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Project **Ecobeach**  
Subject **Proposal**

### Introduction

We like to introduce an unsolicited proposal (USP) to the ministry of environment and the coastal authority for Ecobeach as a system for coastal protection of a part of the west coast of Jutland.

BAM is a construction company which is established in the Netherland, Belgium, Germany, Denmark, 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 such as the Xbloc.(see [www.xbloc.com](http://www.xbloc.com) and [www.dmc.nl](http://www.dmc.nl), DMC is a trade name of BAM).

BAM is familiar with the PEM system developed by mr Poul Jakobsen ( SIC). In the Netherlands BAM has performed a test with the PEM system under the name Ecobeach, which has been completed two years ago. A scientific contribution – peer reviewed- has been presented at the ICE 2015 conference on coastal management in Amsterdam. The Ecobeach test and our ongoing research in the Netherlands and Denmark gives BAM trust in the performance of the system as a tool for coastal protection. For more information we like to refer to the attachment of this letter.

The aim of the Danish government by the west coast protection is to prevent flooding of the hinterland due to a breach in the dune system. The dunes have to resist a 1:100 year storm. The minimum required dune width is 40 meters. One method Kystdirektoratet applies to prevent the hinterland from flooding, is to establish a wide and high beach in front of the dunes. Ecobeach provides a wide and high beach by the increase of beach volume, a stronger beach by the coarser sand and growth of the dunes. Ecobeach will contribute to the protection of the west coast.



Our USP consists at first of the installation and maintenance of Ecobeach over 55 km along the west coast of Denmark. Secondly our USP consists of the intensive –quarterly- surveying of the coast along the 55 km and additional analyses to monitor the change in the quality of the sand. In this manner we are able to monitor the changes of the beach after installation.

#### **Why BAM proposes this USP**

Kystdirektoratet policy to assure safety is to establish a wide and high beach in front of the dunes. Ecobeach fits perfectly in that safety policy of the Danish government because it provides an increase of the beach volume and a stronger beach by the coarser sand.

BAM trust of the system is based on the tests and analyses over the years in Denmark and Netherlands.

- Significant growth of the beach in the Netherlands
- Skodbjerg test site shows significant growth after placing the PEM/Ecobeach system in the period 2009-2014
- Coarser sand (improved strength) is found on Danish and Dutch Ecobeach test sites
- After removal of Ecobeach in the Netherlands significant decrease of the beach volume, back to the 50 year average value. The beach sand particle size in the test area returns to the average value along the coast

Kystdirektoratet refers often to the Skodbjerg PEM evaluation report of 2008. We conclude that more recent information; the measurements of the particle size of the sand and the survey data up to 2014 requires a reconsideration of the conclusions of the 2008 report.

We have also made a comparison of the application of nourishments in the coastal management system of the Netherlands and Denmark. The sand resources for the nourishments in Denmark consist of relatively fine sand (no contribution to a stronger beach and a shorter lifetime of the nourishment). We have noticed that the sand nourishment volume in Denmark has been much less in comparison to the Netherlands despite the longer length of the Danish sandy coast and exposure to higher wave energies.

**USP: governance and safety of the coast.**

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BAM likes to make a clear statement; the governance and security of the Danish coast is the responsibility of the Danish authorities.

BAM reports to the Danish authorities. BAM has the aim to avoid surprises. BAM provides an early warning system by the high measuring frequency of the relevant coastal state indicators.

In all cases of emergency the Danish authorities have always the right to take the necessary measures.

#### **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 55 km along the west coast of Jutland for a period of at least five years. The system will be installed from Nymindegab to Fjand. Our proposal has been changed in comparison to the 2013 proposal, in order to offer KDI the opportunity to assess beach behaviour with and without Ecobeach over longer stretches. After installation BAM will maintain the system for the contract period.

#### **USP: analyses and reports**

Ecobeach and the quantity of the sand 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 after installation with a yearly frequency the sand particle distribution will be determined along the coastal stretch of 55 km. On a local smaller stretch the frequency of measurements of the sand particle 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 to KDI. 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
- beach volume
- the change in the sand particle diameter

On basis of the monitoring results further research will be proposed.

#### **USP: success of Ecobeach.**

The yearly results of Ecobeach will be defined in comparison with the coastal condition at the beginning 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 55 km is stable or
- the average sand quantity over the 55 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 the effect of storms is taken into account. The first two conditions means that on a local spot in the 55 km the coast can recede or accumulate.

If there is a success the project shall be continued for 5 more years and extended to other stretches of the coast.

The details of the evaluation of success will be determined later.

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During our maintenance activities we will adapt the Ecobeach system in order to optimise the system

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 windblown sand drift on the beach to the dunes. Measures to fix the sand in the dune zone are recommended, but excluded in our proposal.

### **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 communication is 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 and have assumed that BAM has the opportunity to use the survey data/reports of the coastal authority for our joint analyse of the coast system.

Of course we like to receive permits by KDI for the application of Ecobeach. The permits shall be in accordance with what we agree in our cooperation. We like to mention that in the Netherlands Rijkswaterstaat allows the application of Ecobeach on the coast. Before the start of the project we expect all the necessary support from the coastal authorities, also in relation to municipalities, for the remaining permits for our installation and maintenance activities.

### **Next step**

We like to present our USP, give an elucidation about our approach and answer your questions. After mutual understanding we have the intention to start up the process to transfer this USP to a contract.

We look forward with interest to receive your response and we are available for a presentation.

Yours sincerely  
BAM Infraconsult bv



J.P.G. Ramler MSc  
Director

Appendices