

WINNER

Entry: L1-47

category: **Rail**

Researcher: Ken Gavin

University: Delft University of Technology

RA7

Transport Infrastructure

Keywords: Slope Stability • Rainfall Induced Failure • Embankments • Vulnerability • Probability of Failure •

Analysing the effect of rainfall on railway embankments using fragility curves

Dr. Gavin is Professor of Subsurface Engineering at TU Delft since April 2016. The Chair is sponsored by sponsors Deltares and Rijkswaterstaat. His primary research focus is on deep foundation systems and the impact of climate change on transport networks.

He has led a number of EU collaborative research projects focussed on infrastructure resilience and been involved in joint industry projects focussed on offshore renewable developments including the instrumentation and analysis of a novel twisted jacket structure installed in the North Sea, the development of design methods for axially loaded pile and was a member of the academic work group of the Pile Soil Analysis (PISA) project together with researchers at Oxford University and Imperial College that was awarded the 2017 British Geotechnical Association Fleming medal in recognition of excellence in the practical innovative application of geotechnics in a project.

Between 2011 and 2014 Ken coordinated the EU FP7 SMART RAIL project that focused on climate impacts on rail infrastructure networks and specifically on ways of decreasing the reliance on visual assessment methods in safety assessments. He supervised two PhD students, one who developed a novel vibration based system to detect bridge scour and a second who developed probabilistic models to predict rainfall induced landslides.

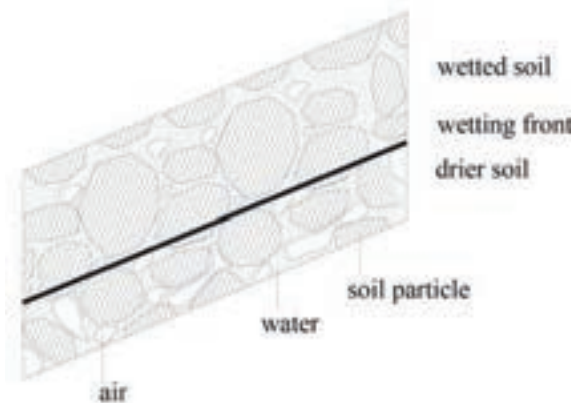
In 2014 based on SMART RAIL outputs and R&D sponsored by Irish Rail, Ken's company

GDG developed a decision support tool, DST to manage 4,000 earth slopes across the Irish rail network. This work informed the H2020 Destination Rail project (2015 – 2018) which aimed to develop a multi-asset DST for rail infrastructure managers. In addition to developing new inspection and analysis techniques many of the techniques developed in SMART RAIL were applied on operating networks.

The DST was showcased at the penultimate project meeting hosted by the Slovenian National Building and Civil Engineering Institute (ZAG) in Ljubljana in December 2017.

Recognising that data analytics techniques were advancing rapidly, he led the development of the concept for the H2020 Shift2Rail project GoSAFE RAIL (2016-2019) with the intention of using machine learning approaches to develop advanced obstruction detection methods and improved safety along rail networks. To date the project has developed and demonstrated on live railways an image analysis based object detection methodology in Croatia and a seismic array based system for detection of rock falls in Norway.

In April 2016 Ken moved to TU Delft in the Netherlands. At the time he was leading a consortium developing the H2020 SAFE-10-T project. The project which officially kicked-off in May 2017. will develop a Safety Framework to ensure high safety performance while allowing longer life-cycles for critical infrastructure across the road, rail and inland waterway modes.



The Geo Engineering Section at TU Delft are responsible for a number of key tasks in the project, these include:

- The development of a cyclic loading model for soil-structure interaction analysis of bridge foundations
- The instrumentation and analysis of submerged tube tunnels in the Netherlands.
- Development of system reliability approaches for the probabilistic analysis of earthworks on transport networks.
- Development of data analytics techniques for the analysis of rain fall induced slope failures and tunnel movements using data from an instrumented rock tunnel in Croatia.

