CIVIL AND ENVIRONMENTAL ENGINEERING

PNRR - Design and Performance Assessment of Mitigation Measures for Risk Reduction along Critical Infrastructures subject to Wind Storms

Funded By	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] Politecnico di TORINO [P.iva/CF:00518460019]
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Context of the research activity	Ongoing climatic changes have increased the frequency and magnitude of synoptic wind storms in extra-tropical regions, Europe included. Such events impact on both built environment and human activities (e.g. transport and energy infrastructures, buildings, urban areas), and natural environment (e.g. forests, coastal areas). The research addresses mitigation measure to reduce the vulnerability of critical infrastructures. PNRR M4C2, Investimento 1.3 - Avviso n. 341 del 15/03/2022 - PE0000005 Multi risk science for resilient communities under a changing climate (RETURN) - CUP E13C22001860001
Objectives	The PhD Thesis generally aims at learning lessons from the past events, and mitigating the vulnerability of exposed systems through the conceptual design of natural and/or bio-inspired Mitigation Measures (MM). In particular, the project is addressed to porous belts to be deployed around/along the exposed system, made by plants and/or trees and/or man-made porous barriers. The sheltering performances of the conceived MM(s) will be assessed under different environmental and operational conditions. Performances will be optimized by means of machine learning techniques, e.g. genetic algorithms. Both performance assessment and optimization will be supported by an efficient computational model of the turbulent wind flow in the Atmospheric Boundary Layer through porous obstacles. The equivalent aerodynamic porosity of the vegetated belt will be evaluated in statistical terms from observations of real-world plants and/or trees. The mathematical model will be solved by means of computational engineering

	simulations. The PhD Thesis will be also supported by the WSMM joint Research and Development group (ww.polito.it/wsmm) established between Politecnico di Torino (DAD, DISMA) and Optiflow Company (FR).

Skills and competencies for the development of the activity	Hard skills: An ideal PhD candidate will hold a Master's degree and have excellent marks from his/her previous studies and courses along with experience in computational wind fluid dynamics, solid mechanics, and computational engineering. Soft skill: An ideal PhD candidate will demonstrate team working skills and problem-solving aptitude. Strong written and verbal communication skills in English are required. Initial confidence with High Performance Computing hardware and software facilities will be appreciated, but not strictly required.