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The monitoring debate: can we do it smarter?

IADC secretary-general **René Kolman** considers whether adaptive monitoring can help save money and time

Monitoring at dredging sites for port expansion and maintenance is a necessary element in the planning and development process. It provides invaluable data for both the client and the contractor to minimise environmental impacts while simultaneously optimising the design. It also helps in communicating accurately with regulators, the public, and other stakeholders who may doubt the dredging process. But what and how to monitor continues to be debated, often to the detriment of gathering useful data.

In practice, a great deal of time is spent on compliance monitoring, far from the actual dredging site. Day after day data is assembled and the result of all this effort is vast amounts of information with little value.

Compliance monitoring will always be needed but it should be conducted in a smarter way, with a focus on relevant issues and uncertainties. 'Adaptive monitoring' can be a management solution that gives better long-term research results and increased credibility among all parties.

The dredging industry understands the need for monitoring and has done so for a long time. As a result it has invested in equipment and research to supply the required data to ensure dredging causes as little disturbance as possible. But how can we avoid monitoring for the sake of monitoring?

For most major dredging projects, five parties are involved: the government that issues permits; the owner, such as the port authority; the stakeholders;

the contractor that will do the work; and in some cases a financier, such as the World Bank. Each has a vested interest in understanding the potential environmental impact.

Monitoring of large projects usually takes place before, during and after dredging and maritime construction. It establishes an environmental baseline, which recognises natural occurrences such as storms, as well as human activities unrelated to dredging, such as shipping and fishing. It takes into account both seasonal and geographical variations. For example, for the Maasvlakte 2 project at the Port of Rotterdam the environmental impact assessment (EIA) ran to 6,500 pages, of which more than half were devoted to dredging-related items.

After many years of unrestrained industrial development, owners and stakeholders are often concerned that dredging may cause more harm than good, and so the facility's owner, environmentalists, the dredging industry, and sometimes the courts, tend to be overly cautious. Furthermore, monitoring can be driven by short-term funding and political motivation rather than scientific enquiry. It can ask the wrong questions or not make use of previous data or predictions.

In contrast, adaptive monitoring tries to pinpoint where potential problems lie by asking defined questions before monitoring begins.

Lindenmayer and Likens's paper *Adaptive monitoring: a new paradigm for long-term research and monitoring* (2009) describes adaptive monitoring as the "traditional scientific method of posing and then answering questions".

It continues: "Adaptive monitoring provides a framework for incorporating new questions into a monitoring approach for long-term research while maintaining the integrity of the core measures. Initial key steps are the development of critical questions and a robust statistical design."

To the question "what should be monitored?" the response should be: "What is the crucial question?" assert the authors.

The idea is that researchers should pose specific questions that are determined before monitoring begins; the monitoring programme should have a firm statistical design and be founded on a

conceptual model of how the ecosystem might work; and the questions should be motivated by a 'need-to-know'.

The scale of a monitoring programme should reflect the size of the dredging project and aim to be cost-effective. It should be in proportion to the potential impacts caused by the project – be it maintenance dredging or a port expansion. In the case of the Maasvlakte 2 project the monitoring process is 1% of the dredging costs.

It is important to note that not all monitoring methods are applicable to all projects. For smaller projects, radar and satellite-based monitoring or ADCP may be unnecessarily expensive. Monitoring programmes should not be 'over-dimensioned'. Too often, to ensure that all possible instantaneous impacts are detected, monitoring plans contain irrelevant requirements.

Making use of 'old' data is an important feature of adaptive monitoring, but if a project is being carried out on a greenfield site this data may not be available. In principle, though, all available data, including previously obtained data and insights gained on similar projects elsewhere, should be considered.

As the monitoring programme evolves, new questions may be asked, resulting in new methodologies being implemented. Such a programme is responsive to changing circumstances and will be far more economical and achieve better long-term results.

A well-planned monitoring programme can predict what impacts may occur and, if they occur, what mitigating measures can be enacted. These impacts must be considered in view of the benefits of the project and these benefits should be balanced against acceptable and unacceptable impacts.

Adaptive monitoring helps port authorities and contractors to make this evaluation. It helps them prepare a comprehensive dredging plan, respond to a potentially detrimental situation before it becomes a serious threat and weigh the advantages and disadvantages of a port construction project and the financial consequences. It will, it is hoped, give transparency and thus establish a basis of trust and confidence in the project among all stakeholders.

Finally, a well-defined adaptive monitoring programme can be used to fill in the gaps in the knowledge of the ecosystem. In this way, risks can be properly assessed and accumulated data can be used for planning future projects.

Adaptive monitoring can help evaluate when and how much monitoring is appropriate and can help avoid spending money to prove something that previous scientific studies tell us is not really an imminent danger or has no real impact.

Not every dredging project needs the same extent of monitoring. Sometimes less will be more: more efficient, more cost-effective and more accurate. **PH**

A silt profiler being placed overboard by a scientist carrying out monitoring

Adaptive monitoring tries to pinpoint where the potential problems lie

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IADC is the International Association of Dredging Companies
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