



## TERRE

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

“Marie Skłodowska-Curie” Early Stage Research Fellowship<sup>†</sup>

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

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

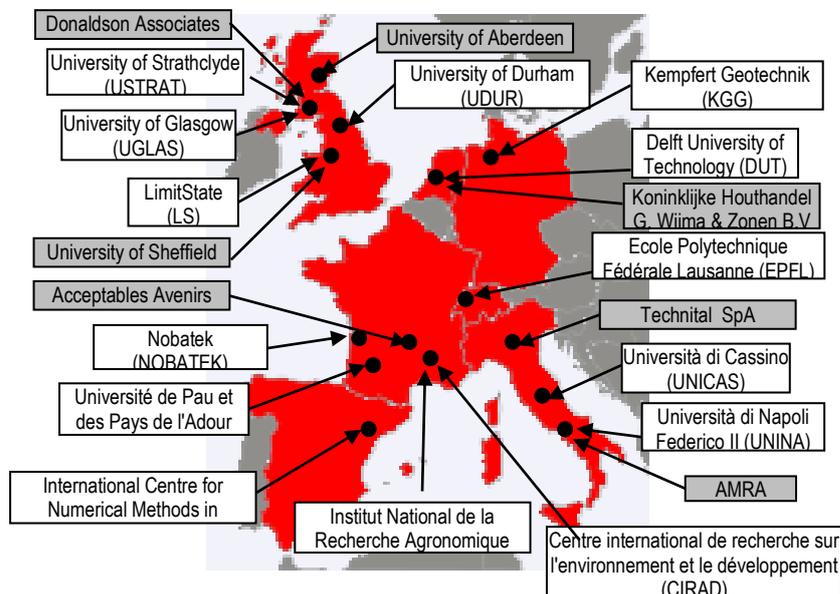
The post is a fully funded Research Fellowship based at TERRE industrial partner LimitState Ltd. for 15 months. At present, engineers can use the LimitState:GEO software to manually optimise a specific design; however this ‘optimisation’ relies on engineering judgement. The goal of the research will be to address one or more of the following: (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 aims will involve close consultation with parallel TERRE projects that are investigating related issues.

The Fellowship 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 part 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.



<sup>†</sup> Tenable for a duration 15 months.

## 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 Civil Engineering, Computer Science 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 their 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 for a period of 15 months and will also involve some periods of secondment to the TERRE academic partner the University of Glasgow, UK.

Candidates should be EU citizens.

### 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. The salary will be paid in pounds sterling and the exchange rate employed may vary and depends on the rate prevalent at the stage relevant funding elements are allocated by the EU.

### How to Apply:

Please send a CV and covering letter by email to Dr Colin Smith ([c.c.smith@limitstate.com](mailto:c.c.smith@limitstate.com))

The application documents should list two persons who may act as references (with phone numbers and e-mail addresses). Applicants with a qualification from a non-UK university are advised to provide an explanation of the grading system used by that university.

### Closing Date

16:00 UTC Monday 13 August. Interviews will take place Friday 17 August 2018.

## Further Details

Further details can be obtained from Dr Colin Smith ([c.c.smith@limitstate.com](mailto:c.c.smith@limitstate.com))

*Note that the post is tenable for a period of 15 months based on the assumption that the candidate will be able to take up the post during the month of September 2018 or earlier. Funding for the post will comprise a “Marie Skłodowska-Curie” Early Stage Research Fellowship of 14 month duration funded by the European Union, and an additional 1 month employment provided by LimitState Ltd. Preference will be given to candidates who can start according to this timescale; however candidates will be considered who may need to adopt a later start date and the appointment period may be correspondingly shortened.*

*The postholder may be offered permanent employment at LimitState following the 15 month period, subject to performance and to appropriate opportunities being available at the company at that time.*

## Job Description

### Brief Outline of Job:

To undertake specific research under the general guidance of a supervisor at LimitState Ltd as part of the Marie-Skłodowska-Curie Innovative Training Network. To attend training activities provided by the project network. To attend project meetings and collaborate with other researchers in the network. To complete required secondments within the consortium. To disseminate research results at consortium meetings, at relevant conferences and through quality journal papers.

### Main Activities/Responsibilities:

1.	Plan and manage own workload in order to conduct research both independently and collaboratively per project requirements, refining the work programme as necessary in conjunction with the supervisor.
2.	Conduct individual research, including determining appropriate research methods and contributing to the development of new research methods.
3.	Produce regular project reports and present these at project meetings.
4.	Write up research work for publication, individually or in collaboration with colleagues, and disseminate results as appropriate to the discipline by, for example, peer reviewed journal publications and presentations at conferences.
5.	Join external networks to share information and ideas, and inform the development of research objectives.
6.	Collaborate with colleagues on the development of knowledge exchange activities by, for example, participating in initiatives, which establish research links with industry.
8.	To actively participate in research and training activities within the TERRE network.
9.	To disseminate research results within the consortium (via project meetings) and externally (via international conferences) to the scientific community and in the non-scientific community (via outreach and public engagement).
10.	Software development, testing and documentation (including e.g. diagrams, code comments and/or clear code). Production of product documentation and example files to demonstrate the capabilities of LimitState software.

## Person Specification

### Educational and/or Professional Qualifications

(E=Essential, i.e. a candidate must meet all essential criteria to be considered for selection, D=Desirable)

	Essential/ Desirable	Assessment Method
MEng or equivalent in Geotechnical Engineering, Civil Engineering, Computer Science or Applied Mathematics or equivalent with first-class or upper second-class honours or equivalent	Essential	Application/CV
Evidence of research potential through completion of projects or other relevant activity	Essential	Application/CV

### Experience

Experience in computer programming	Essential	App/CV/ Interview
Experience in numerical analysis of geotechnical/engineering problems	Desirable	App/CV/ Interview
Experience in geotechnical design	Desirable	App/CV/ Interview
Experience in interaction with public and private sector	Desirable	App/CV/ Interview

### Job Related Skills and Achievements

Ability to plan and organise own workload effectively	Essential	App/CV/ Interview
Developing ability to conduct individual research work and to disseminate result	Essential	App/CV/ Interview
Excellent presentation skills	Essential	App/CV/ Interview
Ability to work both independently and as part of an interdisciplinary team	Essential	App/CV/ Interview
Excellent interpersonal and communication skills, with the ability to listen, engage and persuade, and to present complex information in an accessible manner	Essential	App/CV/ Interview

### Other Relevant Factors

ESR Eligibility: Has not resided in the UK for more than 12 months in the last 3 years; has not been awarded a Doctoral Degree; and is in the first four years of their research career.	Essential	Application/CV
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