EU POLICY VS ECI
conflict or compatibility

SAFETY’S CHILD
I am my colleagues’ keeper

GOING THE EXTRA MILE
monitoring at Maasvlakte 2
Guidelines for Authors

Terra et Aqua is a quarterly publication of the International Association of Dredging Companies, emphasizing “maritime solutions for a changing world.” It covers the fields of civil, hydraulic and mechanical engineering including the technical, economic and environmental aspects of dredging. Developments in the state of the art and other topics from the industry with actual news value will be highlighted.

- As Terra et Aqua is an English language journal, articles must be submitted in English.
- Contributions will be considered primarily from authors who represent the various disciplines of the dredging industry or professions, which are associated with dredging.
- Students and young professionals are encouraged to submit articles based on their research.
- Articles should be approximately 10-12 A4s. Photographs, graphics and illustrations are encouraged. Original photographs should be submitted, as these provide the best quality.
- Digital photographs should be of the highest resolution.
- Articles should be original and should not have appeared in other magazines or publications.
- An exception is made for the proceedings of conferences which has a limited reading public.
- In the case of articles that have previously appeared in conference proceedings, permission to reprint in Terra et Aqua will be requested.
- Authors are authorised to provide in the “introduction” an insight into the drivers (the why) behind the dredging project.
- By submitting an article, authors grant IADC permission to publish said article in both the printed and digital version of Terra et Aqua without limitations and remunerations.
- All articles will be reviewed by the Editorial Advisory Committee (EAC). Publication of an article is subject to approval by the EAC and no article will be published without approval of the EAC.

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**ON PUBLIC PROCUREMENT RULES IN THE EUROPEAN UNION AND EARLY CONTRACTOR INVOLVEMENT**

FREDERIK J. MINK

Benefiting from early contractor involvement does not necessarily violate the European Union’s principles of freedom to supply goods and services.

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**IADC 2012 SAFETY AWARD: CHILD — “COLLEAGUES, HELP INJURIES TO LEAVE DEME”**

LIEVEN DURT

Hard lessons at a project led to a huge shift in safety awareness, where 4000 employees learnt that each person must take responsibility, not only for themselves, but also for their colleagues.

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**THE MONITORING PROGRAMME FOR THE MAASVLAKTE 2 CONSTRUCTION AT THE PORT OF ROTTERDAM**

WIL BORST AND TIEDO VELLINGA

Compliance for permitting was not enough for the monitoring team at the Port of Rotterdam. When they discovered gaps in scientific knowledge, they initiated more research.

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**BOOKS / PERIODICALS REVIEWED**

Just published, *Hydraulic Fill Manual for Dredging and Land Reclamation* is an indispensable reference work; IADC’s *Dredging in Figures* gives an annual overview of the industry; and Marie-José Jongerius’s *Lunar Landscapes: Maasvlakte 2* shows the art behind the technology.

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**SEMINARS / CONFERENCES / EVENTS**

2013 starts with Batelle’s annual Contaminated Sediment Conference in February in Dallas, Texas; two conferences in Edinburgh; WODCON XX in Brussels in June; and in August WEDA 33 / TAMU 44 in Hawaii.

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Dredging is an industry of new beginnings, of innovations, of long-term steady planning and progress. That goes for equipment, for research and for the people in the industry. As I assume my new position as president of IADC and assess the industry that has kept me occupied for so many years, I’m pleased to be able to announce the publication of a long-awaited and comprehensive new book, a book based on the experience and expertise of the international dredging contractors.

The *Hydraulic Fill Manual for Dredging and Reclamation Works* is a joint venture of CUR Building & Infrastructure (www.curbouweninfra.nl) and CIRIA, the Construction Industry Research and Information Association (www.ciria.org). It represents the combined knowledge and dedication of a large group of dredging professionals. It tackles an extremely complicated but crucial aspect of dredging and aims to give guidance to clients and consultants confronting large hydraulic fill projects, projects which demand extensive technical understanding of design and quality control.

Without proper hydraulic fill and suitable specialised equipment, many major infrastructure projects could not be realised. Ports, airports, roads, residential and industrial construction projects are dependent on the “right” kind of hydraulic fill being used in the “right” way. Collectively, the book represents many years of research and engineering experience in land reclamation and restoration gathered from the contractors, consultants and clients, who have worked on major projects from Hong Kong and Singapore, to Dubai and Bahrain to the Maasvlakte in Rotterdam. As acceptable land fill becomes ever more difficult to find, good guidance and best practices become ever more necessary. *The Hydraulic Fill Manual* adds pertinent information to the body of dredging literature and maintains the excellence that readers of *Terra et Aqua* expect. A fuller review of the book can be found on page 30.

Recently at PIANC’s once-in-a-decade Dredging 2012 Conference, this spirit of knowledge exchange and professional respect was evident as numerous of our IADC member companies gathered to discuss our evolving industry with their counterparts from all over the world.

As always, the articles in *Terra et Aqua* address some of the current subjects that are presently priorities in the industry: Early Contractor Involvement (ECI) and its compatibility with the legal and contractual requirements in EU policy; the constant search for ever higher levels of on-the-job safety; and the significance of environmental monitoring before, during and after dredging projects. These subjects are of primary importance to the international dredging community, be they operating abroad or in their home markets, and are addressed with a sharp eye toward improvement, innovation and cost-effective solutions.

Without dredging some of the most basic infrastructure of our modern civilisation would not exist. With dredging our ports are maintained and expanded, our exports and imports increase, overcrowded urban areas become more livable with new land for housing and industry, our beaches are wider and cleaner and our defences against climate change and flood risk are more secure.
ABSTRACT

From the start of European cooperation (1958), which now as the European Union comprises 27 member states and a population of over 450 million people, the leading goal has been to create economic integration through the creation of an internal market. The European Commission realised early on that the public procurement sector represents a major slice of this economic activity and one that may be put under control of European rules (“directives”).

After a long evolution, the current directive that governs public procurement in all EU member states is Directive 2004/18. Because the subject of “early contractor involvement” merits particular attention, this article reviews the constraints that the EU Directive 2004/18 imposes on the tendering process for complex infrastructure works.

INTRODUCTION

Currently the European Union (EU) comprises 27 member states and a population of over 450 million people. From the start of European cooperation (1958) the leading goal has been to create economic integration. The Treaty for the European Union makes this perfectly clear and provides the basic principles to reach this goal.

The instrument to reach this goal is the creation of an internal market. To underpin one internal market a number of basic rights have been defined: Free movement of persons, free movement of goods, freedom of establishment and freedom to provide services within the Union.

Specifically Recital 2 of the current Directive on Public Procurement states: The award of contracts concluded in the Member States on behalf of the State, regional or local authorities and other bodies governed by public law entities is subject to

the respect of the principles of the Treaty and in particular to the principle of freedom of movement of goods, the principle of freedom of establishment and the principle of freedom to provide services and to the principles deriving therefrom, such as the principle of equal treatment, the principle of non-discrimination, the principle of mutual recognition, the principle of proportionality and the principle of transparency.

While these principles and goals may be quite clear, their application within the Union to public procurement has many obstacles: Established practices, cultural differences, language barriers, differences in market structure, national standards – all of these could result in preferential treatment of one or more bidders.

The European Commission realised early on that the public procurement sector represents a major slice of EU economic activity and one that could be put under control of European rules (“directives”). The current directive that governs public procurement (Directive 2004/18) in all EU member states is the latest in an evolution that started in 1971. Although the rules and practices of public procurement have evolved, the goal remains the same: To ensure that economic operators benefit fully
from the opportunities that an integrated
market provides and at the same time to find
the public benefit that should result from
optimal and transparent procurement practices.
This article reviews the constraints that the EU
directives impose on the tendering process for
complex infrastructure works with an examination
of the subject of “early contractor involvement”.

THE EU PUBLIC PROCUREMENT
DIRECTIVE

Directive 2004/18 provides rules for procurement
of goods, services and works. In this article the
focus is on the procurement of public works.
Special EU rules apply to public tenders for
works above the threshold of € 5,000,000.
The type of contracts covered by the current
directive concerning “works” is limited to
construction, design and construct or public
works concessions. The concept of a public
works concession is not very well defined and
differences of interpretation remain on the
type of contracts that fall under the rules of
public procurement.

Note that other, more complex types of
contracts, in particular public-private
partnerships, are not covered by the specific
rules of the directive, but only by the general
rules of the Treaty. This aspect is discussed
below. The Commission has recently
published proposals to cover more complex
forms of contract with a separate directive.
This development is discussed under the
heading of public-private partnerships and in
the section on upcoming revisions to the
framework of procurement legislation.

Procedures
The current directive limits the procedures for
tendering and bid award to the following
categories:

- **Open procedure**: any economic operator
  may submit a tender in response to a
  published notice.

- **Restricted procedure**: after a round of
  prequalification a restricted number of
  contractors that qualify are invited to bid.

- **Competitive dialogue**: the Contracting
  Authority conducts a dialogue with a
  selected number of contractors in view of
  obtaining professional input and selecting
  state-of-the-art solutions for particularly
  complex projects.

- **Negotiated procedure**: if, for a particular
  invitation to tender, no satisfactory proposal
  has been received under an open or restricted
  procedure, the Contracting Authority may
  opt to negotiate with one or more
  contractors in view of defining an acceptable
  solution. Additions to the scope of an existing
  contract may also be negotiated under certain
  conditions. The specifics are more restrictive
  but are not developed in this article.

Both the selection criteria and the award criteria
must be published up front in a contract notice.
The current directive emphasises that the
criterion to award the contract to the lowest
bidder may be appropriate for run-of-the-mill
works, but that for more complex projects – and
certainly for tenders in response to functional
requirements – the award on the basis of
“the most economically advantageous” bid
is strongly recommended.

The “Competitive Dialogue”
The current directive provides for a new
procedure, “the competitive dialogue”, which is
intended to be used in the case of “particularly
complex contracts” to obtain input of qualified
contractors in order to define the optimal
technical or financial solution (Figures 1 and 2).

The procedure as outlined in the directive is as
follows:

(a) Indicate selection criteria: Publish a
    contract notice that defines the needs and
    requirements of the Contracting Authority
    with an invitation to indicate interest to
    participate in the competitive dialogue.

(b) Select from the responding contractors
    those that qualify considering capabilities,
    experience, financial strength....

(c) Maintain the principle of equal treatment:
    Open a dialogue with a minimum of three
    qualified bidders, in order to define the
    best (technical) solution that each
    contractor could offer in response to the
    requirements. Note that each contractor
    must be treated on the same basis and
    that under no circumstances should
    important information be provided to one
    contractor, but not to another.

(d) Respect confidentiality and intellectual
    property rights: The Contracting Authority
    may not share particularly promising
    solutions of one contractor with any
    others unless authorised by this contractor.

(e) The process is likely to result in a multi-
    track situation with different possible
    solutions in parallel. To make the procedure
    less cumbersome, the Contracting
    Authority may structure the process in
    successive stages and reduce the number
    of solutions at each stage by applying the
    formally published award criteria.

(f) The dialogue may continue until the
    optimal solution or solutions which may
    meet the Contracting Authority’s needs
    have been identified.

(g) If and when the dialogue has been
    concluded all participants will be notified.

(h) The Contracting Authority will then request
    the remaining candidates to submit final
    priced tenders on the basis of the respective
    solution(s) that has/have been specified
    during the dialogue. The competitive
    process requires that at least two
    contractors are retained at this stage, unless
    it can be demonstrated, in exceptional
    cases, that only one contractor can provide
    an acceptable solution.

(i) The tenders may be further clarified,
    specified and fine-tuned at the request of

Figure 1. In March 2012 Femern A/S invited
the international construction world to
“Industry Day” in Copenhagen, Denmark
where some 500 participants from
17 countries gathered to learn about the
construction of the proposed Fehmarnbelt
 tunnel linking Germany and Denmark.
provided that the fundamentals of the tender are not changed.

(k) Award the contract.

(l) The Directive stipulates explicitly that in the procedure of a competitive dialogue the Contracting Authority may foresee a financial compensation for the efforts provided by contractors during the dialogue stage.

Comments on the Competitive Dialogue procedure

The European Commission recognises that standard procurement procedures do not always provide the best results, especially pertaining to the building and design of complex infrastructure projects. The competitive dialogue procedure is an attempt to diversify procurement procedures and stimulate professional input early in the tendering process.

At the same time the procedure is clearly quite complex and not free from pitfalls. The fundamental demand is that the dialogue with different bidders must take place in parallel. Since the Contracting Authority may not share solutions proposed by different candidates, entirely different technical approaches could be developed in parallel, a situation which can complicate the life of the Contracting Authority. The temptation to provide hints to competitors on the strength of a solution proposed by another contractor is very real.

The concern of the Contracting Authority is to keep the bid evaluation process manageable and to maintain effective competition.

The interest of the parties invited to such a dialogue is the opposite: Attempt to be as creative as possible and provide cost-effective solutions, preferably protected by patents that provide an unbeatable competitive advantage. This is likely to make the Contracting Authority feel vulnerable, because it realises early in the dialogue that one of the invited bidders may develop a strong advantage over the rest.

“Particularly Complex Projects”

The European Commission recognised the complexity of the dialogue procedure quite soon. In 2005 the EC published ‘Explanatory Note’ (CC/2005/04) to explicate the competitive dialogue procedure in more detail, apparently because the text of the Directive is not sufficiently clear. One specific element warrants emphasis: The procedure can only be applied for “particularly complex projects” where:

- the Contracting Authority is not objectively able to define the technical means capable of satisfying its objectives or is not able to determine which of several possible solutions is best suited to satisfy its needs, and the technical complexity of an envisaged project is at stake.
- the Contracting Authority is not objectively able to specify the legal or financial make-up of a project. This situation may arise with plans or projects that require complex and structured financing as is the case with most public-private partnerships. Another instance could be when the contractors are expected to carry higher than normal financial and contractual risks in a contract

the Contracting Authority, provided that the fundamental features of the tender are not changed. Variants at this stage of the procedure are not acceptable. Innovative and cost-effective solutions should have been put forward earlier during the competitive dialogue. Clearly the same extent of information should be shared with all bidders. The Contracting Authority will now select the successful bidder on the basis of the most economically advantageous bid, in accordance with the award criteria as published.

(j) Even now, the Contracting Authority may find a need to clarify certain aspects of the tender or to confirm commitments,

They have been put forward earlier during the competitive dialogue. Clearly the same extent of information should be shared with all bidders. The Contracting Authority will now select the successful bidder on the basis of the most economically advantageous bid, in accordance with the award criteria as published.

(j) Even now, the Contracting Authority may find a need to clarify certain aspects of the tender or to confirm commitments,
situation based on performance criteria, for instance with certain forms of turnkey contracts or with concessions where the contractor collects the revenue from the concession as payment.

Most complex contract forms, such as DFBO (design-finance-build-operate) or public-private partnerships, are not covered by the scope of this directive. The “competitive dialogue” format may still be used, but the detailed restrictions of the directive could possibly be relaxed. This aspect is addressed in the new proposal for a directive on concession contracts (see below).

Although the experience with “competitive dialogue” is limited at present, the European Commission has invited feedback on the functioning of the revised Directive in its Green Paper COM(2011)15, “On the modernisation of EU public procurement policy”.

Feedback from the industry
Some feedback from the industry is already available. The question was: “Do you think that the procedures as set out in the current Directives allow contracting authorities to obtain the best possible procurement outcomes?”

The response of the European Federation of Building Contractors (FIEC) was:

On the Competitive Dialogue – There is diverging feedback regarding this procedure according to national experience. It is reported that this procedure leads to confidentiality problems and cherry-picking in some member states, as well as to higher costs and lengthy procedures in general. It therefore requires stronger safeguards: enhancing contracting authorities’ capacity building; addressing the length of procedures with better project preparation according to the subject matter of the contract and the publication of the procedure schedule in the call for tender. Also, it is more specifically appropriate for big complex projects.

The Commission itself, in the Green Paper, remarks:

‘Cherry picking’ of intellectual property rights or of innovative solutions themselves has been raised as an issue of concern, particularly with regard to the competitive dialogue: If a participant discloses the unique features of its solution, these may become known to the other candidates. While the current rules require that such information must be kept confidential, the Contracting Authority is nevertheless in a bind between the obligation to protect the confidential information and the need to disclose some information in order to identify solutions which are best suited to satisfying its needs. Contracting authorities might be tempted to put pressure on tenderers to agree to disclosure.

Finally, the Dutch government amongst others also responded to this Green Paper and pointed out in general terms that the public procurement procedures involve heavy administrative efforts by the authorities and often lead to lengthy procedures. Specifically the Dutch reaction was that the current limits of the competitive dialogue to “particularly complex projects” are too restrictive. The procedure provides more flexibility and interaction with the economic actors and should be allowed more widely for “complex projects” in general.

In conclusion, the EU public procurement rules at this stage restrict “early contractor involvement” to a bare minimum: Only for very complex and demanding projects where a technical, functional or performance specification cannot be established by the Contracting Authority is a competitive dialogue with candidate contractors allowed.

In fact, the scope of the directive is limited to the three contract types (construct, design and build; or simple concessions). In practice particularly complex projects are likely to take on other contract forms, such as DBO or DFBO or build and maintain, or any public-private partnership contract; none of these are covered by the directive. They are thus far covered by the general rules of the Treaty, but these rules are less restrictive: The principles of the Treaty must be respected (equal treatment, non-discrimination, competition, transparency…), but the procedure is not cast in stone.

What about other complex contracts?
The directive on public procurement – as far as works are concerned – takes for granted that in the majority of cases detailed technical specifications are included in the tender documents and in some cases functional or performance specifications. Tender documents are prepared by the Contracting Authority, possibly with the help of a consultant.

Presumably, when drafting the procurement directive, the Commission considered that authorities might lack specific knowledge in drawing up tender documents for “complex contracts” and would organise first a consulting phase, during which one or more consultants would provide the necessary technical input. Only in the case of “particularly complex contracts” would direct input by contractors be necessary because even consultants do not have sufficient expertise for such complexity.

The current rules leave the contractor little room for initiative and do not provide an incentive for innovation. Using the traditional approach, that is, separating design, construction and operation processes has discouraged the private sector from making a fully effective contribution to public works projects as well as discouraged entrepreneurial risk capital (Cowie 1996).

Finding effective ways for more contractor input during the procurement process is important especially for large (infrastructure) works, which seek to optimise the life-cycle cost and to stimulate innovation.

Figure 3 presents a graph of various contract models that are common today, while distinguishing between contract forms covered by the public procurement directive 2004/18 and other, more complex contract forms. It illustrates that most of the more complex forms that would be considered for large infrastructure projects do not fall under the specific rules of the current directive.

On the other hand, a standard tender procedure clearly does not fit the more complex relationships between the Contracting Authority and the contractor.

Risks
For all contract forms that are not classical works contracts, fairly detailed contract negotiations are an absolute necessity. The object of such negotiations is not so much the technical concept and the basis for costing, as the allocation and management
Public-Private Partnerships

The European Commission has begun to reflect on the application of the Treaty’s principles to other contract forms. A good example is the discussion on partnering between public and private actors, which is the core element of public-private partnerships (PPPs) (see COM(2006)569). The Commission makes a helpful distinction between:

- **Contractual PPPs**, where the cooperation between the public and the private party is strictly contractual. This category covers not only concessions, but also the various forms of complex contracts (BOT, DFBO, construct and maintain...)

- **Institutional PPPs**, under which the public and the private party cooperate by forming a separate legal entity. In this category, many different possible structures can be found in practice, all of which include the creation of a separate legal entity, but the method of financing, the shareholder structure, the extent of subcontracting, the division of risk and responsibility vary.

For both classes of partnering, the Treaty’s principles must be respected: Equal treatment, transparency, mutual recognition, competition.

In the first case, **contractual PPPs**, a procedure identical or similar to the competitive dialogue could be followed (publication of a tender notice, prequalification, parallel negotiation, selection, tendering and award). At least two bidders must be retained until the final stage, unless submitting a price tender is objectively impossible and circumstances might justify a negotiated procedure with only one party. This latter case would be the rare exception.

For the class of **institutionalised PPPs**, the problem is even trickier. The selection of a private partner to form a separate public-private entity needs to take place in a process where competition is maintained until the final selection, but nevertheless quite early in the project stage, because legal entities must be established. As the project envisaged (often complex infrastructure) still needs to be designed in detail, selecting the partner with the most economically advantageous offer will be problematic. The selection is likely to be based on qualifications, competences, expertise and financial strength of the private partner. Even though selecting the private partner prior to the “best and final offer” may be the only reasonable solution, the European legislator eyes this with great scepticism. The criticism that the chosen private partner gets preferential treatment is difficult to refute. In short, legal uncertainty on the conditions to be respected during the initial stage of an institutionalised PPP still prevails.

This uncertainty obviously does not encourage public contracting authorities to form an institutionalised PPP. The Commission has finally recognised that the trend towards more private sector involvement may need more specific guidance and has published another communication on the subject, COM(2007)6661 – “On the application of Community law on Public Procurement and Concessions to Institutionalised Public-Private Partnerships”.

Also the Commission has published two new proposals:
- a proposal on revised public procurement directive (COM(2011)896) and
- a proposal on the award of concession contracts (COM(2011)897).

Both take into consideration the feedback received from the public and private sectors on the existing procurement procedures. The further development of these proposals will take place in the coming year.

**EARLY CONTRACTOR INVOLVEMENT**

In terms of the concept of “early contractor involvement”, a review of the European legislation on public procurement and public-private partnerships clearly indicates that the Treaty’s principles give preference to broad competition and leave little room in the proposal stage for relationships with contractors that are closer than at arm’s length. The dominating concern in the various directives is that transparency requires that competition should be maintained throughout the bidding stage.
The public procurement directive 2004/18 does open the possibility for “competitive dialogues”, but only for “particularly complex contracts”. Under this procedure the competition should be maintained to the final bidding stage between at least two contractors. Some problems and pitfalls have been hinted at above. In view of the comments received in a round of consultation on current experiences, the Commission now is proposing to somewhat soften the restrictions and to open the competitive dialogue procedure to all complex contracts where the public authority lacks detailed knowledge on the technical or financial possibilities that may be found in the market (Figure 4). Nonetheless, the requirement that at least two contractors should be consulted in parallel during the competitive dialogue is maintained.

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COM(2011)15 – On the modernisation of EU public procurement policy (27/01/2011)

CONCLUSIONS
The marine offshore and dredging industry has evolved rapidly over the last two decades. The marine offshore and dredging industry has evolved rapidly over the last two decades. A Contracting Authority or consultant may not be aware of new innovative technical options to solve complex problems in a cost-effective manner. Finding optimal solutions may require discussions between the Contracting Authority and potential contractors prior to a proper tender phase.

The EU procurement directive introduced in 2004 offers – for the conventional contract forms (construction of works, design and build, works concessions) – a new method of procurement for “particularly complex projects”, namely the competitive dialogue. This procedure allows for structured interaction with candidates during the bidding process. The dialogue is focussed on technical solutions, but may also cover specific financing or contractual arrangements. This instrument offers a possibility to involve the contractor early on in the procurement process.

The scope of the current directive is formally limited to the above-mentioned specific contract forms. However, complex projects tend to be based on other, more complex contract forms and/or various forms of public-private partnerships. For these contract forms, the rules of the existing directive are not directly applicable, but the principles of the EU Treaty apply.

In order to fill this gap in the legislation, the European Commission has recently proposed a new directive to cover most forms of concession contracts. The procurement procedure must respect the Treaty’s principles and follow similar steps as under the works contract.

In all cases maintaining competition throughout the procedure is imperative. But complexity and sharing of risk necessitates early involvement of contractors. Such early involvement should result in an optimised project structure and balanced life-cycle costs.

The “competitive dialogue” format may offer a suitable solution for interaction with candidate bidders early on in the procedure. The restriction to “particularly complex projects” is not relevant here. The Contracting Authority has the freedom to choose a suitable procedure, provided that it satisfies the principles of the Treaty. Under European competition and procurement law the “competitive dialogue” is thus the instrument that offers the best compromise between the requirement of sustained competition and the need to discuss technical approaches.

The “institutional PPP” is more difficult, because selection of the preferred partner must take place on the basis of objective criteria, yet no final offer has been accepted, because the authority and the contractor plan to enter into a joint venture that will be responsible for the design, construction and operation of the works.

In both cases – “competitive dialogue” and “institutional PPP” – two basic rules must be respected during the selection and award phase: transparency and equal treatment.
ABSTRACT

CHILD is an ambitious safety and prevention project, aiming to increase awareness for dangerous situations and safe behaviour at the workplace; to incite personal responsibility, action and initiative; and to radically change the mindset and corporate safety culture. The unique approach is that top management takes the lead and that the safety department and other corporate divisions have a supportive role to play. The message is threefold: Safety is personal. Safety determines the reputation and future of the company. And safety and efficiency go hand in hand. Unfortunately, a tragic incident on one of the project sites was at the origin of the CHILD programme. Hard lessons were learned before there was healing. The CHILD campaign is the successful answer to some old questions: How to reach over 4,000 individuals in a large corporate structure, and how to get every single person to take responsibility and initiative for their own safety and for the safety of their colleagues.

INTRODUCTION

Simão Macanda was a trainee tugboat deckhand at DEME’s Soyo site in northern Angola, where he was involved in a project for landfall and cofferdam construction, and trenching operations for three near- and offshore gas pipelines. At Soyo, DEME was a subcontractor for two French companies, Acrery and Spiecapag, which were working for the client Angola LNG – a consortium of Chevron, Sonangol, BP and Total.

Simão Macanda was 53 years old and the father of eight children. He was fatally injured when towing operations turned bad and he passed away in a Luanda hospital. He had been working with DEME for just five days. Apart from the personal grief, the accident sent a shock wave through the company. Work on-site was stopped immediately, and both management and external investigators were flown in from overseas. It took 22 days after the accident happened before activity on all vessels could resume – and not before corrective actions had been implemented and other gaps discovered during the gap analysis were closed.

The final close-out report concluded with a concurrence of circumstances and responsibilities, identified as serious shortcomings in the field of equipment, training, procedures, and organisation. But first and foremost was the lack of leadership and accountability. The scathing findings were very confrontational. Although blame was deliberately avoided, the ultimate judgment was rather humiliating. A cruel lesson was learnt. A company-wide soul searching followed. It was obvious that a profound change of safety culture was needed – a change in the way the entire company sees safety. This new mindset required an increased awareness in the first place from top management all the way through to site operators. That was how CHILD was born: an appeal to “Colleagues, Help Injuries to Leave DEME”.

CHILD: THE FIRST STEPS

As soon as corrective action had been taken on the Angola project and activity was resumed, DEME management began facing the broader picture. Why had this turned so bad and what should be done in terms of company policy, organisation, responsibility and long-term measures? We did have a safety policy, didn’t we? We did have an operational safety department, toolboxes, “take-5” moments, even cultural and
behavioural campaigns. We did distribute safety leaflets and special safety issues of our company magazine, or so we thought? We had after all hammered for years on wearing personal protective equipment, RIGHT?

Top management intervened at this point, firmly putting an end to self-pity and self-justification. It was humiliating enough that outsiders had exposed our weaknesses and shortcomings. The way we dealt with safety was sub-standard indeed – and we had to face it. That message came out loud and clear.

As a start, a working group was set up with the mission to come up with proposals and a blueprint for short- and long-term actions. The members were chosen from within the very top of the organisation and from different backgrounds in the company – including men, women, engineers, technical and administrative staff – in order to get fresh ideas and a new approach.

Brainstorming began late 2009. A survey was conducted amongst all levels of the company – on site, on board vessels, at offices. Less than five months later, this resulted in 69 “action points”. Information and statistics were prioritised in risk classes. Based on weight factors for categories such as “near misses”, “first aid”, “medical treatment”, “restricted work” and LTI, a DEME Hazard Top 10 list identified “slipping, tripping, hitting” as the most frequently reported incident during 2010 – responsible for no less than 27 percent of all incidents. Planning, time schedule and proposals for a dedicated safety campaign were submitted, discussed and approved.

As early summer 2010, ideas had sufficiently matured for the formal kick-off.

**CHILD CAMPAIGN LAUNCHED**

The CHILD project, an acronym for Colleagues, Help Injuries to Leave DEME, was born. The
very name of the project of course made a strong association with caring, fostering, shielding, protecting. You do not want to find yourself or your colleague in a situation you would not wish for your own child.

A project manager was appointed, and he was formally given “full authority and support to implement and to co-ordinate the actions generated by CHILD”. A dedicated email address was distributed amongst all crew and staff for CHILD-related actions, questions, remarks and suggestions.

A telling logo (Figure 1) was designed: the blue, falling dominoes at the right side represent dangerous situations and behaviour. Or they can be interpreted as someone in danger, losing control, unsteady, in need of support. They may also be seen as one unsteady person making others become unstable. CHILD seeks to be a dam: The dominoes lean against it, but do not fall. The bold letters underscore the idea of strength. The dam will get stronger if each and every one sticks closely together for the same objective.

Top management gave the starting shot. A letter from the CEO Alain Bernard was distributed worldwide amongst head office, area directors, project managers, site offices, regional desks, vessels, staff and crew. It was dated June 10, 2010, less than six months after the Angola incident. The message presented the new CHILD initiative and focussed on three points:

1. CHILD aims to make safety a personal issue. We take safety in our own hands, as a matter of priority. First we think about our own and others’ risks; then we start working safely. This must become a personal, spontaneous drill and not the result of enforcement.

2. CHILD wants to point out that poor safety statistics reflect badly on the reputation of the company and will eventually jeopardise the future of our organisation.

3. CHILD wants to confirm the fact that safety goes hand in hand with efficiency; a well-prepared and thought-out project is a safe project and will generate a profitable outcome.

To achieve increased safety awareness, CHILD action points will focus on our people, the organisation, the equipment and the procedures.

**CHILD GROWING UP**

As the CHILD action programme was fine-tuned, the focus was narrowed on six priority issues:

1. Safety will always and everywhere come in the first place. Applications of this principle were identified during work execution; work preparation; meetings; internal and external communications; and in the incorporation of risk assessment in the method statements.

2. More focus is put on safe work preparation and safe work planning. This was made concrete by stressing “Take-5”; Risk Inventory and Evaluation (RI&E) and Job Safety Analysis (JSA); complementing Standard Operating Procedures (SOPs); and by organising an increasing number of toolboxes.

3. Safety is everyone’s concern. Every employee has the task to report and to correct unsafe behaviour and situations. Everyone gets the opportunity to propose improvements and new ideas. “Stop-work” authority was explained and promoted by no one less than the CEO. A new Incident Notification and Analysis Form was introduced; Safety Hazard Observation and Suggestion Cards (SHOC) were distributed; and safety was emphasised during the annual feedback talk with crew and staff.

4. A more supportive, documented approach towards safety issues was set up in the company. This includes an overview of the DEME “Hazard Top-10” (Figure 2) more profound safety education; site instruction with regard to health, travel, local legislation, and so forth.

5. DEME management staff is giving the correct example. Seminars for top management, area managers and project managers will be organised; the Project Management Manual (PMM) will be reviewed; safety-related training sessions for staff are to be improved.

6. Clear definition and communication of DEME standards with regard to personal protective equipment (PPE) (Figure 3); point of interests during execution of heavy lifts; how to construct a proper jetty; correct handling and storage of compressed gas cylinders; correct transport and storage of fuel, oil, chemicals, paint and other things; alcohol and drugs policy; towing; explanation about Permit-To-Work (PTW) and Lock-Out-Tag-Out (LOTO) systems; the use of Material Safety Data Sheets (MSDS); minimum requirements for oil spill equipment, and so on.
At about the same time in mid-2010, the Safety Department itself was also re-structured and strengthened with additional staff and budget. Working visits were paid to various major companies that have a reputation for their professional safety policy and good safety record. Lessons could be learnt from their experience.

A “Safety Thermometer” (Figure 4) indicating the progress as the campaign unfolded was developed. After a first announcement in July 2010, a comprehensive article on the CHILD programme appeared in the April 2011 issue of the company magazine. But it was a series of seminars that really triggered the worldwide campaign.

Eighteen CHILD safety seminars worldwide
To start with, two seminars were organized: one for top management and one for area and project managers. Everyone was reminded of the origin of the CHILD initiative, namely the tragic incident in Angola, and the severe consequences both on a personal level and for DEME. Safety is personal, has to do with reputation and efficiency, which was the “red thread” for this 2-day seminar.

To catch broadest possible attention of all colleagues the seminar was setup psychologically for four typical types of personalities:
- In a first session, the statistics and the figures were presented for those who love to analyse and look at the numbers.
- The second session was the presentation of the Angola accident (Figure 5) for those who like to be convinced by the facts. The Angola case clearly points out each and everyone’s responsibility, but especially the responsibility of the managers in the company, starting from the top of the organisation down. This presentation indeed targeted these managers specifically. The Angola case was always presented by the responsible area director himself (also the chairman of the CHILD initiative) who was present during the original accident investigations and who had to deal firsthand with this tragic situation.
- The third session was a theatre play where sketches showed typical and familiar unsafe situations on project sites, played by professional performers to which the audience was asked to respond. This was a particularly interactive show, addressed to people who like to be actively involved with the subject.
- In the fourth session 7 practical workshops were held, where people could feel and touch the latest developments in PPE: As a team safely build a scaffold, practice safe lifting of daily weights and prevent back injuries, experience what safe noise levels are and so on… This session was geared to people who only believe when they can feel and touch it.

In the closing session, people were asked to write down and submit a personal commitment and express where they intended to make a difference in the company from now on. The commitments were collected and filed and will be used for future purposes.

Seminars shift the focus
From now on, DEME would follow a unique approach with regard to raising the safety awareness: In the past, the safety department used to spread the word, but it still left some people in doubt with regard to the real meaning of promoting safety: “Is it not rather efficiency and production that top management is after?” Now, the very top management would take the lead of this campaign. Throughout all the seminars the real message was now clear and direct, because the interactive discussions were personally entertained and presided by the CEO, the COO and other members of the management team. Other departments, including the Safety Division, would play a supportive role because
of their obvious expertise and by way of disseminating the central message and execution. The focus was on the top management. As they were leaving the seminar, every participant was given a few “good viruses” – sweets with the name of the CHILD programme printed on them. It was just one little idea to spread the message and keep it alive on the work floor. And just like viruses are spreading – often even out of control, so the CHILD programme soon became the talk-of-the-day amongst 4,000 staff and crew all over the world. The seminars at senior management level came to an end in January 2011. As from two seminars for senior management. It was deadly quiet, every time the story of Simão Macanda was recounted – universally moving and recognisable. The interactive stage play was so concrete that discussion came up spontaneously, and various initiatives were suggested for correcting situations and behaviour that everyone perceived as familiarly dangerous. And more than anything else: Nobody left the seminar room without a profound conviction that they themselves had to face, to report and to correct unsafe situations and behaviour. That was a major result for the intended change of mindset. Finally, and before a new packet of “good viruses” was “sneezed” through the audience, every participant was asked to commit to one very specific point of action in the field of on-job safety. It was announced that this written allegiance would be followed-up. Listening to feedback after the initial seminars for operational management, DEME decided to organise additional and specific safety seminars for other departments, such as Human Resources. Observations confirmed that language issues and multicultural work environment certainly influence safety matters. Assignment practice, site allocation, availability of technical skills, and replacement of crew asked for alertness with regard to safety implications. Worldwide, a total of eighteen safety seminars were organised. More than 1000 management, staff and crew were directly reached. Very few of those that did not participate, did not catch a word of the safety campaign that had become the talk-of-the-company. Addressing 4,000 individuals in so many work situations in so many countries all over the world had been the biggest challenge. DEME’s successful CHILD safety seminars proved that it is feasible. Safety concerns were no longer just an annoying requirement in a bidding procedure. Safety had become a living issue in spring 2011, the initiative was generalised and similar seminars were organised for operational management, vessel staff, site and desk management. Based on specific feedback or case by case, dedicated seminars were also organised on sites and at desks in Belgium, the Middle East, India and the Netherlands. Some area directors and regional offices began organising the same at their level of authority. Clearly the message had been heard, and the “good viruses” were spreading. No one could escape facing the issue any longer. The programme of each of the following seminars was broadly the same as with the viruses” was “sneezed” through the audience, familiar and recognisable situations relating to slipping, tripping and hitting hazards. 

Figure 6. Three of the posters in the CHILD campaign describe
over the world would be bombarded with an all-round barrage of letters, posters, e-mails and specific actions. There was no way to escape. The “Safety Moment Day 2011” campaign was launched with a letter of September 12, 2011, signed by the CEO, the COO, the chairman of the CHILD campaign and the QHSE-S manager. The aim was explained (“to increase awareness”) and the focus was reminded to be on ‘Slipping, Tripping, and Hitting” – the top priority of ‘DEME’s Hazard Top-10’-list which had been developed and promoted one year earlier by CHILD to focus the attention of the employees on the most dangerous situations. All workplace, site, project and area management was explicitly asked to be visibly present during the campaign, together with the area directors and the other members of the DEME Management Team. Various initiatives and practical arrangements were set forth.

A DVD (Slips, trips and finger nips) would shortly be sent, produced by IMCA, to support the presentation/toolbox to be held on the “Safety Moment Day”. The DVD addresses a variety of aspects, such as: hazard identification; risk assessment; means of control like Permit to Work (PTW); detailed procedures; importance of looking out for each other; safety is everyone’s business; good housekeeping is really important; keep your eyes open; stop and correct, and so on (Figure 7).

An announcement was made that an inspection tour on and about the site/ workplace would be organised by the Management Team, together with the management of the ship, the area, the site. An inspection list and a blank action plan for the inspection tour will be made available.

A series of four letters followed within less than a month, between October 31 and November 23, with reminders, alerts, practical arrangements, requests for feedback. The bombardment was on. The company was under heavy shelling now and no one could hide against incoming shrapnel.

SAFETY QUESTION OF THE WEEK
To make the impact even harder, a parallel “raid” had been launched quite some time before with regular and continuous safety alerts by e-mail. Not the common e-mails that go unnoticed and disappear as spam before they are even read. A special automated format was created on a full A-4 page, with a multiple choice “Safety Question of the Week” to be answered. This was sent to all company e-mail addresses once in a week.

To make things even more enticing, the “Safety Question of the Week” was linked to a prize winning competition. Safety questions included very recognisable, everyday subjects: eye protection; the correct use of fire extinguishers; hazards related to lifting gear; working with excavators and wheel-loaders; management of subcontractors; the use of portable ladders, and so on (Figure 8).

The “Safety Question of the Week” e-mail campaign was an overwhelming success. Up to 650 answers came in every week. In total, the campaign was able to reach more than 1,150 active participants who answered the safety question on a regular basis.

As a very practical step towards improved protection against slipping and tripping, the Procurement Department selected anti-skid steps that were offered for fixing on stairs in offices and on vessels. An order form was sent out, and every local manager was asked to mark the number of desired appliances with stairs width.

Specifics became clear in a CHILD letter of October 28, 2011:

- Three sets of posters (Figure 6) each are distributed. In a series of telling, colorful comic strips, they draw a picture of familiar and recognisable situations relating to slipping, tripping and hitting hazards. A strong picture tells more than a hundred words. Apart from a reference to the general framework of ‘DEME Safety Moment Day 2011” and the CHILD logo, only two lines catch the eye: Why fall/slip/hit? And a reminder that in 2010 some 27 percent of all incidents in the company were caused by slipping, tripping, and hitting. All posters were purposefully neutral from the point of view of culture, race, or gender. A version was available without text, in order to be locally completed in any required language. The enclosed posters had to be visibly displayed on vessels, at projects, in work shops and offices.

Figure 7. The DVD focussing on “Slips, trips and finger nips”.

Figure 8. Samples of “Safety Question of the Week” from week 12 and week 18.
When the “Safety Moment Day” finally arrived, Presentation/toolboxes were held all over the world. Company-wide safety inspection tours were organised. At all workplaces an inspection checklist was circulated, containing eleven risk areas and several more focus points. Improvement action plans were submitted. The DEME-wide CHILD Safety Moment Day campaign 2011 was concluded with a letter of thanks signed by the CEO and the COO, stressing that a change of mindset had indeed been achieved. It was hard to imagine that even one single person in the company had not been confronted with the safety campaign and its objectives. The letter expressed gratitude for the 512 people that had taken part in a total of 167 inspections. No less than 983 action points for improvement had been identified and more than 1,000 anti-skid steps had been distributed so far. A new safety poster was added and would be displayed, together with this letter, on board all vessels and project offices. And if someone might have doubted, a new “DEME Safety Moment Day” would be planned for 2012. As scheduled, this took place in November 2012.

IMPROVEMENTS

Obviously management would like to see tangible and measurable results in return for the huge efforts that were put in the CHILD initiative. These measurable results indeed started to show and are best presented in the graph in Figure 9. The graph shows the 12-month rolling average LTI (Lost Time Incident) frequency rate and the number of Near-Miss Reports. One can notice a further escalation of the LTI frequency during the period of contemplation right after the fatality in Angola, followed by a flat curve when CHILD started to deploy its first initiatives and seminars for top managers. A sudden and steady decline is noticeable when more and more people were getting involved, resulting in an absolute low in the last few months where DEME enjoyed even a few zero LTI months.

Similarly, as soon as CHILD started focussing on pro-active safety (near incidents and dangerous situations), rather than on reactive safety (incidents), the near-miss reporting increased, with an even steeper increase in reporting after the popular DEME Safety Moment Day.

CONCLUSIONS

The CHILD initiative was a result of a gap analysis after a fatal accident in Angola in December 2009. This gap analysis was conducted by a third party and clearly exposed shortcomings in leadership and in the organisation. It also pointed out the responsibility of the respective management levels within the organisation. This was the trigger for a radical change of the management’s attitude and awareness around safety. It had to be embedded and promoted as a core value by top and line management and no longer only by – but still of course with the help of – the QHSE department.

After a period of contemplation and internal and external consulting, an ambitious programme was worked out by the CHILD working group, which comprised enthusiastic top management representatives.

The plan was to change the awareness of 4,000 employees, with three important focusses:
1. Safety is personal, because it concerns you and me;
2. Safety is about reputation and is a guarantee for the future;

Various initiatives were set-up focussing on 4 domains of the company: people, equipment, organisation and procedures. Amongst the most effective undertakings should be mentioned:
- The 18 seminars presided and entertained by top management, which mainly focussed on the personal responsibility of each manager and employee
- The very popular Safety Question of the Week, which made safety become a popular subject of regular discussion
- The issuing of the DEME Safety Hazard Top Ten, which became a popular subject for toolboxes on the biggest hazards of our job
- The Safety Moment Day on November 11, 2011 (and followed up in November 2012) initiated in each region by its own area management and followed-up by numerous management safety walkabouts, generating loads of practical and useful feedback and suggestions for improvements.
ABSTRACT

Maasvlakte 2 (MV2) is the Port of Rotterdam Authority’s port extension project west of the existing Maasvlakte. The project area is 2,000 hectare gross of which 1,000 hectare is the net infrastructure. The first phase of the project is scheduled to be finished in mid-2013.

Before operations for the project could begin, a stringent Environmental Impact Assessment (EIA) was conducted to meet permitting requirements. This article focusses on the monitoring aspects and the effort the Port of Rotterdam (POR) has put into complying with the conditions of the excavation permit. The article will demonstrate that the POR went beyond what was required; that in order to satisfy what they considered their duty to understanding what was going on in the North Sea, they initiated more scientific research as gaps of knowledge became apparent, instead of mere monitoring for the sake of a permit.

INTRODUCTION

Maasvlakte 2 is the Port of Rotterdam (POR) Authority’s port extension project west of the existing Maasvlakte. The project area is 2,000 hectare gross of which 1,000 hectare is the net infrastructure. The first phase of the project is scheduled to be finished in mid-2013. To date the project is on schedule and within budget.

Previous articles on Maasvlakte 2 (MV2) in various publications have highlighted the construction and contractual aspects. This article, the first of four, will focus on the monitoring aspects and the effort the Port of Rotterdam (POR) has put into complying with the conditions of the excavation permit. The article will demonstrate that the POR went beyond what was required; that in order to satisfy what they considered their duty to understanding what was going on in the North Sea, they initiated more scientific research as gaps of knowledge became apparent, instead of mere monitoring for the sake of a permit.

After a long preparation period (more than 15 years) the construction of MV2 finally started in September 2008. The works were tendered as a “Design & Construct” contract. The contractor PUMA (Project Organisation for Expansion of the Maasvlakte) has to comply with specifications provided by the Client, i.e., MV2 Project Organisation (PMV2) of the Port of Rotterdam.

The first m³ of sand were dredged from the Yangtze harbour (Euromax container terminal) and deposited by pipeline on the sandy beach in front of the existing Maasvlakte. The bulk of the sand needed for the construction of MV2 however had to come from an offshore located borrow area approx. 10-15 km from the Maasvlakte (see Figure 3).

The offshore sand extraction started on January 13, 2009. Gradually over time the
number of TSHD bringing sand to MV2 increased. The number of dredgers working for MV2 changed constantly. On average 5 TSHDs were present. The maximum number simultaneously working was 13. In total 24 different TSHDs were active from 2009 to the present.

Of the total required 220 million m$^3$ of sand for the first phase of MV2 approximately 200 million m$^3$ of sand was dredged offshore (July 2012) (see Figure 1).

In this article the following subjects will be presented:

- Monitoring requirements and set-up in general,
- Baseline measurement of juvenile fish (2007),
- Seabed composition, sieve analysis and the silt component therein,

The following topics will be addressed in future articles:

- Benthic community along the Dutch coast (2006 – 2012)
- Silt in the water column along the Dutch coast (2007 – 2012)
- Monitoring of the current condition in the Maasgeul, the entrance to the Port (2006 to the present)
- Underwater sound of TSHD at work (source terms) (2008 – 2009)
- Verification of the EIA predictions with respect to underwater sound (2013)
- Archaeological and palaeontological finds and research projects initiated (2009 to the present)

**MONITORING REQUIREMENTS AND GENERAL SET-UP**

The MV2 project is part of a total concept for the development of Rotterdam-Rijnmond, in which three objectives are combined. The objectives are:

- the sustainable expansion of the Rotterdam Port by construction of MV2,
- the creation of 750 hectare new green areas and recreational facilities in the greater Rotterdam Area and,
- the re-development, re-allocation and improved efficiency of the existing port.

To implement the above, the Project Mainport Rotterdam (PMR) was created in 1999, as a combined effort of the Port of Rotterdam, The Municipality of Rotterdam and some national and provincial Government agencies: The Netherlands Ministry of Transport (RWS) and Ministry of Commerce, Agriculture & Innovation (called EL&I in Dutch – Economie, Landbouw and Innovatie) and the Provincial Public Works Departments.

For MV2 alone there are 5 major permits:

- Excavation permit,
- Concession permit,
- Nature Protection Act,
- Flora & Fauna Exemption Act and
- Public Works Act (permission to work in or on the seafloor).

These are issued by two different ministries (RWS & EL&I). Each permit has its own Monitoring and Evaluation Programme (MEP) and underlying Monitoring Programme (MP). The MP provides the necessary input for answering the question to allow the evaluation of the actual effects registered through monitoring (and further analysis). The MP is delegated through the permits to POR. The evaluation remains the responsibility of the Authorities.
Hence, the combined and integrated approach under the PMR umbrella to safeguard uniformity and unambiguity in the evaluations (as shown in Figure 2).

The permit to excavate sand from the North Sea shows an area of approx. 90 km², located north and south of the Eurochannel (Figure 3). This area is based on an excavation depth of 5 metres. Till 2009 the allowable depth (permit condition) for sand extraction was 2 metres. In the EIA Construction MV2 all the effects of a deep excavation were investigated, e.g., environmental impact overall, stability of slopes, coastal defence, stagnant (anaerobic) water, benthic communities, fishing activities and so forth.

The permit allowed a maximum dredging depth of 20 metres below the existing seabed. The choice and the location(s) within the excavation area had to be made by the contractor, as different parts of the work required different sand qualities. In the end all the sand was excavated from two areas, indicated in Figure 3 by the red circle. The northern borrow area has a depth of 20 m (approx. -40 m NAP); the southern borrow area is approx. 10 m deep (-30 m NAP) (Figure 4).

The actual excavation limits and depths are shown in the bathymetric chart of mid 2012 shown in Figure 4.

In general only effects, although small, that cannot be neglected or are potentially significant require monitoring. Effect analysis is based on the BACI (Before-After-Control-Impact) assessment.

For the construction of MV2, apart from the covering up of existing sea bottom, the driving force for the possible impact is the extra silt (fine fractions) brought in suspension through the overflow of the TSHDs.
The monitoring results will provide answers so that the main and sub-questions can be answered after a 5-year period.

- **Subject:**
  Construction MV2 – borrow area

- **Main question:**
  How will the quality of the seabed (benthic communities) develop in the borrow areas after construction of MV2 as regards to the original benthic community in and around the excavation pits?

- **Sub-questions:**
  What benthic community was present before the start of MV2?
  What are the soil properties of the top layer in and around the designated borrow areas?
  What are the quality and the variability of the original benthic community?
  What benthic community will come back (re-colonisation)?
  How long will it take before re-colonisation will take effect? What will be the quality and variability of the new community?

The actual monitoring for the construction phase of MV2 will continue after 2013 as some after effects may occur, e.g., as a result of buffering of silt in the seabed being released again into the water column by storms, that is, by wave-induced water-bottom interaction (van Ledden et al.).
Table I. Overview of all the monitoring conducted by the POR.

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<td>Deltares / BOOR / TNO</td>
<td>Desk studies and field investigations (2006 – 2010)</td>
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<tr>
<td>Paleontology</td>
<td>NMR, University Leiden, Naturalis Leiden, TNO</td>
<td>Excavation and sorting of excavated material (2011)</td>
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<td>Juvenile fish</td>
<td>IECS (Hull, UK)</td>
<td>Trawling trip in the borrow area (2009 – 2011)</td>
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<td>Mechanical and hand picking searches on the outer perimeter (sandy beach) of MV2 (2010)</td>
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<td>Baseline study (2007)</td>
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<td>Impact of silt on juvenile fish (Evaluation of larva data)</td>
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In Table I an overview is presented of all the monitoring the POR is carrying out. The themes relate to the respective subjects that are extensively described in the Monitoring Programme (MP) approved by the authorities; the table column 2 indicate who carries out the surveys on behalf of POR. All the monitoring in the field and in the laboratory has been extensively supervised by specialists from POR and in some cases POR took an active role. The first three monitoring items assigned to PUMA are related to compliance with the permit conditions. They are checked by the authorities on a monthly basis and fall outside the EIA as such. The juvenile fish monitoring was no longer an issue at the time the permits were released.

**Baseline measurement of juvenile fish (2007)**

During the EIA it was not clear, even after consultation with external experts, whether or not juvenile fish would be affected by extra fines in the water as a result of the MV2 construction. Therefore in 2007 a baseline juvenile fish survey was carried out. This baseline fish survey was carried out in conjunction with the POR’s silt survey (same area and statistically speaking the same points). The fish survey and the silt survey comprised of 100 locations, 20 sections perpendicular to the coast and approx. 5 points per section. The 100 locations are intertwined with the benthos 2008 baseline locations (statistically speaking the “same”coordinates).

The juvenile fish survey consisted of catching bottom fish with a 2-m width beam trawl and pelagic juvenile fish with a plankton net. The survey was carried out in April, July and October 2007 and sailing occurred during the night as juvenile fish would be better.
dispersed over the water column (Figures 5 and 6). Approx. 65,000 fish from the bottom trawl have been weighted and measured in order to establish their condition. More than 52 species were identified in the catches.

From the plankton net the juvenile fish samples were taken and deep frozen; in total 28 larval fish species were encountered (Figure 7). The idea was to compare their stomach contents in case the condition of the juvenile fish established during the construction of MV2 (effect of the extra silt from the borrow area on juvenile fish larvae) were found. The stomach content should indicate if silt particles could be the reason.

**Conclusion of the juvenile fish survey of 2007**

In the permits and later on when the final MEP / MP was available, the effect on juvenile fish was considered highly improbable and difficult to prove owing to the variability of the North Sea ecosystem. Hence POR was not obligated to continue monitoring juvenile fish. Silt was not a decisive factor, moreover, larval fish are particulate feeders and can distinguish between silt and plankton.

Since the juvenile fish larvae were still stored, a decision was made in 2008 to carry out a further analysis on the stomach contents of the frozen juveniles. At the same time the environmental parameter and constraints were taken into account when analysis and interpreting the results, i.e., silt in seabed, silt in water column, depth, and so on. This resulted in seasonal and spatial distributions of flatfish and juvenile fish (in 2007) in front of the Dutch coast.

A total of 28 larval fish species were encountered during the surveys with greater larval densities in April and a decreasing trend.
towards the end of the survey period. Nineteen of these species were collected in April (11 unique species to April) grouped into 2 assemblages (cluster analyses and SIMPER), 17 species in July (4 unique) and 4 assemblages, and finally 9 species (1 unique) and 1 assemblage type in October.

Herring (Clupea harengus), flounder (Platichthys flesus) and dab (Limanda limanda) dominated the catches in April. Sand goby (Pomatoschistus minutus), dragonet (Callionymus lyra), and sprat (Sprattus sprattus) dominated in July, and in October sand goby (Pomatoschistus minutus) was the most abundant species (Figures 8, 9 and 10).

A significant effect of month of collection on assemblage composition was found (PERMANOVA p<0.0001). Seasonal factors explained most of the variance (70%) but also total suspended matter (TSM) and chlorophyll-α were significantly related to the assemblage composition, although the estimated effects were minor (Redundancy Analysis, RDA). Partial RDA analysis with season and temperature as covariates (to remove seasonal effect) identified TSM and chlorophyll-α as statistically significant variables although the explained variance was low (5.4%) and presented comparatively small environmental gradients (Figure 11).

Conclusions of the Redundancy Analysis (RDA)

For larval assemblages results showed:
• Flatfish larvae dominate in the Spring
• Main predictive variables are Season and Temperature; Seasonal spawning.
• TSM and Chlorophyll may have structuring roles but with very low predictive power
• Species diversity and seasonality best chances for a predictive model

For juvenile flatfish results indicated:
• Assemblages segregate by size groups reflecting seasonal and spatial variability in usage of the nursery
• Main predictive variables are Month, Depth and Salinity; Habitat characteristics
• Larvae abundance (supply of recruits) does not explain abundance of juvenile flatfishes; flatfish assemblages probably controlled by post settlement mechanisms… or is it sampling bias?
For more details reference is made to Rafael Pérez-Domínguez et al., i.e., the two reports and the presentation at the conferences (available from POR).

The study concludes that a seasonal-based model may be a useful baseline reference to describe larval fish assemblages in the area.

**SEABED COMPOSITION**

The seabed composition in and around the borrow area needed to be monitored. The same applied for the other (reference) areas in the North Sea, as storm conditions could cause the fine sediment fraction (silt) of the seabed to be (re)mobilised and re-suspended in the water column. There is a northward directed net residual tidal current of approximately 1.0-1.5 cm/s along the Dutch Coast.

To facilitate this monitoring aspect the box core samples provided an excellent opportunity as they covered 300 points each year. The benthic infauna was investigated by means of a Reinecke box corer of 32 cm diameter and deadweight of 200 kg (Figure 12).

Once on deck, the water above the sample is carefully siphoned off in order not to disturb the fluffy silty layer on top of the sample. Small tubes are inserted to collect sediment samples to determine the granular distribution of the sediment over the first and second layer of 5 cm thickness. After that the rest of the box core sample is treated as usual – sorted out over a sieve with a one-millimetre mesh to largely remove the sand and clayish material in the sample (Figures 12 and 13).

The sediment samples of three tubes of 1 cm diameter (or one bigger sized one) were stored in small pots and kept on ice (freeze dried). In the laboratory the samples were sieved using a particle size analyser (Malvern). For the coarse sand fraction (> 63 µm), the D50 and other specific characteristics were also assessed (Figure 13).

For each year, 2006 and 2008 thru 2012, the sediment composition of the 300 point is now available. The results are used in the analysis of the benthos (environmental variable parameter) to see if increased silt in the seabed corresponds with changes in benthic communities.

In general a slight increase in the percent (%) of fines around the borrow area has been noticed after the start of the construction works (Figure 14).
MISMATCH BETWEEN HATCHING OF COCKLE LARVAE AND THE ALGAE BLOOM (SPRING PEAK)

The possible effect chain through turbidity has been depicted in Figure 15. The possible mismatch between the spring peak in edible algae bloom and the effect of this on the growth of shellfish larvae and – ultimately – on the availability of food for shellfish-eating ducks, a complex chain of effects is evident. This chain is influenced by a large number of factors, such as water temperature, sunlight, the presence of silt, the ratio between salt and fresh water, and not to forget storms (waves and current action).

Algae (phytoplankton) grow – just like plants – through photosynthesis. They are dependent on the amount of light in the water. Every year, in spring, algae grow rapidly, so that suddenly a large quantity of algae is present in the sea water. This “algal peak” is also referred to as the spring bloom. It occurs because in the spring the sun is in a higher position in the sky and the longer days mean that the water warms up and more light is available for photosynthesis. As a result, algae grow faster. Growth slows down if the nutrients needed by the algae become exhausted. Some of the suspended silt released in the water column during sand extraction is transported by tide, wind, wave and currents to the Voordelta. The Voordelta is the coastal area of the Netherlands in the North Sea, protected under Natura-2000. It is located around the deltas of Haringvliet, Grevelingen, and Oosterschelde, with a total area of about 900 km².

More suspended silt in the water will make the water more turbid (less translucency). This reduces the amount of sunlight that can penetrate (deeper) in the water. Increased silt concentrations during sand extraction could conceivably have an effect on the annual spring algal bloom: The algae growth could be reduced and the spring bloom could occur later than normal. For some shellfish larvae, particularly the cockles, this would be bad news: They emerge from their eggs in spring and eat certain (edible) algae to grow. Under normal conditions, the cockle is the first species of shellfish to spawn, often even before the spring algal bloom. The water temperature is decisive: When the temperature rises above 12°C, the cockles begin to spawn. The other shellfish species relevant for the study tend to spawn later. For this reason, and because the cockle is an important source of food for diving ducks, the cockle was chosen for the monitoring operation. In spring, cockle larvae float in the water and feed on the part of the hytoplankton that is edible for them; these are algae smaller than 20 µm.

If the spring peak in edible algae were to shift to after the peak in the presence of cockle larvae, this would be a mismatch, because then the two peaks would not coincide. In this situation, there could be too little food for the cockle larvae. As a result, larvae could perhaps die prematurely or be retarded in their growth before they nest on the seabed (spat fall). If the shellfish larvae do not catch up on this possible retarded growth, the cockles on the seabed remain smaller. This could ultimately lead to less food being available for Eider ducks and Common Scoters (Melanitta nigra) which dive to the seabed to feed on shellfish.

A second possible effect of the increased silt concentrations is that the cockles which have settled on the bottom will grow more slowly if there is more silt in the water. Shellfish filter organic material as food from the water. In doing so, they also take in suspended silt. This is not edible and is expelled. If they take in more silt, they digest relatively less food. That could retard their growth. If these cockles have less meat weight, that could lead to a temporary decrease in the amount of food available for shellfish-eating ducks in the Voordelta because this area is the foraging area for Eider ducks and Common Scoters in autumn and winter.

Chain effects

This complicated sequence of effects begins with the water becoming more turbid because the silt concentration is too high. Hence all the work that went into the Environmental Impact Assessment (EIA) was to chart, with the aid of models, the pattern via which the silt released by the sand extraction could be distributed through the sea water.
The EIA is based on the maximum increase in silt concentration in the worst-case scenario. The extensive monitoring programme for the silt survey, in which numerical models are also used, provided new insights into the distribution pattern of the silt released. The water-seabed exchange is amongst one of the new developments that was further explored as a result of the MV2 EIA and is now one of the "normal" tools (Figure 16).

As explained in the foregoing in EIA, temporary negative effects on the food stocks for shellfish-eating ducks were predicted on the basis of worst-case scenarios (Figure 17). This worst-case effect could have supposedly occurred in the spring of 2010 during bad weather conditions – which would naturally result in more silt in the water column – and this coincided with a large amount of sand being extracted. The increased silt concentration in the Voordelta could then rise so much during the sand extraction that the spring peak in algae concentration would occur two weeks later. This could therefore lead to a mismatch between the presence of high algae concentrations and shellfish larvae and that could ultimately mean fewer or smaller cockles being available for the shellfish-eating ducks.

It was implicitly assumed here, on the basis of available literature that shellfish (cockles) only spawn once a year – in spring. Another starting point was that shellfish (cockles), once they have suffered retarded growth, no longer catch up later in the year; supposedly, they continue to have lower biomass, leading to reduced food stocks for the shellfish-eating ducks in this area.

The monitoring of the mismatch was initially thought to be based on data from the existing measuring programmes used by RWS and the measurement data from the satellite images made from space of the North Sea (remote sensing). By using remote sensing, the algae growth can be monitored and the time of the bloom – the spring peak – can be determined.
Soon however this originally proposed measuring method was abandoned. During the spring bloom visible in the remote sensing data, the algae community consists mainly of colonies of the algae Phaeocystis.

During the juvenile fish survey a plankton net was drawn through the water at half the water depth. This very fine mesh net repeatedly was completely clogged in April 2007 survey when a Phaeocystis bloom occurred (Figure 19).

This made it clear that these particular algae are not edible for shellfish larvae in this form, owing to their size (colonies with a diameter of approximately 2 millimetres), as the shellfish larvae themselves only measure about 100-250 micrometres and their mouths are a maximum 20 µm. Determining the spring algal bloom from the remote sensing observations would therefore not give a good indication of the availability of food for shellfish larvae.

A new monitoring (and research) programme was set up based on water sampling in the Haringvliet Estuary (Figure 20). The conclusion was that the amount of food (algae) available and the quantity and size of the cockle larvae could only be determined by microscopic analysis of water samples. Also, samples of 0-year-old shellfish at various places on the seabed in order to determine the possible retarded growth were necessary. In order to gain an understanding of the possible impact on the effect chain described, water samples were taken with a high frequency at fixed points in the Haringvliet Estuary in 2009 and 2010, from the start of the growth season (spring) until into the early summer. The purpose was to determine the development of algae in combination with the development and growth of cockle larvae and their ensuing settlement on the seabed (spat fall).

Parallel to setting up the field study a TUD student (Y. van Kruchten) carried out a model study for the Port as her Master thesis. The purpose of this was to calculate, using what was known at the time, the chance of significant retarded growth occurring amongst shellfish larvae given different temperature and turbidity scenarios. The chance proved to be extremely small. The insights gained via this study were used to further streamline the planned field study.

Samples of algae, cockle larvae and cockles

In the spring of 2009 (baseline measurement) and the spring of 2010 (peak in sand extraction, April-June), water samples started to be taken just before the first larvae appeared. This was done at three locations off the coast of Voorne (in the Haringvliet Estuary) as soon as the water temperature reached about 12°C. As a mismatch of a few days could already have measurable consequences for the larvae, measurements were taken very frequently. Twice a week, samples were taken from the water column using a water sampler. The samples were always collected during the same tidal phase.

The shellfish larvae present were then filtered from the water via the sieve of plankton net.
A second sample was taken and preserved so that the phytoplankton in it could settle.

In the laboratory, the following were ascertained using a microscope:
• Density, size and species composition of the algae. Per shape and size, the number of cells was converted into biomass.
• Density and size of the cockle larvae. Their speed of growth was determined from the length of the larvae. At the same time, a number of physio-chemical parameters were measured, such as the water temperature and the conductivity (salinity) of the water in the Haringvliet Estuary. Please note that fresh water is discharged from the Haringvliet if the Rhine discharge becomes (too) high (redistribution of water).

These studies were carried out by ecological consultancy and research firm Koeman and Bijkerk and closely supervised by the POR experts. The samples were taken by ATKB (soil, water and ecology consultants) (Figure 22).

During the measurements, it came to light that an important assumption of the environmental impact assessment was incorrect. When determining the length of the larvae, it transpired that cockles did not spawn once per growth season, but several times. New cockle larvae kept appearing in the water in approximately weekly waves (cohorts). In the measurements, that was visible as the sudden appearance of large numbers of small larvae and the disappearance of the larger larvae, which had sunk to the bottom to settle there (spat fall).

By combining data from literature on the filtering and assimilation capacity of shellfish larvae with the research results, a comparison was made between the energy needs of the shellfish larvae and the amount of energy available in the edible algae fraction.

In the summer and autumn of 2009 and 2010, cockle spawn was sought on the mud flats of Voorne. To do this, the top layer of the ground (about 5 centimetres) was scraped away during low tide using a scoop. The shellfish present were sieved out. The age, shell length and biomass (fresh weight and ash-free dry weight) of these shellfish were determined. This study was carried out by the NIOO-CEME and the experts from the Port. In 2009, this study produced no results because hardly any 0-year-old shellfish were
found in the seabed. Studies were conducted again on July 15 and October 28, 2010 (Figure 23). Cockle spawn was found this time, including some cockles from the year before.

**Conclusions with respect to a possible mismatch**

In the period during which the effects of the sand extraction operations for MV2 would supposedly be the greatest, no mismatch occurred between the spring bloom of edible algae and the presence of shellfish larvae. The peak in the density of the edible algae fraction coincided with the appearance of the shellfish larvae (2009) or preceded it slightly (2010). In both years, the shellfish larvae did not therefore miss the algal peak, considering the fact that they were already there before the algae volume was at its highest.

The study also revealed that a mismatch cannot occur, because the cockles produce several cohorts of larvae. Cockles therefore spread the risk: At least one group of larvae is always growing under sufficiently favourable conditions. This can also be seen from the 0-year-old cockles in the Haringvliet Estuary, which reached normal size in the autumn and winter of 2010 (Figure 24). It becomes apparent from analysis of the algae composition, from the estimated amount of food ingested (from literature and the energy model) and the estimated energy needs of shellfish larvae (literature), that sufficient food was available in the water for the shellfish larvae in both 2009 and 2010. The energy needs for maximum growth were definitely not always achieved, but this is far from uncommon in natural systems. In 2009, hardly any shellfish were found on the seabed. This was presumably because the shells on the bottom had been crushed during spring storms of high intensity.
The length of the 0-year-old cockles from 2010 does not differ from that of other years. The length-frequency distributions from various years reveal considerable variation and show that the 2010 values fall completely within the natural variation and range.

In 2010, therefore, no effects of the sand extraction on the size of the cockles can be ascertained. This means that there is also no reason to suppose that the shellfish-eating ducks would not have enough food in the autumn and winter to come (Figure 25).

**New knowledge**
The studies indicate that cockles spawn several times per season. In 2009, at least two cohorts could be identified and in 2010 there were six. In 2010, the first cohort was present on the first sample date (April 26) and the last two cohorts on June 10 and June 14 respectively. Cockles are apparently insensitive to when the spring bloom occurs.

This data is confirmed by the shellfish studies done in the Haringvliet Estuary, two or more peaks in 0-year-old cockles were measured on several occasions.

Also, the natural variation in the Haringvliet is great and changeable conditions in terms of weather (wind), temperature and the ratio of fresh and salt water are not unusual. It probably does not matter too much to cockles when the greatest quantity of edible algae are available (spring peak in algae), because several cohorts are present each year.

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CONCLUSIONS

Maasvlakte 2 is the Port of Rotterdam Authority’s port extension project west of the existing Maasvlakte. The project area is 2,000 hectare gross of which 1,000 hectare is the net infrastructure. The first phase of the project will be finished mid-2013. To date the project is on schedule and within budget.

In this article four elements were discussed:
The monitoring requirements and general set-up for the project have been defined; the baseline measurements for juvenile fish – which were established in 2007 – were evaluated; and the seabed composition, sieve analysis and the silt component therein. In addition, the potential mismatch between hatching of cockle larvae and the algae bloom in relation to the spring peak was examined.

In the set-up of the EIA Construction MV2, all the effects of a deep excavation were investigated, e.g., environmental impact overall, stability of slopes, coastal defence, stagnant (anaerobe) water, benthic communities, fishing activities and so forth. In general only effects, although small, that cannot be neglected or are potentially significant require monitoring. Effect analysis was based on the BACI (Before-After-Control-Impact) assessment.

In the permits and later on when the final MEP / MP was available, the effect on juvenile fish was considered negligible and difficult to prove owing to the variability of the North Sea ecosystem. Hence POR was not obligated to continue monitoring juvenile fish.

Regarding seabed composition, in general a slight increase in the percent (%) of fines around the borrow area has been noticed.

And finally, in the period during which the effects of the sand extraction operations for MV2 would supposedly be the greatest, no mismatch occurred between the spring bloom of edible algae and the presence of shellfish larvae.

In subsequent article(s) other topics mentioned at the start of this article – which also fall under the EIA monitoring and the MP – will be presented. Some of these are still ongoing and are needed in order to ensure a complete evaluation of the possible effects of the dredging operations and to ascertain compliance with the permit conditions.

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Innovative highlights in the environmental impact assessment MV2

Voedselbeschikbaarheid en groei van schelpdierlarven in de Haringvlietmonding, meesterjaar 2009
(food availability and growth of shell larvae in the Haringvliet Estuary, measured in 2009)
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(food availability and growth of shell larvae in the Haringvliet Estuary, measured in 2009)
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(food availability and growth of shell larvae in the Haringvliet Estuary, measured in 2009)
Rapport 2009-125, Koeman and Bijkerk, Haren
G. Mulderij et al. 2009

Hydraulic Fill Manual: For Dredging and Reclamation Works
EDITED BY JAN VAN ‘T HOFF AND ART NOOY VAN DER KOLFF
CRC Press/Taylor & Francis.

Planning, designing and constructing a land reclamation using hydraulic fill is a subject that has long been overlooked in the literature of dredging. After several years of development with contributions from a multitude of engineers, the Hydraulic Fill Manual has arrived – guided into existence under the stewardship of CIRIA (Construction Industry Research and Information Association) and CUR Building & Infrastructure and two editors-experts in the field, Jan van ’t Hoff and Art Nooy van der Kolff.

The book is incredibly comprehensive and there is certainly something here for anyone who comes in contact on whatever level with the demands of a land reclamation project – clients, consultants, technical and financial advisors. The enormity of the book reflects the enormity of many land reclamation projects: Think of Hong Kong airport, Changi in Singapore, Maasvlakte 2 in Rotterdam, Dubai and Abu Dhabi.

A quick rundown of the contents will give some idea of the areas the book examines, mostly in-depth. A general discussion of the basic elements of a land reclamation project, with a bow to Systems Engineering, is followed by a chapter on data collection – what data are required and how are they applied. Next a chapter is devoted to describing dredging equipment, including environmental and operational limitations, in an effort to guide the client toward a realistic cost-effective choice. The selection of the borrow area and the operational planning and selection of construction methods including the fill mass properties and placement issues are described. The technical aspects of ground improvement, why, when and how it is done, are explained, followed by the philosophy behind designing a reclamation area – such items as strength, stiffness and permeability of the fill mass as well as liquefaction and earthquakes. Special fill materials and problematic subsoils are addressed including carbonate sand fill materials and hydraulic rock fill. Other issues such as drainage, wind erosion, slope, bank and bed protection are described followed by monitoring and quality control issues. Finally an overview of technical specifications with a checklist of project requirements rounds out the subject. And just for good measure four appendices have been added – equipment, field and laboratory tests, correlations and correction methods and geotechnical principles – and an extensive list of references.

The book combines the theoretical and the practical and is a must-have for clients, consultants, engineers and other advisors aiming to create well-designed and less costly hydraulic fill projects. A long-awaited and thoroughly researched manual that is destined to become a standard go-to reference work.

Lunar Landscapes – Maasvlakte 2
BY MARIE-JOSÉ JONGERIUS
In Dutch and English. NAi010 Publishers. ISBN 9789462080263. €49.90

The Port of Rotterdam is the largest in Europe, and after Shanghai and Singapore, the largest in the world. With 2,000 hectares of new land being reclaimed from the sea, the construction of Maasvlakte 2 is one of the largest infrastructure projects in recent years. This full-colour, photographic book has been published to accompany the Jongerius’ exhibition at the Nederlands Fotomuseum in Rotterdam. Through the photographer’s eyes, this “landscape” is above all an alien landscape and a world of amazement and expectation as she records the development of Maasvlakte 2. Using her large-format camera at night, with limited light, Jongerius has produced large-format photographic images with a mysterious beauty that imagines the genius behind this enormous sand expansion. The Exhibition “Lunar Landscapes - Maasvlakte 2” runs from November 3, 2012 through January 13, 2013 at the Nederlands Fotomuseum (Netherlands Photomuseum), Wilhelminalaad 332, NL-3072 AR Rotterdam. www.nederlandsfotomuseum.nl. The book is on sale in the shop of the Nederlands Fotomuseum and at www.naibooksellers.nl.

Dredging in Figures 2011

According to Dredging in Figures, the drivers of dredging have developed favourably, though moderately, over the last decade, but “in the dredging industry itself, the total turnover has more than doubled. Why has the dredging industry grown faster than its drivers?”

Dredging in Figures is an annual statistical review of the global dredging market published by the IADC as a service to parties interested in the financial development of the dredging industry. Through charts and data collected from high-level international sources as well as its own member companies, the IADC tries to answer questions about and give insight into the importance of the industry to the world economy. The present document, issued in November 2012, focusses on the situation in 2011. The information includes data about the “drivers of dredging“ – waterborne trade, urbanisation and demography, energy, tourism, climate change and coastal defence and the environment – as well as the turnover of the open and closed global dredging markets and the types of projects where dredging plays a major role. Free PDF download available at www.iadc-dredging.com.
SEVENTH INTERNATIONAL CONFERENCE ON REMEDIATION OF CONTAMINATED SEDIMENTS  
FEBRUARY 4-7, 2013  
HYATT REGENCY HOTEL,  
DALLAS, TEXAS, USA

Organised and presented by Battelle, the Seventh International Conference on Remediation of Contaminated Sediments will be held February 4-7, 2013, at the Hyatt Regency Hotel in Dallas. This conference series focuses on hazardous contaminants that find their way to the sediments of rivers, lakes, bays, and harbors, where they present significant risk to economic development and the health of aquatic environments worldwide.

To maintain the economic and biological viability of these environments, it is necessary to manage the complex series of actions that affect a wide range of environmental, economic and social issues. Each Conference addresses the challenges of combining basic research, new characterisation and assessment methodologies, innovative engineering, and good management practices to address the concerns of all stakeholders.

The Sixth Sediments Conference, held in New Orleans in February 2011, was attended by approximately 1,100 scientists, engineers, regulators, remediation site owners, and other environmental professionals, representing universities, government agencies, consultants, and R&D and service firms from around the world. The technical programme comprised one panel discussion and 48 specialised sessions, encompassing 430 platform and poster presentations.

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WIND FARM DEVELOPMENT:  
EUROPEAN OFFSHORE 2013  
APRIL 10-11, 2013  
EDINBURGH, UK

Wind Farm Development: European Offshore 2013 will provide presentations and interactive discussions lead by senior representatives from the leading companies operating in the offshore wind sector. Key industry players and decision makers will be present to discuss the development and future of this significant renewable energy source.

This is an opportunity to enhance your network and gain contacts from within the leading organisations making a difference in the offshore wind industry with two days of networking and open interactive discussions. Attendees will be senior management from within the industry including: wind farm developers, wind farm operators, turbine manufacturers, engineers, consultants, ports and harbours, offshore shipping companies, energy analysts and lawyers. Fees for the conference will be £1,495 (ex VAT).

For further information please contact:  
Justyna Korfanty  
Tel: +44 207 981 2503  
• Email: jkorfanty@acieu.net  
www.wplgroup.com/aci/conferences/eu-ewp3.asp

WODCON XX  
JUNE 3-7, 2013  
SQUARE-BRUSSELS MEETING CENTRE  
BRUSSELS, BELGIUM

Organised by CEDA on behalf of WODA (World Organisation of Dredging Associations) which incorporates WEDA, CEDA and EADA, WODCON XX, with the theme “The Art of Dredging”, will showcase some 120 technical papers over three days covering all aspects of dredging and maritime construction. All WODCON XX papers will be peer reviewed and provide up-to-date, relevant and high quality information.

The Congress will also feature a technical exhibition and technical visits. These technical programme elements will ensure a complete learning process, while various social events will allow participants to meet fellow professionals from all over the world in a friendly and inspiring atmosphere. The 2013 conference marks the XXth edition of WODCON and coincides with the 35th anniversary of the current WODA and its three component associations.

Topics of interest include but are not limited to the following broad areas: Method, Equipment & Techniques; Management of Sediments (clean and contaminated); Environmental Issues; Regulatory Issues; Management and Economics; Alluvial and Deep Sea Mining.

WODCON XX will bring together expert representatives of manufacturers, universities, research institutes, consultants, public authorities working in the dredging, navigation, coastal and inland flood protection, deep-sea mining, offshore wind energy, oil and gas production fields and providers of a broad range of services such as brokers, insurers, financiers, lawyers and many more.

For further information contact:  
Congrex Belgium - WODCON XX Organisation Office  
Tel: +32 (0)2 627 0166  
Fax: +32 (0)2 645 2671  
• Email: wodcon@congrex.com  
www.cedaconferences.org/wodcon
COASTS, MARINE STRUCTURES AND BREAKWATERS
SEPTEMBER 17-20, 2013
EDINBURGH INTERNATIONAL CONFERENCE CENTRE, EDINBURGH, SCOTLAND, UK

The Institution of Civil Engineers is pleased to announce the tenth in this highly-regarded series of specialist conferences. This is an international forum addressing the developments in offshore and nearshore energy production, procurement, issues with coastal defence, and the construction, management and refurbishment of all coastal assets.

Whilst retaining the historical coverage on shoreline structures, coastal processes, and design and construction of breakwaters and related structures, the conference will also emphasise aspects at the civil and coastal engineering interface, such as fluid loadings, resource modelling, interactions with the environment, construction, installation, cabling, servicing and maintenance. The conference will showcase some 150 technical papers, all of which are rigorously peer reviewed to ensure that they will have an in-depth technical aspect giving all attendees access to the highest quality information. Papers are available to delegates in advance of the event to stimulate discussion, and papers are discussed in formal proceedings following the event.

In addition to the main session presentations, the ‘Fringe’ will give opportunities for presentations of recent news, continuing research, and developments in progress. Workshops, short courses and technical visits will also be offered as part of the event.

For further information contact:
ICE Events Team, Institution of Civil Engineers
One Great George Street
Westminster, London SW1P 3AA, UK
Tel: +44 (0)20 7665 2226
Fax: +44 (0)20 7233 1743
Email: events@ice.org.uk
www.ice-conferences.com/Upcoming-events/ICE-Breakwaters

CALL FOR PAPERS
WEDA 33 / TAMU 44
AUGUST 25-28, 2013
HILTON HAWAIIAN VILLAGE, HONOLULU, HAWAII

The theme of the Western Dredging Association’s 33rd Annual Western Hemisphere Dredging Conference and Texas A&M’s 44th Annual Dredging Seminar (WEDA 33 / TAMU 44) is “So That Ships May Pass” and will focus on the Historical, Structural and Operational Development of Navigation throughout the Western Hemisphere. Included in the dredging conversations will be the critical global economic need for dredging, the importance of enhancing the marine environment as well as historical dredging developments, trends and the dredging progress that has created today’s market trends and also emerging environmental issues. Included in the conference will be a forum for discussions between North, Central, South American and Pacific regions.

Topics of interest include, but are not limited to:
• History of Dredging Milestone Projects (Last Millennium)
• Dredging Research
• Budgeting & Cost Estimating
• Development of Cargo Carrying Ships
• Dredging for Flood Control
• Geotechnical Aspects
• What Drives the Industry?
• Market Trends
• Navigation Channel Depths
• Surveying & Mapping
• Dredging for Beach Nourishment
• New Dredging Equipment
• Dredge Safety Issues
• Environmental Cleanup Sites

The Technical Papers Committee will review all one-page Abstracts and notify authors of acceptance and final manuscript instruction for production of the proceeding on CDs. One page abstracts must include: descriptive title, author names, author contact information (company name, address, phone, fax and email address) and abstract (<300 words).

Key Dates:
• Abstracts Deadline: February 1, 2013
• Notification of Acceptance /Author Instructions: April 1, 2013
• Final Manuscript Due: June 1, 2013

Interested authors should email their abstracts to one of the following:
• Dr. Ram Mohan/Anchor QEA, Chair, Technical Papers Committee, Email: rmohan@anchorqea.com; Tel: +1 267 756 7601
• Dr. Robert Randell/Texas A&M University; Email: r-randall@tamu.edu; Tel: +1 979 845 4568
• Mr. Robert Wetta/DSC Dredges; Email: rbwetta@dscdredge.com; Tel: +1 985 479 8050
• Mr. Robert Ramsdell/Great Lakes Dock & Dredge Company; Email: RCRamsdell@gldd.com; Tel: +1 630 574 3463

For further information contact:
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Terra et Aqua is a quarterly publication of the International Association of Dredging Companies, emphasizing “maritime solutions for a changing world.” It covers the fields of civil, hydraulic and mechanical engineering including the technical, economic and environmental aspects of dredging. Development in state of the art and other topics from the industry with actual news value will be highlighted.

- As Terra et Aqua is an English language journal, articles must be submitted in English.

- Contributions will be considered primarily from authors who represent the various disciplines of the dredging industry or professions, which are associated with dredging.

- Students and young professionals are encouraged to submit articles based on their research.

- Articles should be approximately 10-12,000 words. Photographs, graphics and illustrations are encouraged. Original photographs should be submitted, as these provide the best quality.

- Digital photographs should be of the highest resolution.

- Articles should be original and should not have appeared in other magazines or publications.

- An exception is made for the proceedings of conferences which have a limited reading public.

- In the case of articles that have previously appeared in conference proceedings permission to reprint in Terra et Aqua will be requested.

- Authors are requested to provide in the “Introduction” an insight into the drivers (the Why) behind the dredging project.

- By submitting an article, authors grant IADC permission to publish said article in both the printed and digital version of Terra et Aqua without limitations and remunerations.

- All articles will be reviewed by the Editorial Advisory Committee. Publication of an article is subject to approval by the EAC and no article will be published without approval of the EAC.

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Through their regional branches or through representatives, members of IADC operate directly at all locations worldwide.

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- Coastal and Island Marine Services Inc., Portmore, Jamaica
- Dravo SA, Madrid, Spain
- Van Oord Florida, Fort Lauderdale, USA

Covers the “left” side of the main sea wall at the Port of Rotterdam’s Maasvlakte 2 extension project, where sand was randomized into the outer contour, was initiated in July 2012. This land reclamation increases the area of the Port of Rotterdam by 20% and makes the Netherlands 2,000 hectares larger. With a coastline 3.5 km further into the sea, it required extensive monitoring before, during and after construction (see page 18).

For a free subscription register at www.terra-et-aqua.com

Terra et Aqua is published quarterly by the IADC, The International Association of Dredging Companies. The journal is available on request to individuals or organisations with a professional interest in dredging and maritime infrastructure projects including the development of ports and waterways, coastal protection, land reclamation, offshore works, environmental remediation and habitat restoration. The name Terra et Aqua is a registered trademark.

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EU POLICY VS ECI
conflict or compatibility

SAFETY’S CHILD
I am my colleagues’ keeper

GOING THE EXTRA MILE
monitoring at Maasvlakte 2