



DIPARTIMENTO DI STRUTTURE PER L'INGEGNERIA E L'ARCHITETTURA
CORSO DI DOTTORATO DI RICERCA IN
INGEGNERIA STRUTTURALE GEOTECNICA E RISCHIO SISMICO

XXXIX CICLO

Il sottoscritto prof. Maria Polese

(PO PA X RU RTD) afferente al Dipartimento di

S.S.D. (*indicare codice e nome per esteso*) ICAR/09 Tecnica delle Costruzioni

CHIEDE

di essere inserito tra i possibili tutor di studenti di dottorato per il XXXIX ciclo.

1. Curriculum sintetico del proponente (max 500 parole)

Maria Polese is currently Associate Professor of Structural Engineering at the Department of Structures for Engineering and Architecture of the University of Naples Federico II. She graduated cum Laude in Civil Engineering in 1999 and received her Ph.D. in Structural Engineering in 2003 at the same university, working on seismic vulnerability assessment of RC buildings. During her PhD she was visiting scholar at the University of Ljubljana, Slovenia. From January 2005 to November 2019 she was Assistant Professor of Structural Engineering at the University of Naples Federico II.

She is involved in several multidisciplinary research activities and projects (National and European) mainly focused on Seismic vulnerability and risk assessment, Reparability of damaged structures, risk/loss estimation methodologies and multi-risk and crisis management policies framework.

She is leader of WP2 “Multi-risk-oriented modeling of urban systems” within research program “Urban and metropolitan settlements” of the Extended Partnership PE3 RETURN “multi-Risk sciEnce for resilientT commUnities undeR a changiNg climate”.

She is PI of project EXPLORA - EXPosure assessment for buiLding typOlogies integRating innovAtive survey techniques, financed for years 2023-2025 by Ministry of Foreign Affairs and International Cooperation of Italy within bilateral Agreements between Italy and Montenegro.

She is leader of WP3 “Good practices and Scenarios” within European Project ROADMAP2 - euROpean observAtory on Disaster risk and crisis MANagement best Practices: way ahead.



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She was coordinator for the research unit AMRA within the European project CRISMA Modelling crisis management for improved action and preparedness, Scientific responsible of the research activity of the Italy research group within the E-Defense Ten-story RC Project, organized to support studies on the 2015 and 2018 tests on 10 story RC buildings at E-Defense (Japan), Leader of WP4 - Shared methodology for cross-border multi-risk assessment, in the European Project BORIS – Cross BOrder RISK assessment for increased prevention and preparedness in Europe, Member of the Steering Committee and participating to the activities of the European Project ROADMAP - euROpean observAtory on Disaster risk and crisis MAnagement best Practices, Scientific responsible for research unit UNINA-E in WP2 – Inventory of structural typologies and existing built environment (CARTIS) and of research unit UNINA-B in WP4 – Seismic risk maps and damage scenarios (MARS) in the project DPC-Reluis 2019-2021, Scientific responsible for research unit UNINA in the special project RS4 Seismic observatory of structures and monitoring RELUIS –DPC 2014-2015-2016

She is author of more than 70 scientific papers published in international peer-reviewed journals or presented at international conferences, and 7 book chapters also as outcomes of the many research activities carried out at national, European and international level.

See more on <https://www.scopus.com/authid/detail.uri?authorId=6701714933>

2. Dottorandi dei quali il proponente è stato tutor nell'ultimo triennio

<i>n. 1</i>	<p><i>Ph.D. scholarship funded by MUR</i></p> <p><i>Ph.D. candidate: Gabriella Tocchi - Structural, Geotechnical Engineering and Seismic Risk - XXXV cycle</i></p>
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3. Titolo della ricerca proposta



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Multi-risk assessment of Urban and Metropolitan settlements in a changing climate

4. Area tematica

Ingegneria Geotecnica

Ingegneria Strutturale

Rischio Sismico

5. Tipologia di borsa per la quale si propone il progetto

Ateneo

DM 117 (Investimento 3.3)
(in questo caso indicare l'azienda co-finanziatrice)

DM 118 (Investimento 4.1 P.A.)

DM 118 (Investimento 4.1 generici)

DM 118 (Investimento 4.1 Patrimonio culturale)

6. Sintesi del progetto di ricerca (max 500 parole. Stato dell'arte, obiettivi e breve programma previsto per le attività e)

State of Art

Modelling and quantifying natural-hazard risk enables decision-makers to understand the potential types and the extent of future disaster impacts. This is particularly relevant in urban and metropolitan areas, characterized by high exposure in complex urbanized systems. For facilitating development and implementation of appropriate preparedness and mitigation strategies, risk quantification approaches should capture the effects of multiple hazards. Indeed, prioritizing risks originating from different hazards in a region of interest is crucial to enable decisions on appropriate and cost-effective mitigation or preparedness measures. However, the performing of multi-risk assessment is a difficult task, mostly due to different methodologies and spatial/temporal resolutions adopted in the quantification of single risks.



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Index-based approaches are particularly suitable for measuring multidimensional realities too complex to be summarized by a single indicator. For this reason, a straightforward multi-risk index that combines multiple hazards and both physical and social exposure and vulnerability is needed.

Objectives

The PhD project shall contribute to the development of a conceptual and methodological framework for the holistic understanding and modelling of multi-risk in urban and metropolitan areas. An interdisciplinary and scalable approach should be adopted, allowing to model the effect of diverse factors contributing to risk, including different type of hazards (e.g. geophysical, hydrological, climatological) and exposed elements in urban settlements, the multiple dimensions of vulnerability (physical, societal, economical) and related exposure as well as to suitably consider the effect of strategic soft or hard policies to improve the communities resilience under climate change.

Program

The PhD research activities shall allow to propose and test systems of composite indicators allowing to measure both the risk and resilience for urban and metropolitan settlements. The system of indicators can be differentiated depending on the dimension of the urban system (small-large cities) and could be used to compare the risk of different cities, their resiliency and possible improvements associated to simulated implementation of different soft and hard risk reduction policies. The approach should also be conceptually scalable, allowing to improve the evaluation of single indicators (contributing to a final composite index) provided more detailed data and information are available. Stakeholders and different institutional players should be involved in the different phases of development of the composite indicators (e.g. in the development of conceptual framework; selection of groups of individual indicators; etc.)

7. Eventuali pubblicazioni del tutor sul tema di ricerca (max 10)

- 1) G. Tocchi, M. Polese, M. Di Ludovico, A. Prota, (2022), REGIONAL BASED EXPOSURE MODELS TO ACCOUNT FOR LOCAL BUILDING TYPOLOGIES, *Bulletin of earthquake engineering*, 20: 193–228, doi.org/10.1007/s10518-021-01242-6



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- 2) Dolce, M., Prota, A., Borzi, B., da Porto, F., Lagomarsino, S., Magenes, G., Moroni, C., Penna, A., Polese, M., Speranza, E., Verderame, G. M., Zuccaro, G. (2021). Seismic risk assessment of residential buildings in Italy. *Bulletin of Earthquake Engineering*, 19, 2999–3032
- 3) Polese M., Di Ludovico M., Gaetani d'Aragona M., Prota A., Manfredi G. (2020) Regional vulnerability and risk assessment accounting for local building typologies, *International Journal of Disaster Risk Reduction*, 43, 141400, DOI: 10.1016/j.ijdrr.2019.101400
- 4) Polese M., Gaetani d'Aragona M., Prota A., (2019) Simplified approach for building inventory and seismic damage assessment at the territorial scale: an application for a town in southern Italy, *Soil dynamics and earthquake engineering*, 121, 405-420, DOI 10.1016/j.soildyn.2019.03.028
- 5) Polese M., Gaetani d'Aragona M., Di Ludovico M., Prota A., (2018) Sustainable Selective Mitigation Interventions towards Effective Earthquake Risk Reduction at the Community Scale, *Sustainability*, 10(8), 2894
- 6) M. Polese, G. Tocchi, M. Dolsek, A. Babič, M. Faravelli, B. Borzi, N. Rebor, D. Ottonelli, M. Mikos D. Quaroni, R. Masi, A. Prota, (2023), Multi-risk framework for assessing and ranking seismic and flood risks: an application in Italy-Slovenia transboundary region, *proceedings of COMPDYN 2023, 9th ECCOMAS Thematic Conference on Computational Methods in Structural Dynamics and Earthquake Engineering*, Athens, June 12–14, 2023
- 7) B. Petrenj, F. Capone, C. Morsut, D. Di Bucci, M. Polese, (2022), The relevance of Good Practices to improve Disaster Risk Management in Multi-Hazard Risk Scenarios in the field of civil protection, *Proceedings of the 32nd European Safety and Reliability Conference (ESREL 2022)*, Dublin, , 28 August – 1 September 2022
- 8) Tocchi G., Polese M., Prota A., (2022), Improving building inventory with a machine learning approach: application in southern Italy, *XIX Convegno Anidis*, Torino, 11-15 settembre 2022
- 9) G. Tocchi, G. Cremen, C. Galasso, M. Polese, Development of a multi-risk index for Italy: a tool for supporting informed decision making on disaster risk reduction prioritisation, 14th International Conference on Applications of Statistics and Probability in Civil Engineering, ICASP14, Dublin, Ireland, July 9-13, 2023
- 10) Polese M., Tocchi G., Dolsek M., Babic A., Faravelli M., Quaroni D., Borzi B., Prota A., (2022), Seismic risk assessment in transboundary areas: the case study on the border between Italy and Slovenia, *XIX Convegno Anidis*, Torino, 11-15 settembre 2022

8. Eventuali progetti di ricerca finanziati in cui l'attività si inserisce

- research program “Urban and metropolitan settlements” of the Extended Partnership PE3 RETURN “multi-Risk sciEnce for resilienT commUnities underR a changiNg climate”
- project EXPLORA - EXPosure assessment for buiLding typOlogies integRating innovAtive survey techniques
- European Project ROADMAP2 – euROpean observAtory on Disaster risk and crisis MANagement best Practices



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9. Eventuali fondi disponibili a supporto dell'attività del dottorando (escluso finanziamento borse)

10. Informazioni relative ad un periodo di ricerca all'estero (minimo tre mesi) previsto per il dottorando (*indicare Università/ente di ricerca e docente/ricercatore di riferimento con indirizzo mail*) (max 300 parole)

University College London

Prof. Carmine Galasso

c.galasso@ucl.ac.uk

11. Eventuali collaborazioni con imprese/aziende sul tema di ricerca (max 300 parole)

Napoli, 30/06/2023

FIRMA



Il presente modulo va compilato in ogni sua parte ed inviato all'indirizzo di posta elettronica phd.dist@unina.it entro e non oltre il 30/06/2023.