the top. If significant impacts can be avoided, prevented by the proposed operation in its design, then there is no problem. But activities in the deep sea, such as bottom trawl fishing and seabed mining almost certainly going to impact the ecosystem, so the focus needs to be on how can impacts be minimized to acceptable levels. The minimalized element of the mitigation hierarchy is key in terms of how equipment can be designed or how the actual operation itself is carried out to reduce impact.

Once impacts are minimized, then we have options of potentially rehabilitation or restoration of the habitat where the damage is remedied after mining stops, but like making a lake on land out of an open cast mine. And there are offsets in the hierarchy as well, where there's a swapping of damaged areas to something else, like a shallow reef area. Both of these concepts, however, are challenging, if not unrealistic options in deep sea given the legislation, the scientific understanding of the structure and function of the deep sea and societal expectations. So, minimizing the residual impact - what's leftover after everything is minimized is the key question the EMMP has to answer. What are likely to be really important options are those of special management, open and closed areas and controlled and slow development with a management plan that's well defined and in place to adapt operations based on the monitoring results, so if things start to deviate from what we expect, we can alter the operation or stop it in time to prevent serious harm.

In this in this brief description. I think you've probably started to get an idea that carrying out a comprehensive and robust EIA process is complex. It takes time and it can be expensive. Several have been done in various national jurisdictions where seabed mining has been applied for. All have had their problems. But some of the key issues identified amongst them can be useful for the International Seabed Authority going forward, the first of these is not enough baseline data, so the impacts of the operation on the wider environment and ecosystems can't be adequately assessed. Also there's often not enough attention paid to adopting an ecosystem approach to assessment rather than detailed description of the various types and components of fauna and consideration of cumulative effects is really important, which is the need to account for other sources of impact, other human activities, multiple mining operations, climate change, etc. And arguably most important, it is not considering how uncertain the data are, and how this is or isn't accounted for the analysis and the overall evaluation.

A lot comes back to the need for a good ERA at the outset and thorough scoping of the environmental impact assessment itself, so that it focuses on the main impacts and can address them well. So, in conclusion there is a complex array of impacts that need to be considered in an EIA. Extensive multidisciplinary research is needed at a range of both spatial and temporal scales if the underlying data are going to be adequate. An effective EIA starts with a strong risk assessment to focus the baseline data and studies required to understand the impacts. That will then require multiple studies, extensive surveys to establish the pre-activity baseline - what is needed to monitor the effects of the operation. And each type of deep-sea resource and mineral type will be different in what's required - one size does not fit all. There is a strong link between the risk assessment, the impact assessment report, the impact statement and the environmental management plan. EIA is an integrated process and it's a package. Each component is dependent on the others to inform the decision-making process. And finally, handling uncertainty is one of the major challenges in any new activity that we've seen. The one that will likely require a high level of precaution, if we're going to successfully balance exploitation with sustainability of the environment. Thank you very much for your attention.