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REVIEW PROBLEM OWNER PERSPECTIVE

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The paper deals with the design and maintenance of berm breakwaters and focusses on the longshore transport in a monsoon-hurricane wave climate. The main object is to determine the initial nourishment needed to survive the design life of 50 years. Three probabilistic approaches are applied to the problem. In the user's perspective we do not necessarily focus on the correctness of the approach but on the appropriateness of the approach for the problem on hand. The user in this respect is the designer of a berm breakwater which has to guarantee a 50 year life and which has little means to get information during the life of the berm breakwater other than at its failure. This aspect is essential to understand the reasons behind the focus on the uncertainty in the long shore transport.

The three approaches provide an increasing sophistication in the way to tackle the problem. The first approach appears to be far too simple, the second is somewhat conservative. Finally, the third approach, although exact, has to be dealt with by simulation. They all yield that there is substantial uncertainty in the amount of transport.

There are several sources of uncertainty. First of all there is the climate with its monsoon and hurricane waves. Their height, steepness and angle all effect the long-shore transport. Secondly the transport equation (1) is not certain either. It contains a threshold B which plays an important role (see Table 1). Thirdly, the quality of the berm breakwater, through the average size of the armour units D_{50} and the relative density Δ, is important, though to a lesser extent.

R. Cooke et al. (eds.), Engineering Probabilistic Design and Maintenance for Flood Protection, 199–200.

The first source is outside our control and is inherently uncertain. Especially the hurricanes can have a devastating effect (cf fig. 4). It is strange that figure 4 suggests that the effect of the monsoons is linear per realisation over the lifetime. The second source is a matter not knowing. This could be handled by doing more research into the transport equation for practical situations, or alternatively, it is where alternative actions should take place to prevent the long shore transport in the design on hand. Finally, the quality of the breakwater is within direct control. The question which now comes forward, is what is the cheapest way to reduce the uncertainty. This question is deepened by incorporating the possibility of corrective maintenance as is done in section 7. Although the probability of failure within 50 years appears to be 0.29, it is economically optimal to repair the berm breakwater every 6 years! It would be interesting to know what would be cheaper: repairing every 6 years or having a larger initial nourishment.

There may be some critique on the maintenance policy. The authors use a periodic repair policy within a finite horizon. They could also have used a nonperiodic policy since the berm breakwater is initially in a good condition. Even better would be a policy where the timing of the repair would be state dependent (e.g. the amount left over of the initial nourishment). The latter policy would require a proper inspection every few years and when that is questionnable one has to take the aforemenentioned policies.

Another aspect to be discussed is how the results can be scaled up to a specific berm breakwater. The authors calculate the probability of failure for a specific cross section. The berm breakwater will have a certain size and it is not yet clear whether the failure probability concerns the whole breakwater or only specific parts.