

ESR 3.5 - Fragility curves for structures including soil-structure interactions

A Research PhD position in the URBASIS ITN funded by the EC

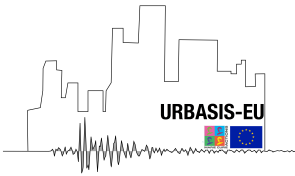
Supervisor – Dimitris Pitilakis (AUTH - Thessaloniki) – Roberto Paolucci (POLIMI - Milano)

Recent devastating earthquakes and induced seismicity near infrastructures must become the centerpiece of analysis in reducing risk and increasing resilience, facing up to global urban population growth in the coming decades and the concentration of wealth in cities. The prediction of seismic ground motion and response of structures are key issues in reduction of seismic urban risk. There is therefore a demand for highly trained scientists with a broad understanding of engineering seismology and earthquake engineering, skills being essential in academic research, in private companies with activities related to risk mitigation and energy facilities and for policy makers. The URBASIS-EU project aims to provide a multi-disciplinary training platform for young scientists in order to develop their individual project and to promote their entrepreneurship and their employability toward the academic, private and insurance or decision-making sector. High-quality supervision of the young scientists will be ensured through the international recognition of the URBASIS-EU partners. A comprehensive set of transferable skills will be developed through innovative and interdisciplinary joint research projects between academic and non-academic partners on the prediction of seismic hazard in urban areas considering low-probability/high-consequences events and induced seismicity related to the exploitation of energy resources; the seismic ground motion prediction within the non-free-field urban area; the coupling between ground motion and structures/infrastructures responses for natural and induced seismicity including time dependent vulnerability; and the systemic risk of interconnected urban systems. URBASIS-EU will create a lasting collaboration for the establishment of a European network of academic and non-academic experts, improving the interface with decision-makers.

More information: <https://urbasis-eu.osug.fr/?lang=en>

Job description

Common practice in seismic performance assessment assumes fixed-base structures, which might be a realistic hypothesis only when these are founded on relatively solid rock or very stiff soil. The seismic response of a structure resting on deformable soil, however, might differ significantly compared to the fixed-base assumption. Soil-foundation-structure interaction (SFSI) and local site-effects are generally shown to be more pronounced in the case of soft soil formations and high-rise structures, causing considerable modification to the free-field motion, as well as to the dynamic response of the structure. In addition to SFSI, structure-soil-structure interaction (SSSI) and the influence of adjacent structures on the structural response has not received much attention in the development of the fragility expressions used in the vulnerability assessment of structures. Moreover, ageing effects on structures might increase their vulnerability and contribute to significant loss of their capacity via a slow, progressive and irreversible process caused by the deterioration of the material properties. With respect to the incoming ground motion, site-effects should be evaluated through powerful numerical tools. In sedimentary valleys, 2D effects and soil non-linearity will be included in numerical analyses using elaborate software.



The ESR will propose new improved fragility curves for various typologies of reinforced concrete and masonry buildings that take into account the cumulative influence of non-linear site-effects, soil-foundation-structure and structure-soil-structure interaction, allowing also for ageing and other environmental detrimental effects. The aim is to study how these effects affects performance levels and structural resilience.

The URBASIS consortium is funded by European Commission's Innovative Training Network (ITN) program. This research project will take place at the Aristotle University of Thessaloniki, Grèce. This project will involve close collaboration with Politecnico di Milano (IT), where the researcher will spend several months. The project will also involve secondment with MUNICH-RE (Germany).

Requirements and Application

The successful applicant must have a Master degree in Civil Engineering, earthquake engineering and engineering seismology or similar. The applicant is expected to have a very strong civil and earthquake engineering and statistics background. Furthermore, knowledge of code programming in python is an advantage. Excellent undergraduate and Master degree grades are expected. A high level of written and spoken English is also expected.

PhD stipends are allocated to individuals who hold a Master's degree. PhD stipends are normally for a period of 3 years. It is a prerequisite for allocation of the stipend that the candidate will be enrolled as a PhD student at the Doctoral program of the Department of Civil Engineering of Aristotle University of Thessaloniki, in accordance with the regulations of the PhD Program at the University. According to the URBASIS-EU, the progress of the PhD student shall be assessed every 12 months. It is a prerequisite for continuation of salary payment that the previous progress is approved at the time of the evaluation.

The qualifications of the applicant will be assessed by the **Selection committee**. On the basis of the recommendation of the **Selection** committee, the Director of the Doctoral program of Aristotle University of Thessaloniki will make the final decision for allocating the stipend.

URBASIS-EU wishes to reflect the diversity of society and welcomes applications from all qualified candidates regardless of personal background or belief. We encourage applications from everyone irrespective of gender and ethnic group but, as women and members of ethnic minority groups are currently under-represented at this level of post, we would encourage applications from members of these groups. Appointment will be based on merit alone.

Application must be in a form of a single PDF file including a CV, a cover letter, academic transcripts, and the names and complete contact information and letter of two referees sent through :

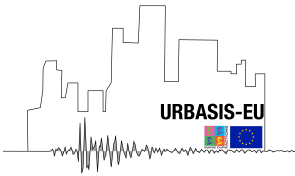
- **the consortium web-page <https://urbasis-eu.osug.fr/?lang=en>**
- **the EU EURAXESS portal <https://euraxess.ec.europa.eu/>**

Vacancy number : URBASIS-EU ESR3.5 (to be reminded in the application form)

Deadline : February, 23rd 2019

Salary : According to the European Commission and local standards ; minimum wage is 3500 euros before local taxes

Contact Information



You may obtain further information from :

- **Philippe Guéguen**, URBASIS project coordinator : philippe.gueguen@univ-grenoble-alpes.fr (Earth Science Institute, Université Grenoble Alpes) for general questions regarding the URBASIS consortium or concerning the scientific and training aspects of the ITN program.
- **Dimitris Pitilakis** : dpitilakis@civil.auth.gr (AUTH) concerning the scientific aspects of the PhD project.
- **Florence Cataye**, URBASIS project manager : florence.cataye@univ-grenoble-alpes.fr for administrative questions.

For more information of Doctoral School: <http://www.dottorato.polimi.it/en/phd-programmes/active-phd-programmes/structural-seismic-and-geotechnical-engineering/>