TUDelft

Vacancy: 2 PhD positions in the field of safety and reliability of flood defences

Section of Hydraulic Engineering, Delft University of Technology, the Netherlands

The group

The Section of Hydraulic Structures & Flood Risk (HSFR) is part of the department of Hydraulic Engineering (Faculty of Civil Engineering and Geosciences) at Delft University. The group focuses on research and education related to hydraulic engineering systems and structures, probabilistic design and flood risk management. The group aims to do top-level research and provides excellent academic education for future generations of (hydraulic) engineers. Research and education are based on the traditionally strong Dutch skills in flood protection (e.g. Delta works) and recently developed approaches in the field of reliability- and risk-based design of hydraulic engineering systems.

The SAFElevee project

Recently the SAFElevee project was awarded to the group by the Dutch Technology Foundation STW. The objective is to enhance the safety of flood prone areas by improving the understanding of failure and breaching of levee systems. Systematic documentation and analysis of international levee performance data enables the development of accurate techniques for the reliable and cost-effective designs of flood defence systems. A cooperative data and knowledge platform on levee performance will be created through the close involvement of international research institutes, governmental bodies and stakeholders from the private sector. The project consists of three work packages: 1) macro-scale analysis of levee failure patterns (PhD1, vacant), 2) hind-casting of individual (near-) failures (PhD2, vacant), 3) modelling of breaching processes (postdoc, taken). For more information on the project see the project proposal.

Levee Failure (Breitenhagen, Germany, June 2013).Left: initial stage of the failure process, probable cause was instability. Right: breach in progress.

The candidate(s)

For two PhD positions (see below) we are looking for candidates will the following background and characteristics:

- An MSc degree in a relevant discipline such as hydraulic, geotechnical or civil engineering. Also candidates holding a degree in related disciplines such as applied mathematics or remote sensing with experience and strong interest in the envisaged applications are eligible.
- Sound skills and strong interest in quantitative (data) analysis and modelling.
- Experience with scientific research (e.g. publications, projects) is an advantage. Candidates should have a strong motivation for science and engineering.

- We are looking for team players with initiative and good communication skills. Interaction with stakeholders (e.g. governments, research institutes) and international research partners will be an important part of the project (incl. travelling).
- Candidates should be able to work independently.
- Candidates are expected to also contribute to general tasks of the section such as teaching in relevant courses.
- Proficient command of the English language (oral and written) is a requirement, knowledge of Dutch is an advantage.

The positions (see also [project proposal](#))

Both PhD positions are described briefly below. Given the common ground of the two work packages, we expect the candidates to collaborate closely to accomplish the project goals.

PhD 1: *Understanding levee failure patterns*

Little is known of what determines failure patterns (i.e. number of failures, types, and locations) of flood defences at a system level during extreme events. The objective of this work package is to collect and analyse data of levee performance and failure at a systems or macro-scale, to identify system failure patterns and its most important causal factors (e.g. type and shape of a levee, geological conditions, vegetation etc.). The work of PhD 1 will also show the value of information of different types or sources of data by demonstrating their impact in predicting failures or assessing the safety of flood defense systems. Special attention will be paid to data from novel monitoring techniques such as from the remote sensing domain, and analysis of the effects of landscape features. Quantitative data analysis skills are essential for successful completion of this work package, basic understanding of flood defense engineering an advantage.

PhD 2: *Hind-casting of individual levee failures and performance observations*

An important but poorly exploited source of information for improving our understanding of levee failures are (near-) failures of actual levees. This will contribute to improving the accuracy of failure mechanism and design models. The work of PhD 2 will consist of data acquisition and analysis of data-rich cases, focusing on geotechnical failure mechanisms (piping, instability), as these appear to be the dominant threats for levees in flood defences. The hind-casting will involve application of different failure models of varying complexity. Also probabilistic inverse analysis techniques will be used in order to detect the most likely causes of failure as well as the most likely field conditions at failure. Implementation and application of this novel type of probabilistic forensic analysis for flood defences will require sound knowledge of geotechnical engineering and / or probability / reliability analysis.

Conditions of employment

Hours per week 38
Location Delft
Contract 4 years
Salary €2125 to €2717 per month gross

Delft University of Technology offers attractive benefits, including a flexible work week and the option of assembling a customised compensation and benefits package (the 'IKA'). Salary and benefits are in accordance with the Collective Labour Agreement for Dutch Universities.

As a PhD candidate you will be enrolled in the TU Delft Graduate School. The TU Delft Graduate School provides an inspiring research environment; an excellent team of supervisors, academic staff and a mentor; and a Doctoral Education Programme aimed at developing your transferable, discipline-related and research skills. Please visit www.phd.tudelft.nl for more information.

Further information

For further information, you can contact: prof. dr. ir. S.N. Jonkman, professor of Hydraulic engineering, s.n.jonkman@tudelft.nl or dr. ir. T. Schweckendiek, researcher / lecturer, t.schweckendiek@tudelft.nl.

To apply, send an up to date CV and motivation letter to prof. Jonkman and dr. Schweckendiek before March 15, 2015. Please provide two references that could be consulted.