

PhD position: “Modelling overtopping erosion for flood defence reliability” at the University of Twente.

Job specification

This PhD vacancy concerns one of the two PhD positions at the University of Twente in the All-Risk program. The technology foundation (TTW) of the national science foundation NWO recently funded the Perspectief programme: “All-Risk, implementation of new risk standards in the Dutch flood protection program P15-21’. All-Risk is joint program with 14 PhD and 4 Postdoc positions, in which 8 universities and research institutes and many public and private parties collaborate to investigate flood risk and how measures such as flood defences can reduce this risk.

In 2014, the Dutch Flood Protection program (HWBP) adopted a new probabilistic risk approach for the management of the flood defences. Protection standards are expressed as flooding probabilities of polder areas, implying that multiple failure mechanisms for all dike sections within a dike ring must be considered, and then combined to assess the overall flooding probability. Implementation of this new approach will start already in the coming years. The transition therefore urgently calls for the cutting-edge scientific knowledge provided by our proposed research in the fields of A) development of the risk framework, B) characterizing dynamics in hydraulic loads, C) understanding subsoil heterogeneity, D) quantifying flood defence reliability, and E) organizing law, governance and implementation. This vacancy addresses project D3: “Modelling overtopping erosion for innovative measures”.

Project description

Failure of a dike cover due to wave overtopping erosion may initiate dike breach. Surface transitions in the grass cover, such as cure points, height difference, roughness difference and objects are often weak spots (Meer et al., 2014, Dean et al. 2010, Van Steen & Van Hoven, 2013), 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. Therefore, a detailed FEM model is required with a sufficiently accurate turbulence model. In this project the model of Bomers et al. (2016) and Aguilar-Lopez (2016) will be further developed, tested and applied to evaluate protection measures to provide insight in the effect of hard constructions on dikes. The aim of this PhD project is to develop tools for probabilistic safety assessment due to dike cover erosion for a range of grass types and transitions and develop innovative protection measures.

The objectives of this PhD work are:

- To develop and validate a numerical model that is able to predict the hydrodynamics and erosion of the dike cover due to wave overtopping.
- To investigate the effect of vegetation, transitions and objects (non-water retaining structures) on the probability of failure of the dike cover.
- To quantitatively or qualitatively assess the effect of interventions, such as innovative measures and maintenance strategies on the reliability of the dike cover.

Close collaboration with the other PhDs in the project (D) and with the users is required.

The research will be executed at the University of Twente, under supervision of the promotor (Prof.dr. Suzanne J.M.H. Hulscher), daily supervisor (dr. Jord J. Warmink) and the other members of the All-Risk consortium. This PhD project runs in close collaboration with the other sub-projects in the programme, hosted at the universities of Twente, Delft, Wageningen, Groningen, Nijmegen and Utrecht. The project is co-funded by STOWA, Rijkswaterstaat (Ministry of Infrastructure and the Environment), Deltares and the companies HKV, RHDHV, Arcadis, Witteveen+Bos, HillBlocks and several waterboards. A user group of externals has been formed to further warrant the applicability of the outcomes of this research.

Education (min 12.5 %) and teaching (10%) are also part of the PhD position at the UT.

Our offer

We offer a very challenging position in an inspiring multidisciplinary and international environment. As a PhD candidate you will be offered a fulltime position for four years, after which you should have completed your PhD thesis. In accordance with the Collective Labour Agreement for Dutch Universities the gross monthly salary increases from € 2.191,- in the first year to € 2.801,- in the final year. In addition, the University of Twente offers attractive fringe benefits.

Your profile

Your MSc is in Civil Engineering, Geosciences (e.g. Physical Geography or Geophysics), Mathematics, Environmental studies or a related field. We are looking for a talented, enthusiastic researcher with an active attitude and broad interests covering hydraulic engineering, modelling, flood risk and fluid mechanics. We consider it important that the candidate is able to view his/her research from a broader perspective (within the All-Risk programme, the scientific world and towards the practical application) and that he/she is willing and able to collaborate closely with other researchers in the programme and involved users in the team. Therefore, we welcome entrepreneurial candidates with an open mind, strong communicative skills and excellent comprehension of English, in both spoken language and writing. Experience in the use of numerical models is required, as is a good command of the English language. Non-dutch or non-native English speaking candidates need to provide IELTS or TOEFL-iBT test results. In addition, comprehension of the Dutch language is strongly beneficial in order to enable interaction with users. Some of the desired skills can be acquired during an individual training programme of 840 hours that is part of the PhD project.

Working environment at the University of Twente

The PhD work will be executed at the WEM group, part of the Civil Engineering Department, University of Twente in Enschede, the Netherlands. Within the UT, under the Faculty of Engineering Technology (ET), you will be part of the Water Engineering and Management (WEM) group, a team of approximately 60 academics and PhD's in the topics of marine, coastal and river systems, sedimentary processes, water footprint and policy studies. For more information on the WEM group: <https://www.utwente.nl/en/et/wem/>

More information and application

For more information about this vacancy you can contact Dr. Jord Warmink, telephone +3153-4892831, e-mail: [j.j.warmink @ utwente.nl](mailto:j.j.warmink@utwente.nl). The start of the project is planned around September 2017. Candidates that expect to graduate around this moment are also invited to apply. Please send your application letter, with a curriculum vitae, transcript (list with grades of courses attended), references and, if applicable, a list of publications before May 20th 2017 through the application link at the university of twente, vacancies.