DREDGING INFRASTRUCTURE

Environmental regulations are not the enemy

The dredging industry worldwide is transcending from a compliance-driven approach to a cooperative relationship with sustainability—including environmental and social concerns—for a win-win solution. ***René Kolman*** *writes.*

The issue of dredging and maritime infrastructure construction is often framed is an adversarial relationship between environmental regulations and economic progress. However, in the present context, that relationship is far from accurate. It is to everyone's benefit that this attitude of conflict is being replaced by an enhanced interest in cooperation. Growing public awareness and concern endorse the view that sustainability is paramount. However, misconceptions about dredging abound.

DREDGING HAS ALWAYS BEEN A NECESSITY

In its simplest form, dredging involves the excavation of material from a sea, river or lake bed and the relocation of the excavated material elsewhere. It is commonly used for maintenance dredging, that is, to improve the navigable depths in ports, harbours and shipping channels. By its very nature, however, the act of dredging is an environmental impact. It is, therefore, of utmost importance to be able to determine whether planned dredging will have a positive or negative impact on the marine environment.

Evaluation of environmental impacts should examine both the short- and long-term effects, as well as the sustainability of the altered environment. Awareness of the repercussions of change is essential. Some of these are:

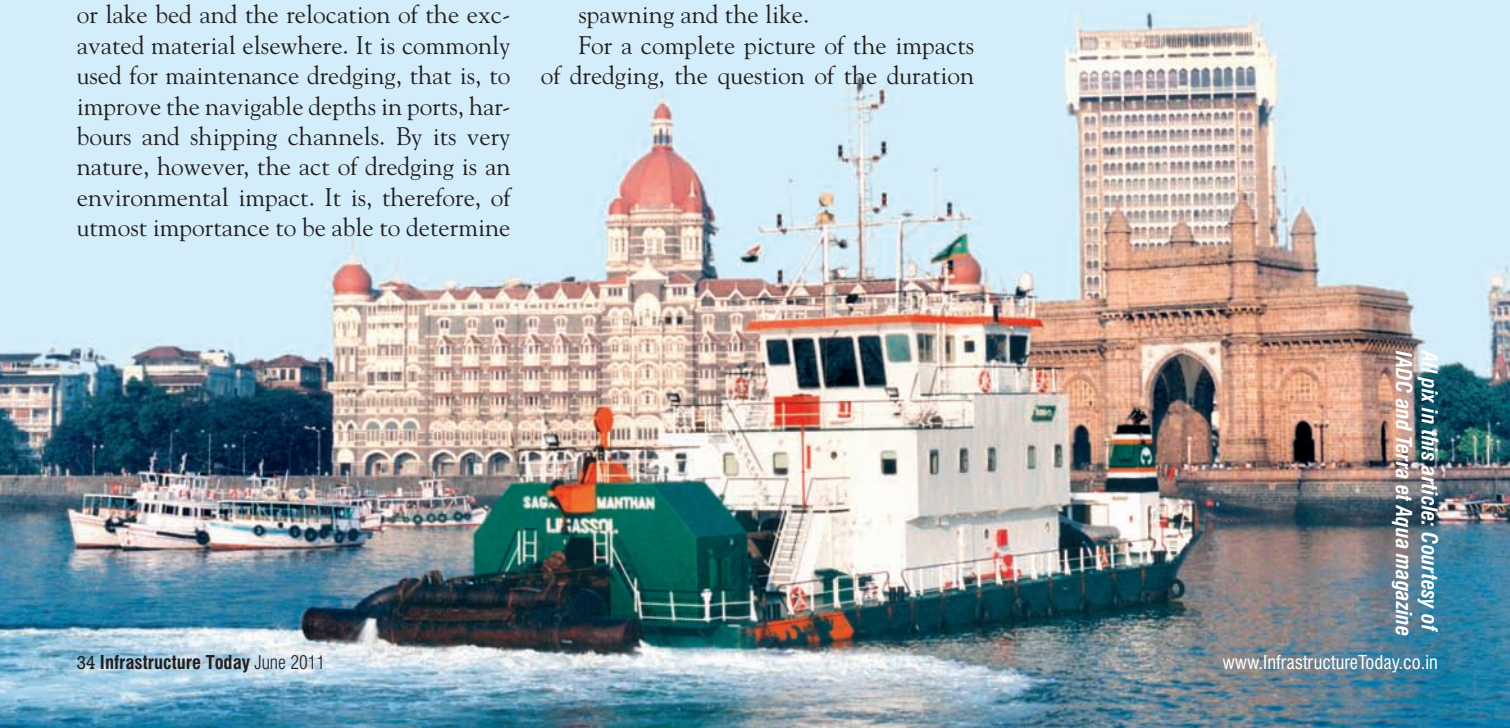
- Alterations to coastal or river morphology may result in enhancement or loss of amenity, addition or reduction of wildlife habitat;
- Alterations to water currents and wave climates may affect navigation, coastal defence and other coastal matters;
- Reduction or improvement of water quality will affect benthic fauna, fish spawning and the like.

For a complete picture of the impacts of dredging, the question of the duration of such effects must be considered. Environmental effects of dredging may include increases in the level of suspended sediment in the vicinity owing to the excavation process, the overflow while loading hoppers, and the loss of dredged material from hoppers or pipelines during transport.

At the placement site the disturbance or loss of benthic fauna may occur. Most often, however, these effects will change the environment to a lesser extent in the long term than will be immediately apparent in the short term.

DREDGING VS OTHER MARITIME ACTIVITIES

Comprehensive and detailed investiga-



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tions of environmental characteristics are frequently an essential prerequisite for any planned dredging activity, together with an assessment of all the potential pros and cons. The re-suspension of contaminated materials especially poses problems and demands rigorous scientific analysis.

Neglecting environmental issues in the past has resulted in the present dire situation in many industrialised and developing nations, where rivers, ports and harbours contain soils that have been conta¬minated by undesirable levels of metals and chemical compounds. When dredging in these soils, contaminants may be released into the water column and from there into the food chain. Thus, the environmental effects of dredging and relocation of the dredged material may be more severe than when dredging clean material and will require closer scrutiny.

Yet, frequently, the level of suspended sediments generated by dredging activities is no greater than that caused by commercial shipping or bottom fishing operations, or even from sediments generated during severe storms. Unfortunately this is often difficult to demonstrate without undertaking comprehensive studies, which tend to be costly but often prove to be a worthy investment.

EARLY CONTRACTOR INVOLVEMENT

Still, anyone involved in dredging projects has come up against delays, postponements and risks. And the question always arises, if belatedly, how could we have avoided this situation, what can we do differently in the future?

Early contractor involvement attempts to get all contracting parties on board with a project, by defining the responsibilities and risks before the project commences. It will ultimately eliminate or minimise unwanted surprises and result in a more cost-effective and efficient operation.

The Melbourne example: The situation at the Port of Melbourne, Australia for the Channel Deepening Project is a good example of this cooperative methodology. To achieve a major expansion, the Port of Melbourne sought a relationship with a contractor of shared responsibility and risk, one based on mutual trust in which the roles, responsibilities and accountabilities of the partners are clearly defined.

An example of the kind of high-tech training being used for dredging personnel: A training simulator for a cutter suction dredger.

This cooperative relationship was instrumental in overcoming one of the major non-technical obstacles to the execution of the dredging works—negative reactions of some stakeholders in the vicinity of Port Phillip Bay. Ongoing discussions and the emergence of a local group of bayside residents who were clearly opposed to the project, eventually led to a court action, which temporarily stopped the dredging operations.

Viewed from the stakeholders' perspective several environmental risks were present including the unique habitats of two Marine National Parks and a RAMSAR wetland. Viewed from an economic perspective, the Channel Deepening Project had a strong, positive business appeal. It is a 30-yearinfrastructure project, with a budget of [US]$640 million, creating 2,300 jobs in construction and 300-500 jobs in operations. The expansion was also necessary to maintain Melbourne's competitive edge in water-transported trade.

Working together with a concerted communications effort to involve the public, the contractor and the port were able to demonstrate the environmentally sound dredging methodology. This educational campaign included public hearings, an information programme and school presentations. It also included extensive monitoring before, during and after the works as well as a multi-level corporate communications campaign. These open and transparent communications efforts played a significant role in reassuring many stakeholders that the channel deepening project could be conducted in a safe and environmentally sustainable manner.

Rotterdam expansion project: For the Port of Rotterdam Authority (PRA), the Netherlands, the Maasvlakte 2 expansion also entailed extensive preparation, environmental awareness and contractor involvement. The PRA decided to apply the Design Construct and Maintenance principle to this huge contract for several reasons:

- To incorporate construction expertise in the design process;
- To avoid disputes between designer and contractor; and
- To make cost savings by having a design made by the contractor with the convenience of construction in mind.

After more than two years of a much-prolonged tendering process, in February 2008, the contract was awarded.

For several years, both clients and contractors of large infrastructure projects in the Netherlands have been experimenting with innovative contracts based on the use

BUILDING WITH NATURE

Another new European effort known as Building with Nature also confronts the demand for maritime infrastructure versus threats to the environment. In Building with Nature, dredging projects are planned, designed and operated whilst creating new opportunities for nature, utilising natural forces (tides, winds) whenever possible.

For instance, traditionally, "hard" dredging solutions such as groynes were built perpendicular to the coast to prevent erosion. Unfortunately groynes initiate rip tides which transport sand away from the beach, literally hollowing out the coast. Using the Building with Nature principle, dredgers places and nourishments in the coastal foreshore. The tides then feed the shoreline and dunes, maintaining or even expanding the dune habitat. Shallow foreshores also reduce wave attacks, decreasing the need for ever-higher flood protection walls and creating space for foreshore habitats, where vegetation grows. This further reduces wave attacks and erosion.

Flanders Bays 2100, introduced in May 2009 by another group of dredging companies and consultants, addresses the complexities of the dramatically receding Belgian coastline, which has reduced the coast to a narrow strip that requires "hard" dykes for protection. The goal is to return to a wide, soft coast, where sand in outstretched dunes, sandbanks and islands provide a natural and flexible protection zone.

of systems engineering. As a result a shift in roles and tasks is taking place in the construction industry in the Netherlands. Clients are increasingly asking contractors to take on the responsibility for preparing designs at a much earlier stage. What motivated this change in approach? The political and social demand for transparency and better process control and the desire to reduce the involvement of the Dutch government and the need to involve the market sector to a greater extent and at an earlier stage in the design, construction and management of infrastructure.

UP-TO-DATE EQUIPMENT AND TECHNOLOGY IS NOT CHEAP

When approaching the rough waters of environment versus economics arguments, the need for state-of-the-art technology and equipment cannot be emphasised enough. Countries which remain closed, like the United States, or semi-closed, like India where a duty is placed on foreign dredging vessels, create an uneven playing field. While in the short run the idea is to benefit the domestic suppliers of dredging services, in the long run these trade barriers work to the detriment of a modernised infrastructure.

The annual R&D investments of the international dredging companies far outweigh that of the smaller domestic or state-owned dredgers. These investments pay off in better equipment, highly skilled employees and scientifically based, environmentally sound working methods.

The complexities of the marine environment, the combination of natural features and phenomena, supporting a diverse but largely concealed, underwater population, make predicting the effects of human-induced changes and short-term operations extremely difficult. Technical and scientific expertise is a must.

Back to Melbourne: For the deepening of the entrance at Port Phillip Bay approximately 400,000 cu m of rock had to be removed to achieve acceptable depths which was one of the first major obstacles. The environmental threats to the Bay's Entrance included the risk of rock falling on deep coral reef habitats in the Entrance, the presence of contaminated material within the Yarra River and the need to store this in an underwater-confined disposal facility (UW-CDF). The effects of turbidity caused by dredging and the amounts of released nutrients could be threatening and needed to be measured and monitored. In addition, the potential loss of heritage, economic loss to the fisheries and the reduction of social values such as recreational activities (diving, fishing, boating and beaches) affected by the noise and visual impacts of dredging and the disturbance caused by turbidity also were issues. Considering the difficulties of the sea, soil and environmental conditions, the project demanded a large investment in R&D to find innovative solutions.

And the contractor was ready to make those investments. Because of the contractor's close involvement, an extensive risk assessment involving all specialists along with the contractor was implemented. Extensive experiments were conducted to determine the impact of biological response to reduced light caused by turbidity. The contractor's R&D department developed an original solution to dredging hard rock in a sensitive environment by developing a new type of draghead—a ripperhead—which could be mounted on a trailing suction hopper dredger instead of a cutter, a feat which had never been attempted before.

Rotterdam's needs: At the Port of Rotterdam Authority (PRA) as well the need for specialised equipment became evident. The Design Construct Maintenance Contract allowed the contractor to develop the design of the sea defence so that it makes optimal use of existing construction expertise and actual knowledge of the equipment and materials available. Partnering between client and contractor that resulted in a new design of the hard sea defence was particularly successful. Because of the volatile wave climate of the North Sea, it was decided to use as little floating equipment as possible for the construction of the hard defence. For installation of concrete cubes (each weighing 40 tonnes) a specially designed crane was developed and constructed.

What projects such as the Port of Melbourne and the Port of Rotterdam expansion at Maasvlake 2 demonstrate is that economic development and environmental protection can work together. When environmental issues arise, and they will always arise, transparency and cooperation are the best remedy. The ultimate objective is to find a balanced method to ensure port expansion and economic development without sacrificing environmental values. The technologies do exist to dredge in a responsible way. It's an investment that may seem costly in the short term, but over time it is the only really sustainable solution. IT

The author is Secretary General of the Netherlands-based International Association of Dredging Companies (IADC), the umbrella organisation for worldwide private dredging industry. Pic: Jim Wilson.