ABSTRACT
Critical erosion of the dike cover due to overtopping waves is currently defined using conservative estimates. To assess failure probability, the actual erosion rate during overtopping is required, however the effects of dike geometry, vegetation type or objects on a dike are largely unknown. In this research project, a numerical model will be developed to evaluate measures to minimize erosion, and provide insight in the effect of transitions between grass cover and embedded objects.

INTRODUCTION
Failure of a dike cover due to wave overtopping erosion may initiate dike breach (Figure 1). Surface transitions in the grass cover, such as cure points, height difference, roughness difference and objects are often weak spots (Dean et al. 2010, Van der Meer et al. 2014), but the effects on the location and evolution of dike cover erosion is highly uncertain. Dike cover erosion is dominated by the turbulence-dominated shear stress at the jet front (Aguilar-Lopez 2016). Therefore, a detailed FEM model is required with a sufficiently accurate turbulence model. In this project the model of Bomers et al. (2016) will be further developed, tested and applied to evaluate protection measures to provide insight in the effect of hard constructions on dike cover erosion. At the University of Twente, two PhD students recently started on the challenge of quantifying the effect of transitions in grass covered dikes on dike erosion. In this presentation, we present their research plans.

RESEARCH OBJECTIVES
Both the PhDs work in the framework of the recently granted All-Risk program: implementation the new risk-based standards in the Dutch Flood Protection Program (HWBP). This program is a joint effort of 6 Universities in the Netherlands to generate knowledge to support the implementation of the fully probabilistic risk-based flood protection strategy. The topic of PhD1 is to assess the impact of wave overtopping using field and flume experiments. PhD2 focusses on the numerical modelling of this phenomenon.

The objective of this research project is to develop tools for probabilistic safety assessment due to dike cover erosion for a range of grass types and transitions:
RQ1: How well can a detailed numerical model predict dike cover erosion for a range of grass cover states and transition configurations?
RQ2: How do vegetation and transitions affect the probability of failure of the dike cover?
RQ3: To what extend can innovative technical measures and maintenance strategies reduce the probability of failure of dike cover: locally around transitions, and for the dike as a whole?

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