WORLD DEVELOPMENT AND THE IMPORTANCE OF DREDGING

by

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1. INTRODUCTION

Ever since humans live on earth, they have been attracted by regions that are rich of water. For several reasons people prefer to live near the sea or near rivers and lakes.

These regions are often the most fertile, offer the best possibilities to find drinking water and in most cases have a moderate and attractive climate. Last but not least, oceans, seas and waterways offer excellent opportunities for transport and for communication.

Since last century however, the already densely populated coastal areas are facing serious problems due to a lack of space. Within a relatively short period the world population has doubled and is expected to rise to eight billion in 2030. Also, since industrialisation has started in the 19th century there has been a continuous migration from rural to urban areas.

With the expectation that this migration will continue and the fact that already 80% of the large cities lie in coastal areas, the prognostics are that in 2030 twice as many people will live, work and recreate within a distance of 100 km of the coast. As a result coastal land will become scarce and the already high prices of land in these areas will inevitably continue to rise. Also, the cities in their existing configuration will become saturated and the pressure on the infrastructure, like roads, sewage and green spaces, so high that the quality of life will drop far below acceptable levels.

2. RECLAMATION PAYS

When land in coastal areas has become scarce, creating new land might offer a solution. Although one might think so, the phenomenon of land reclamation is certainly not new. Already in the 11th century, the Dutch created new land by building dykes in the coastal wetlands and pumping the enclosed land dry, thus creating so-called polders.

The first time in the Netherlands that land was reclaimed from the sea was in the 20th century, just after the Second World War, when the ‘Zuiderzee’ polders were made. Already in 1932, the then ‘Zuiderzee’ (Southern Sea) was closed off by a large dyke, the ‘Afsluitdijk’ (Closure dam), turning the estuary in a closed-off lake, which was from that moment on called the ‘IJsselmeer’ (IJssel lake).

The first real large-scale reclamation of land in the open sea, took place around 1970 when the ‘Maasvlakte’ was built, as an extension into the sea for the growing port of Rotterdam. With their extensive experience in land reclamation, the Dutch soon started to work on large scale land reclamation projects elsewhere in the world.

In the eighties and nineties of the last century, international dredging companies like Van Oord have carried out major reclamation projects in Hong Kong (Container terminals, Penny’s Bay and Chek Lap Kok airport) and in Singapore, for example the Changi, Jurong and Tuas reclamation. At the moment, a series of very large scale land reclamation projects is being carried out in Dubai in the United Arab Emirates.

The construction of large scale land reclamation in Dubai started in 2001 when Van Oord brought in a fleet of trailing suction hopper dredgers to build ‘The Palm Jumeirah’ with sand dredged at sea. The ‘Palm Jumeirah’ was based on the vision of Sheikh Mohammed bin Rashid Al Maktoum. The
economy of Dubai has for many years been based on the oil industry, but realising that the oil reserves will not be sufficient enough to secure the high living standard for an indefinite future, Sheikh Mohammed was convinced that Dubai had to gradually shift to other sources of income, tourism for example.

Dubai however had the problem that with an original coastline of just 70 kilometres, it had only limited space to offer for recreational and tourist purposes. The ‘Palm Jumeirah’ project, completed in 2005, enabled Dubai to more than double the length of its coastline, the project added 78 kilometres to the existing coastline. This first land reclamation project, involving an amount of 110 million m³ of sand, was soon to be followed by similar and even larger ones, like the ‘Palm Jebel Ali’, ‘The World’, ‘Deira Islands’, ‘Palm Deira’ and ‘Dubai Waterfront’, projects that are currently all under construction.

Also other countries in the Gulf region started with reclamation projects for various reasons, like Qatar where the new international airport of capital Doha is built for 50% on land that is reclaimed from the sea.

When evaluating these large scale land reclamation projects and looking at the costs they are made for, a few conclusions can be made.

<table>
<thead>
<tr>
<th>City</th>
<th>Range of land prices in € / m² in 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monaco</td>
<td>25,000 - 35,000</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>19,500 - 31,400</td>
</tr>
<tr>
<td>Singapore</td>
<td>4,600 – 6,200</td>
</tr>
<tr>
<td>Dubai</td>
<td>1,785 – 4,150</td>
</tr>
<tr>
<td>Tokyo</td>
<td>1,250 (average)</td>
</tr>
<tr>
<td>Rotterdam</td>
<td>485 - 625</td>
</tr>
</tbody>
</table>

Although no large scale reclamation project is alike, in most reclamation projects the costs of the dredging and filling operations have historically stayed under € 240 per m² of reclaimed land. When taking into account that there
are additional costs for elements like shore protection, soil improvement and site preparation, the all inclusive costs of many reclamation projects have stayed under € 500 per m².

How does reclamation costs compare with commercial prices of seafront land ashore? As shown in the next table, the prices per m² of existing land in seafront areas are a multitude of the average price of reclamations.

So, can reclamation be the solution to the scarcity of existing coastal land? It is legitimate to state that the costs of reclaiming new land is much less than the price of existing seafront area. Also, it will solve the shortage of urban space and will extend highly valued waterfront areas. The final conclusion can only be that “land reclamation pays”.

3. OTHER VALUES OF THE DREDGING INDUSTRY

Land reclamation is only one example of the current high demand for new maritime infrastructure. Other examples are the deepening and widening of shipping channels and harbours, the construction of coastal defences and the realisation of infrastructure for the offshore industry. The main drivers that lie behind the need for new maritime infrastructure are:

- Demography (migration and growth of the world population)
- Economy (trade and transport)
- Energy
- Tourism
- Climate change

In all these cases the dredging industry can and does play a major and highly valuable role to find and realise optimal solutions.

4. MARITIME INFRASTRUCTURE FOR TRANSPORT

The past few years have seen an increase in maritime transport as never before and to cope with the high demand, both size as well as number of sea going vessels have increased enormously. In particular, this development can be seen in the maritime container traffic. In the early eighties of the last century, 2,700 TEU vessels were the largest container ships, but the nineties saw the arrival of the first post-Panamax ships with capacities up to 4,800 TEU. At
The capacity of the largest container vessels have surpassed 12,000 TEU and within the near future, vessels of 14,000 or even 15,000 TEU will be built.

As far as the total worldwide traffic of containers over sea is concerned, it is expected that this will grow with at least an average of 6.5 % per year up to 2012. At the moment, there is a record number of container vessels under construction in shipyards all over the world. The top 20 shipping lines only, have currently more than 550 ships on order, an increase of 38 % of the current capacity.

In order to be able to handle the increasing shipping traffic, Port and Canal Authorities all over the world are investing heavily in new infrastructure, by reclaiming new land for terminals as well as increasing the capacity of the shipping lanes.

But, the need for dredging is not limited to the maritime transport sector only; the aviation industry too has been responsible for a large amount of dredging activities over the recent years. This could be observed in the construction of new airports (Hong Kong, Qatar and Japan) but also in dredging for airplane production facilities, like for the assembly of Airbus airplanes near Hamburg in Germany, for which Van Oord has carried out a large reclamation project on the river Elbe in 2002.

5. ENERGY RELATED PROJECTS

For a number of reasons there is a high demand for new maritime infrastructure that is energy related. First of all the increasing world population is needing a higher amount of energy products like oil, gas and coal – products that mainly depend on maritime transport and for which the capacity of port terminals has to be increased.

Also, there is a gradual shift to the use of products that are considered more environmental friendly, like LNG (Liquefied Natural Gas). To enable the increasing worldwide transport of LNG, new terminals have to be built, both in exporting as well as in importing countries. Last but not least, the land based sources of energy are fast getting depleted and more and more the mining of oil and gas has to take place at offshore sources. This development is requiring more and more dredging capacity, for example for the excavation and backfilling of pipeline trenches.
THE INCONVENIENT TRUTH

Maybe even more than by his candidature for the American presidency, Al Gore has become famous by bringing the message about the disastrous consequences of the climate change, under the title “The Inconvenient Truth”.

Although the way he brings his message might seem highly dramatic and a bit exaggerated, it cannot be denied that globally the climate is changing and that to some extent this will have an impact on worldwide sea levels.

It is most probable that the average level of the sea will rise over the next decades. How much it will rise cannot yet be determined with certainty. But, what can be said for sure is that the risk of inundations of low lying coastal regions, mainly river deltas like in Bangladesh, India, Vietnam, Egypt and the Netherlands as well as in Louisiana in the US, will increase. Of course this gives reasons for great concern. On the other hand the development in the dredging industry has been such that without any doubt the sector is now technically as well as logistically able to take the necessary measures to sufficiently protect vulnerable coastlines. For example by means of onshore and / or offshore sand replenishments and land reclamation.

THE WORLDWIDE CAPACITY OF THE DREDGING INDUSTRY

Does the international dredging industry have sufficient capacity to cope with the booming markets, with the enormous demand of today for the realisation of maritime infrastructure projects? It can be concluded that the demand for dredging capacity is very high and the supply of dredging capacity limited. It’s a ‘suppliers market’. As a result the rates for dredging equipment and therefore the prices of land reclamation are on the rise.

That’s the reason why dredging companies like Van Oord are investing heavily in new and highly efficient dredging equipment. In order to ‘secure’ dredging capacity, clients are advised to, at a very early stage, get an experienced dredging contractor involved in the project feasibility studies, as well as design stage. An open communication and dialogue between client and dredging and marine contractor about execution methods, planning and time schedules for the realisation of projects is highly recommended.

Over the past few years, dredging and marine construction companies like Van Oord have evolved into EPC (Engineering, Procurement, Construction) contractors and are now able to offer so called ‘total solutions’. That means participation in a project from the early feasibility stages, to the design, the engineering, the procurement, the construction and if relevant the future maintenance.

CONCLUDING

The rapidly changing world offers many challenges. Many of these challenges are located in the maritime environment and may seem too big to overcome. However it is a reassuring fact that international dredging companies like Van Oord are continuously improving their techniques, increasing their capacities and broadening their abilities. It is for sure that we will be able to cope with the current challenges and that we will continue to do so in the future.
With their extensive experience in the Netherlands, international dredging and marine contractors like Van Oord are involved in land reclamations worldwide. In the 1980’s and 1990’s major reclamation projects were carried out in Hong Kong and Singapore. In recent years and up to this day, a series of very large land reclamations have been and are executed in Dubai, including Palm Jebel Ali, The World, Deira Islands, Palm Deira and Dubai Waterfront. Discussing the increasing scarcity and already high prices of coastal land as well as the drivers behind the need for new maritime infrastructure, the author concludes that ‘land reclamation pays’. He states that the cost of reclaiming new land is much less than the price of existing seafront area. Also, land reclamation will solve the shortage of urban space and will extend highly valued waterfront areas. In addition, the increase of maritime transport and the size as well as the number of sea going vessels has led port and canal authorities to invest in better capacity of shipping lanes. A number of reasons for the high demand for new maritime energy related infrastructure are suggested. Against the background of the current dredging ‘suppliers market’ and the rising rates for dredging equipment, dredging and marine contractors like Van Oord invest heavily in new and highly efficient dredging equipment; they improve their techniques; they increase their capacities; and they broaden their abilities.

**SUMMARY**

Grâce à leur expérience reconnue aux Pays Bas, les entrepreneurs internationales de dragage comme Van Oord réalisent dans le monde entier des remblais de terrains conquis sur la mer. Dans les années 80 et 90, les principaux projets concernaient Hongkong et Singapour. Ces dernières années et jusqu’aujourd’hui, une série de création de terrains de très grandes dimensions a été exécutée à Dubaï, dont Palm Jebel Ali, The World, les îles de Deira, Palm Deira et le front de mer de Dubaï. Évoquant la pénurie croissante de terrains côtiers aux prix déjà élevés ainsi que le besoin de nouvelles infrastructures maritimes, l’auteur conclut que “la création de terrains conquis sur la mer paye”. Il établit que le coût de la création de terrain est bien inférieur au prix de l’existant en bord de mer. En outre, la création des terrains résoudra le manque d’espace urbain et prolongera les secteurs très recherchés de front de mer. De plus, l’augmentation du trafic maritime, de la taille et du nombre de navires a mené les autorités de port et de canal à investir dans un meilleur rendement des lignes de fret. Des justifications de nouvelles infrastructures maritimes liées à l’énergie sont avancées. Sur la base du marché de dragage et d’augmentation des taux d’utilisation des équipements, les entrepreneurs de dragage comme Van Oord investissent fortement dans du nouveau matériel performant; elles améliorent leurs techniques; elles augmentent leurs capacités; et elles élargissent leurs compétences.

**ZUSAMMENFASSUNG**