

PhD: Numerical Modelling of Sediment Augmentation in Rivers

Faculty/department Civil Engineering and Geosciences

Level Master degree

Maximum employment 38 hours per week (1 FTE)

Duration of contract 4 years

Salary scale €2083 to €2664 per month gross

Civil Engineering and Geosciences

The Faculty of Civil Engineering and Geosciences provides leading, international research and education. Innovation and sustainability are central themes. Research addresses societal issues. Research and education are closely interwoven. The faculty consists of the departments of Transport and Planning, Structural Engineering, Geoscience and Engineering, Water Management, Hydraulic Engineering, and Geoscience and Remote Sensing.

The Department of Hydraulic Engineering is concerned with the safe and sustainable use of surface waters (e.g., coasts, rivers, harbours). This involves studying and modelling the physics of these environments, optimising management strategies, and designing technical infrastructure.

Within the Department of Hydraulic Engineering, the Rivers Group focuses on the flow of water and transport of sediment in rivers. The main research themes are: (longterm) morphodynamic prediction, sediment transport and sorting, flow over groynes and obstacles, river bank processes, interaction between flow and vegetation, and uncertainties in fluvial modelling. Analyses of field observations, laboratory experiments, as well as analytical and numerical modelling are key components of our research.

Job description

A PhD candidate is sought for the project "Numerical modelling of sediment augmentation measures in lowland rivers".

For rivers that are prone to aggradation or degradation, sediment management measures, such as sediment augmentation and dredging, have become increasingly popular worldwide as they are flexible, sustainable, and cost-effective. Sediment augmentation has the potential to restore the natural morphodynamic behaviour of a river system (e.g., the Ebro river in Spain), reduce or halt bed degradation (e.g., the German Rhine), increase habitat diversity (e.g., the Spree river in Germany), and temporarily arrest the erosion of riverbanks or dikes to await more permanent constructions (e.g., the Cauca river in Colombia). It is still difficult, however, to predict the effects of such sediment management measures, as the effects of bedforms and sediment sorting on riverbed topography are not well accounted for. The objective of this project is to develop a 2D numerical research code for predicting channel response to sediment augmentation measures in sand-gravel rivers such as the Dutch Rhine. The numerical code will deal with mixed sediment processes such as grainsize-selective transport and vertical sorting. Such a numerical tool will aid in the design of sediment augmentation measures such that these measures optimally counteract the longterm degradation in the Dutch and German Rhine.

This vacancy concerns a project in the research programme 'RiverCare: towards self-sustaining multifunctional rivers', recently funded within the so called PerspectiefProgramme of the Dutch Science and Technology Foundation (NWO-STW). In RiverCare five universities and many public and private parties collaborate to get a better understanding of the fundamental processes that drive ecomorphodynamic changes, to predict intermediate and longterm developments, and to develop best practices to reduce maintenance costs and increase the benefits of interventions. The river restoration projects currently carried out in the Dutch Room for the River programme provide a unique opportunity to achieve these objectives and use the results to develop models and develop guidelines for best practices. This research project will be conducted in close cooperation with other subprojects in the RiverCare programme, and more specifically with a RiverCare project that focuses on the physical effects of sediment management measures on bedforms, mixed sediment processes, and navigability in lowland rivers.

The research project will be conducted at Delft University of Technology. Advisors are Dr. Astrid Blom, Dr. Robert Jan Labeur, Prof. Wim Uijttewaal (promotor), and other members of the RiverCare consortium (Dr. Ralph Schielen of Twente University). The project is co-funded by Rijkswaterstaat (Ministry of Infrastructure and the Environment). A user group will be installed and warrants a link to practice.

Requirements

The PhD student is required to have an MSc degree in Civil or Environmental Engineering, Applied Mathematics, Physics or a related field. The candidate should have a thorough background in numerics, hydrodynamics, morphodynamics, or general physics. In particular, the preferred candidate has a strong interest in development (not only application) of numerical code, as well as in river morphodynamics. He/she is communicative, curious, eager to learn, and able to work in a multi-disciplinary team of scientists.

Conditions of employment

TU Delft offers an attractive benefits package, including a flexible work week, free high-speed Internet access from home (with a contract of two years or longer), 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. 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.

Information and application

For more information about this position, please contact Dr. Astrid Blom, e-mail: astrid.blom@tudelft.nl. To apply, please send the following:

- (1) a letter of application (max 1 page),
- (2) a detailed Curriculum Vitae that explicitly states your educational record, list of publications (if any), industrial experience (if any), and the names of three persons who could be contacted for a reference,
- (3) a first and short indication of research questions and the methodology that you, at this stage, would propose for this project (in 400 words or less).

Please e-mail your application before 25 September 2014 to Dr. Astrid Blom, astrid.blom@tudelft.nl. When applying for this position, please refer to vacancy number CITG14-33.