



## TERRE

Training Engineers and Researchers to Rethink  
geotechnical Engineering for a low carbon future

**36-month “Marie Skłodowska-Curie” Early Stage Research Fellowship**

**including registration as a PhD student at the University of Glasgow, UK**

### Geotechnical design optimization for minimum energy/carbon (ESR12)

The use of state of the art optimization techniques in geotechnical design has the potential to generate significant benefits in minimising energy and carbon usage in geotechnical construction. However to date this potential has not been fully exploited. This project will draw on the latest research undertaken in the TERRE consortium on quantifying carbon footprints of civil infrastructure and low carbon technologies with the aim of incorporating it into an optimization based design tool. The research will build on the established optimization based software LimitState:GEO (see <http://www.limitstate.com/geo>) that is able to rapidly analyse the ultimate limit state for geotechnical constructions of any geometry using computational limit analysis.

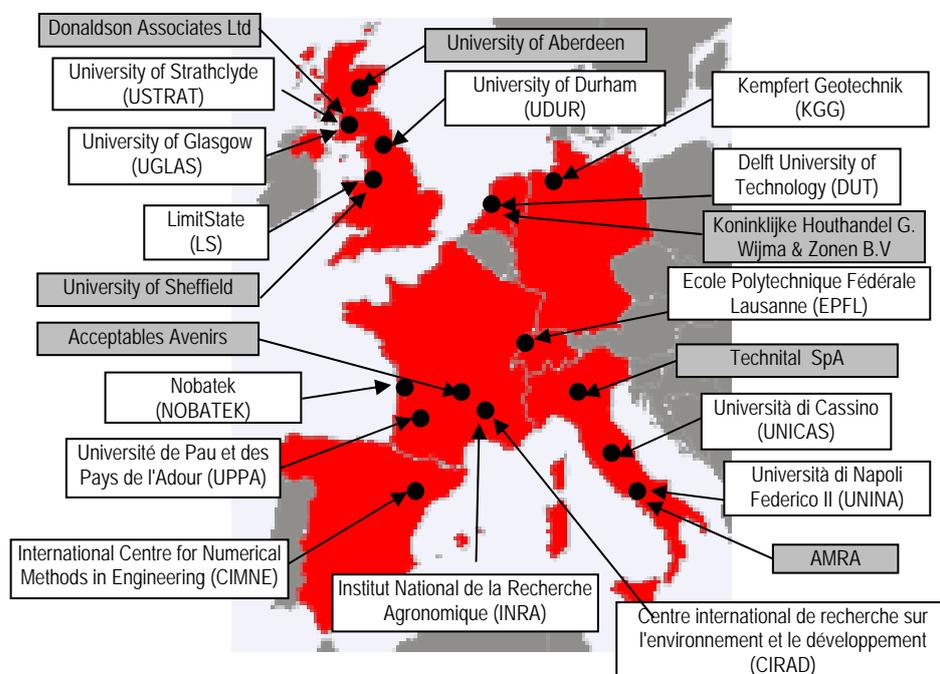
The project is a fully funded ‘industrial’ PhD based at industrial partner LimitState Ltd. (24 months) and the University of Glasgow (12 months) who will award the PhD. At present, engineers can use LimitState:GEO to manually optimise a specific design; however this ‘optimisation’ is largely down to the engineer’s judgement. This project will work to: (a) examine novel approaches that can automate the optimisation process based on defined criteria, (b) provide a measure of cost/energy/carbon to be used for the optimisation goals, and (c) incorporate the effects of soil suction and vegetation into the analysis. The latter aim will involve close collaboration with a parallel TERRE project that aims to incorporate the effects of soil suction and suction control into the analysis.

The PhD will suit candidates with a strong mathematical and programming ability and provides an excellent opportunity to research cutting edge optimization techniques in the context of low carbon engineering.

This project is funded through the European Training Network TERRE.

#### TERRE Network

TERRE involves 11 academic partners, 3 industrial partners and 7 Partner Organisations (grey boxes) from seven different European countries.



## **TERRE Project Overview**

The project position is part of the European TERRE Marie Skłodowska-Curie Innovative Training Network (H2020 Marie Curie Action grant number 675762). The project “Training Engineers and Researchers to Rethink geotechnical Engineering for a low carbon future” (TERRE) is led by the Department of Civil & Environmental Engineering at the University of Strathclyde and includes participants from UK, France, Italy, Netherlands, Spain, Germany and Switzerland. The TERRE network aims to develop novel geo-technologies to address the competitiveness challenge of the European construction industry in a low carbon agenda. Industry and Research in the construction sector have been investing significantly in recent years to produce innovative low-carbon technologies. However, little innovation has been created in the geo-infrastructure industry, which is lagging behind other construction industry sectors. TERRE aims to close this gap through a network-wide training programme carried out by a close collaboration of eleven Universities and Research Centres and three SMEs.

The Marie Curie Early-Stage Research (ESR) fellows will be involved in inter-sectoral and intra-European PhD projects via enrolment in 8 ‘Joint-Awards’ and 7 ‘Industrial’ PhDs focusing on carbon-efficient design of geotechnical infrastructure. In addition to ‘Training through Research’, TERRE will offer ‘Training through Courses’ designed at Network level to develop ESRs’ technical and complementary skills.

### **Eligibility criteria:**

- i) Early-Stage Researchers (ESRs) shall, at the time of recruitment by the first host organisation, be in the first four years (full-time equivalent research experience) of their research careers and have not been awarded a doctoral degree. Full-Time Equivalent Research Experience is measured from the date when a researcher obtained the degree which would formally entitle him/her to embark on a doctorate
- ii) At the time of recruitment by the first host organisation, researchers must not have resided or carried out their main activity (work, studies, etc.) in the countries of their host organisations (i.e. the UK) for more than 12 months in the 3 years immediately prior to the reference date. Compulsory national service and/or short stays such as holidays are not taken into account.

In addition to the above, applicants should have a good MSc or MEng degree or equivalent in a relevant field such as Geotechnical Engineering, Civil Engineering or Applied Mathematics. Applicants should have the ability to undertake research and disseminate results and should be creative, with strong programming skills and the ability to apply initiative and solve problems. Candidates should have excellent communication and technical presentation skills and be able to work well both independently and as part of a team. Willingness for significant mobility throughout Europe to engage with academic and industrial partners is required. The project is based at the industrial partner LimitState Ltd. in Sheffield, UK (24 months) and the University of Glasgow, UK (12 months).

### **Living, mobility, and family allowance**

The ESR will be recruited with an employment contract consisting of a Living Allowance of €3110/month (adjusted with the country coefficient), a Mobility Allowance of €600/month, and a Family Allowance €500/month (if eligible). Allowances are subjected to employer and employee’s compulsory deductions.

### **PhD registration and the University of Glasgow**

The ESR will register for PhD study at the University of Glasgow. The University of Glasgow was founded in 1451 (the 4<sup>th</sup> oldest in the UK) and now has more than 25,000 undergraduate and postgraduate students from more than 140 countries worldwide. In 1840 we became the first university in the UK to appoint a Professor of Engineering and the School of Engineering now has 109 academic staff, 110 postdoctoral researchers and more than 1600 students, including 240 PhD students. The ESR (PhD student) will be based in the Infrastructure & Environment Research Division within the School of Engineering. Supervision will be provided by Dr Colin Smith (LimitState Ltd. and University of Sheffield) and Prof Simon Wheeler (University of Glasgow).

**How to Apply**

Apply online at <http://www.gla.ac.uk/about/jobs/vacancies/>. The Reference for the post is 013829.

**Closing Date**

24th July 2016

**Who to Contact**

Further details can be obtained from Dr Colin Smith ([c.c.smith@sheffield.ac.uk](mailto:c.c.smith@sheffield.ac.uk)) or Prof. Simon Wheeler ([Simon.Wheeler@glasgow.ac.uk](mailto:Simon.Wheeler@glasgow.ac.uk))