BAM Infratechniek bv

Runnenburg 12, 3981 AZ Bunnik / Postbus 206, 3980 CE Bunnik
Telefoon +31 (0)30 659 89 88 / www.bam.nl

Postbus 206, 3980 CE Bunnik

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Uw referentie	
Onze referentie	FHE/HVE/HKI/13.023
Behandeld door	F. Heinis
Afdeling	BNDR
Telefoon direct	(020) 407 22 80
Fax direct	
E-mail	f.heinis@bam-it.nl
Blad	1 van 7

Departementschef
Mr J. Heinsen/Kystdirectoratet
Frederiksholms Kanal 27 F
1220 KOBENHAVN K
Denmark

Onderwerp **Proposal Ecobeach**

Introduction

We like to introduce an unsolicited proposal (USP) to the Ministry of Transport and the Danish Coastal Authority for Ecobeach as a system for coastal protection of the west coast of Jutland.

BAM is a construction company which is established in the Netherlands, Belgium, Germany, Ireland and the UK . In some niche markets we are operating worldwide . The turnover of BAM is 7,4 billion euro a year. BAM has experience in marine works and has developed research intensive products for coastal protection as the Xbloc (see www.xblox.com, www.dmc.nl, DMC is a subsidiary of BAM)

BAM is familiar with the PEM system developed by Mr Poul Jacobsen of Skagen Innovations Center (SIC). In the Netherlands we performed a test with Ecobeach which has been finished this year. Scientific presentations are scheduled for the next years. The Ecobeach test and our additional research gives BAM trust in the performance of the system as a tool for coastal protection.

Our USP consists at first of the installation and maintenance of Ecobeach over 110 km along the west coast of Denmark. Secondly our USP consists of the intensive surveying of the coast along the 110 km and additional analyses to monitor the change in the quality of the sand. Thirdly in our USP we like to offer a guarantee: if the systems does not perform according to our promises, a part of the project costs will be refunded to the Coastal Authority. This is a new concept in coastal management.

Danish coastal management and the BAM USP

BAM has learned from the Ecobeach test that an innovation has to fit in a coastal management strategy of the responsible authorities.
We noticed that in Denmark, in contrary to the Netherlands, landowners are responsible for their own coastal protection and there is no legal obligation to feed the coast with a yearly quantity of sand. The decision for measures on the coast in Denmark is based on considerations of nature and recreation and is the outcome of a negotiation process with the

municipalities. The Coastal Authority protects the coast in general with (beach) nourishments and occasionally with hard constructions.
The transport along the coast exceeds, according to the Coastal Authority, ca. 4 mio m3 / year. From 1983 till now the coast has been nourished with 59 mio m3 sand. This means a yearly input of ca 2 mio m3/year. Although we haven't found an official policy statement, apparently a continues erosion of the coast is accepted.

In our proposal we have the intention to stop the erosion. Ecobeach has the aim to fix the dune foot -and so the hinterland- and to increase the resistance of the beach by a stable quantity of sand in front of the dunes We are convinced that this proposal will contribute to the long term policy of the Coastal Authority and add value to the stakeholders of the coast.

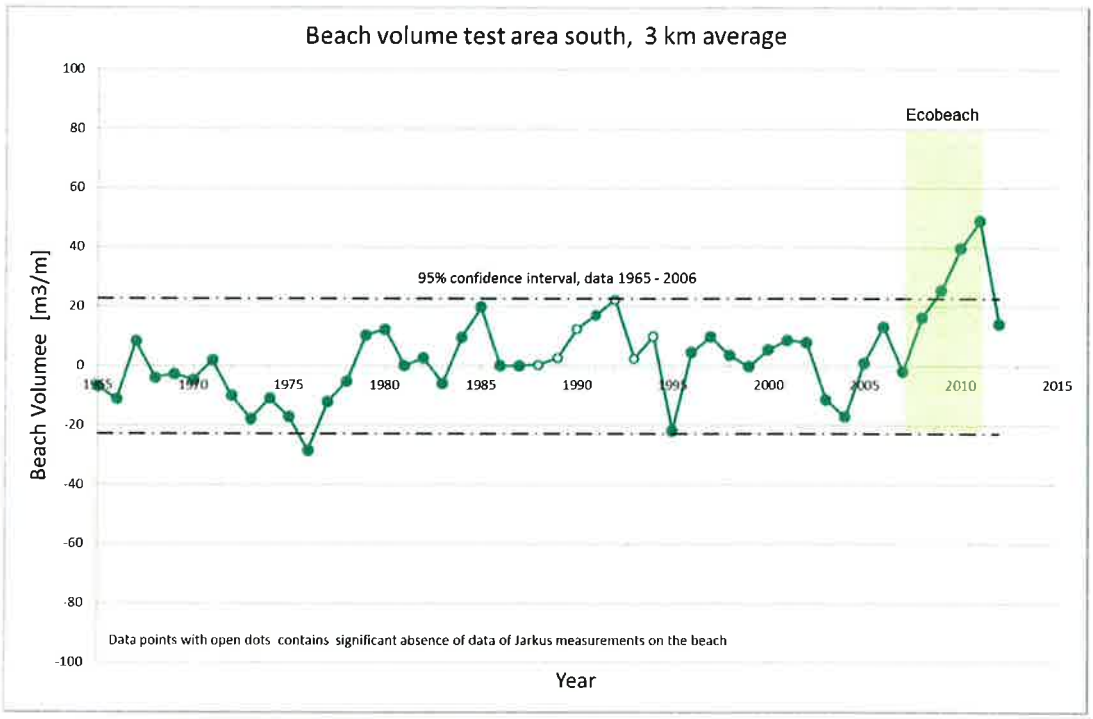
Why BAM starts with Ecobeach
After evaluating the results of SIC, BAM decided in 2006 to perform a test in the Netherlands. With Ecobeach the beach is well protected and it improves the growth of the dunes. The advantages of the system are clear. The PEM system is environment friendly because it has only a minor influence on sea life due to the fact it works with the natural forces of the coast There is less exhaust of sand sources which are suitable for beach nourishment. Ecobeach has a favourable CO2 footprint, in the Netherlands nourishments significantly contribute to the CO2 footprint of the public authorities .

Results BAM and Ecobeach test
Of course BAM faced the question how the system works. In the research results from Denmark we noticed the approach for a search for a big effect of the PEM system which would explain the substantial growth of the beach. In our BAM research we started with the possibility that a small effect in a dynamic equilibrium also may lead to a substantial effect on the beach. We discovered that, despite the small effects, the properties of the beach on the longer term significantly are affected by Ecobeach. These new properties explains the growth and increased stability of the beach. With this new knowledge we trust the system.

A four year test has been carried out at Egmond at the west coast of the Netherlands, from 2006 to 2011, in cooperation with the Dutch Ministry of Public Works. The Ecobeach system was installed in two 3 km long test areas, 1 km apart. The southern test area is a stable coast without significant beach erosion. The northern test area is located in front of the town of Egmond. In this test area, beach and foreshore nourishments have been carried out since 1990 to maintain the shoreline in a seaward position. The last nourishment was carried out in 2005, approximately 1.5 year before the start of the Ecobeach test. The Ecobeach system has been installed in the nourished beach at the end of 2006.

Since the installation of the Ecobeach system the beach volume in the southern test area has grown in a linear trend till the system was removed in the beginning of 2011. At the end of the test period the beach volume had increased with on average 50 m3/m over the 3000 m. This

is an all-time high since the measurements started in 1965. The dune foot moved seawards during the test.



At the end of the Ecobeach test, six years after the last beach nourishment, the beach volume in the northern test area also reached an all-time high since 1965. Also in the northern test area the dune foot moved seawards. This all-time high was reached although this part of the coast had been eroding before the test.

At the end of the first year of the test, 2007, a severe storm occurred which caused a storm surge which led to the first storm closure of the Rotterdam storm surge barrier since its construction. At IJmuiden the highest waves since start of measurements were recorded, during the Ecobeach test.

During the test it has been observed that large quantities of fine sand are blown towards the dunes in the test areas. Both in the Dutch and in Danish test areas it has been investigated whether this would affect the grain size distribution on the beach. It has been found that in the southern test area at Egmond, the grain size diameter had significantly coarsened compared to the grain size before the test. This coarsening has occurred only in the upper 2 m of the beach, the active zone. Also in the test areas at Hvide Sande coarser sand has been found compared to the reference areas. Coarser sand leads to a more permeable, dryer and a more stable beach. Therefore it is believed that the PEMS initiate a process where the beach sand becomes coarser as fine beach sand is blown towards the dunes.

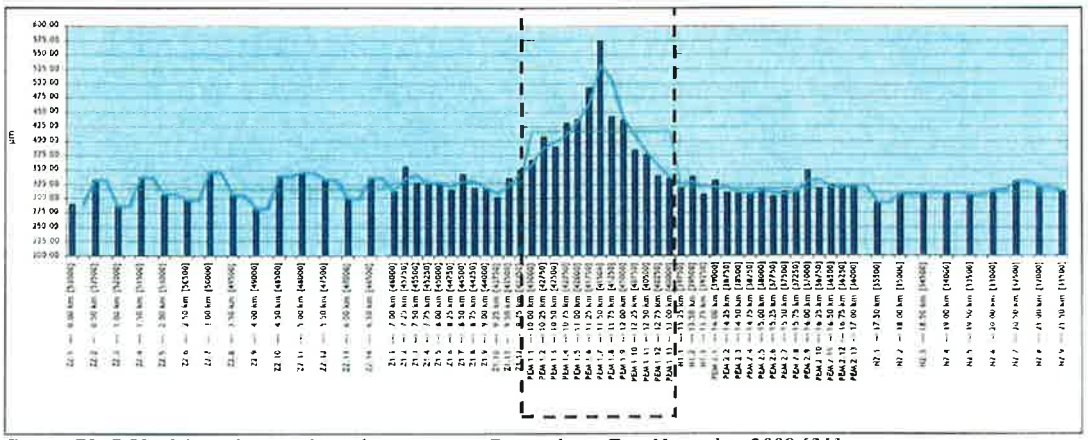


Figure F3: D50 of the sediment along the coast near Egmond aan Zee, November 2009 [31]

USP: Activities

For this proposal BAM has obtained permission from SIC to apply Ecobeach in Denmark.

We propose to install Ecobeach over a stretch of 110 km along the west coast of Jutland for a period of at least five years. The system will be installed from Nymindegab to Agger Tange. After installation BAM will maintain the system for the project period.

USP : Analyses and reports

Ecobeach and the quantity on the beach will be monitored on a frequent basis. The beach level will be measured 4 times a year.

In our USP we will monitor the quality of the sand. We continue to build on the outcome of our Ecobeach research in the Netherlands. Before installation and with a yearly frequency the sand corn distribution will be determined along the stretch of 110 km. On a smaller stretch the frequency of measurements of the sand corn distribution will be more intensive. The outcome will be the relation of Ecobeach with the change in the quality and quantity of the sand on the beach.

Every year the survey results and analyses will be presented by BAM We will report on yearly basis at least the following coastal state indicators :
-actual dune foot position(+4 m line)
-actual average beach height in front of the dune foot
-the change in the sand corn diameter

The monitoring will probably lead to observations and analyses which still have to be determined by BAM.

USP: Price
These activities are offered for 6,4 mio euro/year (excl. VAT) and a contract period of 5 years.

Our proposal fits within the budget and still enables the Coastal Authority to develop new and or additional projects.

USP: guarantee by BAM
Guarantees are not standard in coastal management. For nourishments there is a payment for the quantity of sand delivered on the beach. There is no guarantee for the life time of the nourishment nor a guarantee for a coastal state indicator as the position of the dune foot. For Ecobeach a permanent system is applied and maintained on the coast. The performance of the system is based on results of tests and other projects. The effects on coastal state indicators are bases on results of other projects . In all cases the results are affected by the local situation and weather/extreme storm conditions.

BAM has the intention to give a guarantee for the performance of the system because we trust the Ecobeach system.

The yearly results of Ecobeach will be defined in comparison with the coastal condition at the begin of the project. The evaluation time is before the storm season. Success of Ecobeach will be defined as:

- the average dune foot position over the 110 km is stable or
- the average sand quantity over the 110 km on the beach 60-80 m in front of the dune foot is stable
- In 3 of the 5 years this performance is achieved.

In the last condition is the effect of storms taken into account. The first two conditions means that on a local spot in the 110 km the coast can recede or accumulate.

If there is no success; at the end of the project a percentage of the total project costs will be paid back according to the following subdivision:

- 0 year success of the 5 years : pay back 30 % of the project costs
- 1 year success of the 5 years : pay back 20 % of the project costs
- 2 years success of the 5 years: pay back 10 % of the project costs

If there is a success the project will be continued for 5 more years.

We like to add some conditions for our guarantee:

- The parts of the coast which are already protected by the PEM system are not taken into account for our guarantee, These stretches are already stabilized by a growth of the beach..
- There will be no manmade adaptions on the coast during the project
- The maintenance (bypassing of sand) of the navigation channels is unchanged
- Sand for nourishments will be derived from existing quarries on the sea
- The lee side erosion of existing port entrances are excluded (the length has to be determined).

During our maintenance activities we will adapt the Ecobeach system in order to gain success.

In case of no success according to the BAM definition but success to Coastal Authority's own evaluation, we offer also the possibility to continue the project for 5 more years.

Success of Ecobeach will result in an increase of the sand drift on the beach to the dunes. Measures to fix the sand on the coast are recommended, but excluded in our proposal.

USP: procurement
Our proposal contributes to the policy of the coastal authority and the stakeholders on the west coast of Jutland. There is, according to the announced tenders for beach nourishment, a need and budget to spend for the protection of the west coast of Jutland.
The solution of Ecobeach is wide within the budget for beach nourishment of the west coast of Jutland.
This proposal is based on a unique IP protected technology. This allows the authorities, according to EU legislation, to start negotiations with the authors of this USP for buying the system.

What we expect from the coastal authorities in Denmark
We like to cooperate for this project with the coastal authorities from the start to finally the evaluation of the project. In this cooperation is communication included.
We have the intention to tune our communication to stakeholders on the coast with the coastal authority. BAM propose to communicate with the coastal authorities on a regular base during the 5 years of the project.
We like to present and discuss our evaluation report(s) and the results of our analyses with the coastal specialists of the authorities.

We trust that BAM has the opportunity to use the survey data/reports of the Coastal Authority for our and/or joint analyse of the coast system.

Before the start of the project we expect all the necessary support from the coastal authorities also in relation to municipalities, for the proper permits for our installation and maintenance activities.

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Next step
We are willing to give an explanation on our USP. The coastal authority has to decide to continue with this approach for coastal management. Then we can start up the process to transfer this USP to a contract.

With great interest we look forward to your response.

Yours sincerely,

BAM Nelis De Ruiter bv

Ing. H.J. Versteegen
Director