CURRICULUM VITAE

Name and Title:	Dr Helen Crowley
Date of Birth:	04/06/1978
Nationality:	British / Irish
Address:	c/o GEM Foundation Via Ferrata 1, Pavia, 27100, Italy Email: <u>helen.crowley@globalquakemodel.org</u>

Appointments

2023 –	Secretary General GEM Foundation, Pavia, Italy
2014 - 2023	European Projects Coordinator European Centre for Training and Research in Earthquake Engineering (EUCENTRE), Pavia, Italy
2014 - 2023	Independent Seismic Risk Consultant
2012 - 2014	Deputy Secretary General GEM Foundation, Pavia, Italy
2009 - 2014	Scientific Coordinator and Executive Committee Risk Coordinator GEM Foundation, Pavia, Italy
2010 - 2012	Coordinator, Risk and Emergency Management (REM) Masters Programme UME School, Pavia, Italy
2007 - 2009	Researcher European Centre for Training and Research in Earthquake Engineering (EUCENTRE), Pavia, Italy
2005 - 2006	Research Assistant Centre for Post-graduate Training and Research in Earthquake Engineering and Seismology (ROSE School), Pavia, Italy
2000 - 2001	Graduate Engineer Whitbybird Consulting Engineers, London

Research projects with a scientific coordinating role

- GeoINQUIRE (Geosphere Infrastructures for Questions into Integrated Research), 52 partners from 14 countries, budget of 10M Euro. (Work-package coordinator, Management Board member)
- RISE (Real-time Earthquake Risk Reduction for a Resilient Europe), 19 partners from 7 countries, budget of 8M Euro (<u>www.rise-eu.org</u>). (Work-package coordinator, Management Board member, Chair of General Assembly)
- SERA (Seismology and Earthquake Engineering Research Infrastructure Alliance for Europe), 31 partners from 16 countries, budget of 10M Euro (<u>www.sera-eu.org</u>) (Work-package coordinator)
- SHARE (Seismic Hazard Harmonization for Europe), 18 partners from 13 countries, budget of 3.2M Euro (<u>www.share-eu.org</u>). (Work-package coordinator)

- SYNER-G (Systemic Seismic Vulnerability and Risk Analysis for Buildings, Lifeline Networks and Infrastructures Safety Gain), 14 partners from 11 countries, budget of 3.5M Euro (<u>www.syner-g.eu</u>). (Work-package coordinator)
- NERA (Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation), 28 partners from 17 countries, budget of 9M Euro (<u>www.nera-eu.org</u>). (Work-package coordinator)
- STREST (Harmonised Approach to Stress Tests for Critical Infrastructures against Natural Hazards),
 12 partners from 8 countries, budget of 3,975,006 € (www.strest-eu.org). (Institution lead)

Summary of Key Research Achievements

- Coordination of the development of the European Seismic Risk Model (ESRM20) (<u>http://risk.efehr.org</u>)
- Coordinator of the European Seismic Risk Services (<u>https://eu-risk.eucentre.it</u>) of the European Facilities of Earthquake Hazard and Risk (EFEHR, <u>www.efehr.org</u>) (since April 2019)
- Coordination of the development of open source seismic risk software (OpenQuake-engine) and of international consortia developing standards and databases for global exposure / vulnerability / consequences data / tools for exposure data as part of the Global Earthquake Model's Working Program 2009-2013 (www.globalquakemodel.org).
- Author/co-author of 190+ publications (77 in peer-reviewed international journals) since 2003 in the field of earthquake engineering, with specific emphasis on seismic risk and loss assessment. H-index of 54 according to Google Scholar and 40 according to Scopus (as of March 2024).
- Presentation of research activities at over 25 national and international conferences.

Editorial/Reviewing Activities

Editor

- Earthquake Spectra (2023 -)

Editorial Board member

- Earthquake Spectra (2012 2018)
- Bulletin of Earthquake Engineering (2020 today)

Peer reviewer for international journals (2005 - today):

- ASCE Journal of Structural Engineering
- Earthquake Spectra
- Bulletin of Earthquake Engineering
- Journal of Earthquake Engineering
- Bulletin of the Seismological Society of America
- Engineering Geology
- Engineering Structures
- Journal of Seismology
- Risk Analysis
- Natural Hazards
- Earthquake Engineering and Structural Dynamics
- Soil Dynamics and Earthquake Engineering
- Natural Hazards and Earth System Sciences
- Earthquakes and Structures
- Earthquake Engineering and Engineering Vibration
- Bollettino di Geofisica Teorica e Applicata
- Acta Geophysica (AGPH)
- International Journal of Disaster Risk Reduction
- Canadian Journal of Civil Engineering
- Geothermics

- Sustainability
- Seismological Research Letters (SRL)
- Scientific Reports

Other review activities:

- Review of "Recommended Practices for Managing Induced Seismicity Risk Associated with Geologic Carbon Storage" for the US National Risk Assessment Partnership (NRAP) project (2021)
- Review of research grant applications for United Arab Emirates University (2017)
- PhD review panel member in Italy (2019, 2022), New Zealand (2021) and Portugal (2022)

Committees and other Technical Responsibilities

- Co-organiser of Special Session at 3rd European Conference on Earthquake Engineering and Seismology (2022): Advances in probabilistic seismic hazard and risk assessment: insights from local, national and regional models
- Executive Committee Member of the EFEHR consortium (since October 2019) and EFEHR representative in EPOS Seismology Consortium (since October 2019).
- Member of Working Group 1 of the European Association of Earthquake Engineering on 'Future Directions for Eurocode 8' (2013 2018).
- Member of the award committees for the EGU Plinius Medal (2010-2013), the SSA Frank Press Public Service Award (2010-2013), the EERI Shah Family Innovation Prize (2018-2022).
- Co-organiser of training workshops on GEM's software OpenQuake for scientists in Central America (February 2012), South Africa (July 2012) and Europe (September 2019).
- Editorial Board member of the World Housing Encyclopedia (2012-2014).
- Co-organiser of Special Session at 15th World Conference on Earthquake Engineering (September 2012): Global Earthquake Model's Physical Risk Activities.
- Set up the Clearinghouse for the Emilia earthquakes (Italy, 2012), in partnership with EERI.
- Co-organiser of NERA Workshop on European Building Inventory, May 2011, Pavia, Italy (involving over 50 international experts) and organiser of SERA workshop on European Exposure Modelling, March 2018, Pavia, Italy (involving 30 European experts).
- Session co-convener at 2011 Seismological Society of America Annual Meeting: Improving Inventory and Vulnerability Data for Earthquake Loss Modelling.
- Co-organiser of Special Session at 14th European Conference of Earthquake Engineering (2010): Seismic Engineering Input Needs for the Next Generation of Seismic Codes.
- Senior Academic of Willis Research Network (2008-2010)
- Member of the Organising Committee of the 100th Anniversary Messina Earthquake Conference, 2008.

Awards and Recognition

- Recipient of the SSA/EERI 2024 Joyner Memorial Lecture ("Why seismic hazard modelling has become a risky business")
- Invited Theme Lecturer at the 3nd European Conference on Earthquake Engineering and Seismology, Bucharest, September 2022.
- Keynote lecture at Swiss Society of Earthquake Engineering and Structural Dynamics SGEB conference, Zurich, September 2021.
- Invited Lecture at the Second International Conference on Natural Hazards and Risks in a Changing World 2021, Potsdam, October 2021.
- 2020 Outstanding Paper Award, Earthquake Spectra ("Development of a global seismic risk model")
- Invited Theme Lecturer at the 2nd European Conference on Earthquake Engineering and Seismology, Istanbul, August 2014.

- 2012 Recipient of Shah Family Innovation Prize "in recognition of her important research contributions and her energy, creativity and passion in developing and disseminating more effective practices and policies to reduce earthquake risk around the world."
- Winner of the European Geosciences Union Plinius Medal 2009 for "*outstanding contributions in the fields of earthquake risk assessment and seismic risk mitigation, and in the neighbouring fields of structural engineering and engineering seismology.*"

Teaching Activities

- Lecturer for the course "Seismic Risk and Loss Assessment" of the Masters and Doctoral programme in Earthquake Engineering and the Masters programme in Risk and Emergency Management (REM), Understanding and Managing Extremes (UME) School, Pavia, 2012
- Co-lecturer for the course "Earthquake Loss Estimation" of the Masters (MSc) and Doctoral (PhD) programme in Earthquake Engineering, ROSE School, Pavia, 2009
- Co-lecturer for the course "Basics of Seismology and Seismic Hazard Assessment" of the Masters (MSc) and Doctoral (PhD) programme in Earthquake Engineering, ROSE School, Pavia, 2007
- Lecturer for the course "Vulnerabilità delle strutture in CA con applicazioni agli scenari di danno" of the Master in Progettazione Sismica delle Strutture Sostenibili in Calcestruzzo, of the Scuola di Specializzazione F.lli Pesenti, Dipartimento di Ingegneria Strutturale, Politecnico di Milano, 2009
- Lecturer for the module "Vulnerabilità sismica di edifici ed infrastrutture" of the Masters Programme Diagnostica Urbana e Territoriale at the l'Osservatorio Sismologico di Messina, 2008
- Teaching Assistant "Assessment and Strengthening of RC Structures" of the Masters (MSc) and Doctoral (PhD) programme in Earthquake Engineering, ROSE School, Pavia, 2003
- Supervised or co-supervised the dissertation/thesis of over 30 undergraduate, Masters and PhD students.

Main consultancy projects

- Deputy Team Leader for the project "Integrating Resilience in Local Governance in West Bank and Gaza (WB&G)", 2022. Client: Municipal Development and Lending Fund, Palestine / World Bank
- Seismic risk assessment from induced seismicity (natural gas extraction). 2014 2022. Client: NAM, the Netherlands
- Seismic risk expert on the project "Integrated techniques for the seismic strengthening and energy efficiency of existing buildings", 2019-2021. Client: JRC, European Commission
- Analysis of simultaneous operational failure of two critical facilities due to earthquakes. 2021. Client: Mosayk, Italy
- Seismic risk assessment due to induced seismicity (hydraulic fracturing for scale gas) in Preston New Road. 2019 2020. Client: Oil and Gas Authority, UK
- Seismic risk assessment due to earthquakes induced by wastewater injection, Rubiales Gas Field. 2019, Client: Ecopetrol, Colombia
- Seismic risk assessment of portfolio of banks in Italy. 2019. Client: Mosayk, Italy
- Seismic risk assessment of schools in Basel. 2014 2015. Client: RESONANCE, Switzerland

Languages

- English (mother tongue)
- Italian (fluent speaking and reading, intermediate writing)

PUBLICATIONS

International Peer-Reviewed Journals

- 1. Crowley, H. and Pinho, R. [2004] "Period-height relationship for existing European reinforced concrete buildings," *Journal of Earthquake Engineering*, **8**(Special Issue 1), 93-119.
- 2. Crowley, H., Pinho, R. and Bommer, J.J. [2004] "A probabilistic displacement-based vulnerability assessment procedure for earthquake loss estimation," *Bulletin of Earthquake Engineering*, **2**(2), 173-219.
- 3. Crowley, H., Bommer, J.J., Pinho R. and Bird, J. [2005] "The impact of epistemic uncertainty on an earthquake loss model," *Earthquake Engineering and Structural Dynamics*, **34**(14), 1653-1685.
- 4. Bird, J., Crowley, H., Pinho, R. and Bommer, J.J. [2005] "Assessment of building response to liquefactioninduced differential ground deformation," *Bulletin of the New Zealand Society of Earthquake Engineers*, **38**(4), 215-234.
- 5. Bird, J., Bommer, J.J., Crowley, H. and Pinho, R. [2006] "Modelling liquefaction-induced building damage in earthquake loss estimation," *Soil Dynamics and Earthquake Engineering*, **26**(1), 15-30.
- 6. Bommer, J.J. and Crowley, H. [2006] "The influence of ground motion variability in earthquake loss modelling," *Bulletin of Earthquake Engineering*, **4**(3), 231-248.
- 7. Crowley, H. and Bommer, J.J. [2006] "Modelling seismic hazard in earthquake loss models with spatially distributed exposure," *Bulletin of Earthquake Engineering*, **4**(3), 249-273.
- 8. Calvi, G.M., Pinho, R., Magenes, G., Bommer, J.J., Restrepo-Vélez, L.F. and Crowley, H. [2006] "The development of seismic vulnerability assessment methodologies over the past 30 years," *ISET Journal of Earthquake Technology*, **43**(3), Paper No. 472, pp. 75-104.
- 9. Gavridou, S. Pinho, R., Crowley, H., Calvi, G.M., Montaldo, V., Meletti C., Stucchi, M. [2007] "Preliminary study on the impact of the introduction of an updated seismic hazard model for Italy," *Journal of Earthquake Engineering*, Vol. 11, Special Issue 1, pp. 89-118.
- 10. Crowley, H., Pinho, R. [2008] "Using Basic Principles of Mechanics of Materials to Assess the Seismic Risk of Entire Countries," *Environmental Semeiotics,* Vol. 1, No. 1, pp. 1-19.
- 11. Borzi, B., Pinho, R. and Crowley, H. [2008] "Simplified pushover-based vulnerability analysis for large scale assessment of RC buildings," *Engineering Structures,* Vol. 30, No. 3, pp. 804-820.
- 12. Bal, I.E., Crowley, H. and Pinho, R. [2008] "Displacement-based earthquake loss assessment for an earthquake scenario in Istanbul," *Journal of Earthquake Engineering,* Volume 12, Issue S2, pp. 12-22.
- 13. Crowley, H., Bommer, J.J. and Stafford, P. [2008] "Recent developments in the treatment of groundmotion variability in earthquake loss models," *Journal of Earthquake Engineering, Special Issue,* Volume 12, Issue S2, pp. 71-80.
- 14. Strasser, F.O., Bommer, J.J., Sesetyan, K., Erdik, M., Cagnan, Z., Irizarry, J., Goula, X., Lucantoni, A., Sabetta, F., Bal, I.E., Crowley, H. and Lindholm, C. [2008] "A comparative study of European Earthquake Loss Estimation Tools for an Earthquake Scenario in Istanbul," *Journal of Earthquake Engineering,* Volume 12, Issue S2, pp. 246-256.
- 15. Bal, I.E., Crowley, H., Pinho, R. and Gulay, F.G. [2008] "Detailed assessment of structural characteristics of Turkish RC building stock for loss assessment models," *Soil Dynamics and Earthquake Engineering,* Vol. 28, pp. 914–932.
- 16. Colombi, M., Borzi, B., Crowley, H., Onida, M., Meroni, F. and Pinho, R. [2008] "Deriving vulnerability curves with Italian earthquake damage data," *Bulletin of Earthquake Engineering,* Vol. 6, No. 3, pp. 485-504.

- 17. Crowley, H., Borzi, B., Pinho, R., Colombi, M. and Onida, M. [2008] "Comparison of two mechanics-based methods for simplified structural analysis in vulnerability assessment," *Advances in Civil Engineering*, Volume 2008, Article ID 438379, 19 pages.
- 18. Crowley, H., Stafford, P.J. and Bommer, J.J. [2008] "Can earthquake loss models be validated using field observations?" *Journal of Earthquake Engineering*, Vol. 12, Issue 7, pp 1078-1104.
- 19. Borzi, B., Crowley, H. and Pinho, R. [2008] "Simplified pushover-based earthquake loss assessment (SP-BELA) method for masonry buildings," *International Journal of Architectural Heritage*, Vol. 2, No. 4, pp. 353-376.
- Crowley, H., Colombi, M., Borzi, B., Faravelli, M., Onida, M., Lopez, M., Polli, D., Meroni, F., Pinho, R. [2009] "Comparison of seismic risk maps for Italy," *Bulletin of Earthquake Engineering,* Volume 7, No. 1, pp. 149-180
- Crowley, H., Stucchi, M., Meletti, C., Calvi, G.M. and Pacor, F. [2010] "Revisiting italian design code spectra following the L'Aquila earthquake," L'Aquila, April 6th 2009, 3:32 am, *Progettazione Sismica*, IUSS Press, Italy.
- 22. Crowley, H. and Pinho, R. [2010] "Revisiting Eurocode 8 formulae for periods of vibration and their employment in linear seismic analysis," *Earthquake Engineering and Structural Dynamics,* Vol. 39, pp. 223-235
- 23. Bal, I.E., Bommer, J.J., Stafford, P.J., Crowley, H. and Pinho, R. [2010] "The influence of geographical resolution of urban exposure data in an earthquake loss model for Istanbul," *Earthquake Spectra*, Vol 26, no. 3, pp 619-634.
- 24. Ahmad, N., Crowley, H., Pinho, R. and Ali, Q. [2010] "Displacement-based earthquake loss assessment of masonry buildings in Mansera City, Pakistan," *Journal of Earthquake Engineering*, Vol 14, Special Issue 1, pp 1-37
- 25. Stucchi, M., Meletti, C., Montaldo, V., Crowley, H., Calvi, G.M., Boschi, E. [2011] "Seismic Hazard Assessment (2003-2009) for the Italian Building Code," *Bulletin of Seismological Society of America*, vol. 101, No. 4, pp.1885-1911.
- 26. Tarque, N., Crowley, H., Varum, H. and Pinho, R. [2011] "Displacement-based fragility curves for seismic assessment of adobe buildings," *Earthquake Spectra* 28 (2), pp. 759-794
- 27. Silva, V., Crowley, H., Pagani, M., Monelli, D., Pinho, R. [2013] "Development of the OpenQuake engine, the Global Earthquake Model's open-source software for seismic risk assessment" *Natural Hazards*, DOI: 10.1007/s11069-013-0618-x.
- 28. Silva, V., Crowley, H., Pinho, R., Varum, H. [2013] Extending Displacement-Based Earthquake Loss Assessment (DBELA) for the computation of fragility curves" *Engineering Structures*, 56, pp. 343-356.
- 29. Silva, V., Crowley, H., Varum, H., Pinho, R. and Sousa, R. [2013] "Evaluation of analytical methodologies to derive vulnerability functions," *Earthquake Engineering and Structural Dynamics*, 43, 2, pp. 181-204
- 30. Ahmad, N., Ali, Q., Crowley, H., Pinho, R. [2014] "Earthquake loss estimation of residential buildings in Pakistan," Natural Hazards, DOI 10.1007/s11069-014-1174-8
- Pagani, M., Monelli, D., Weatherill, G., Danciu, L., Crowley, H., Silva, V., Henshaw, P., Butler, L., Nastasi, M., Panzeri, L., Simionato, M. and Vigano, D., [2014] "OpenQuake Engine: An open hazard (and risk) software for the Global Earthquake Model," Seismological Research Letters, Vol. 85, No. 3, pp 692-702.
- 32. Silva, V., Crowley, H., Pinho, R., Varum, H, Sousa L. [2014] "Investigation of the characteristics of the Portuguese RC building stock and development of a vulnerability model," Bulletin of Earthquake Engineering, 10.1007/s10518-014-9669-y.
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- 34. Weatherill, G., Silva, V., Crowley, H. & Bazzurro, P. [2015] "Exploring the impact of spatial correlations and uncertainties for portfolio analysis in probabilistic seismic loss estimation," *Bulletin of Earthquake Engineering*, DOI: 10.1007/s10518-015-9730-5
- 35. Bommer, J.J., Crowley, H. and Pinho R. [2015] "A risk-mitigation approach to the management of induced seismicity," *Journal of Engineering Seismology*, *DOI: 10.1007/s10950-015-9478-z*
- 36. Casotto, C., Silva, V., Crowley, H., Nascimbene, R. and Pinho, R. [2015] "Seismic Fragility of Italian RC Precast Industrial Structures", *Engineering Structures*, 94, 122-136.
- Woessner J., Danciu L., Giardini D., Crowley H., Cotton F., Grunthal G., Valensise G., Arvidsson R., Basili R., Demircioglu M., Hiemar S., Meletti C., Musson R., Rovida A., Sesetyan K. and Stucchi M [2015] "The 2013 European Seismic Hazard Model - Key Components and Results," *Bulletin of Earthquake Engineering*, Volume 13, Issue 12, pp 3553-3596.
- Martins L., Silva V., Marques M., Crowley H. and Delgado R. [2015] "Development and assessment of damage-to-loss models for moment-frame reinforced concrete buildings," *Earthquake Engineering and Structural Dynamics*, DOI: 10.1002/eqe.2687
- 39. Silva, V., Crowley H. and Bazzurro P. [2015] "Exploring risk-targeted hazard maps for Europe," *Earthquake Spectra*, DOI: http://dx.doi.org/10.1193/112514EQS198M
- Yepes-Estrada C., Silva V., Rossetto T., D'Ayala D., Ioannou I., Meslem A., and Crowley H. [2016] "The Global Earthquake Model Physical Vulnerability Database," *Earthquake Spectra*, Vol. 32, No. 4, pp. 2567-2585.
- 41. Sousa L., Silva V., Marques M. and Crowley H. [2016] "On the treatment of uncertainties in the development of fragility functions for earthquake loss estimation of building portfolios," *Earthquake Engineering and Structural Dynamics,* DOI: 10.1002/eqe.2734
- 42. Villar-Vega M., Silva V., Crowley H., Yepes C., Tarque N., Acevedo A.B., Hube M.A., Coronel G.D., and Santa María H. [2017] "Development of a Fragility Model for the Residential Building Stock in South America," *Earthquake Spectra In-Press*. DOI: http://dx.doi.org/10.1193/010716EQS005M
- 43. Bommer J.J. & Crowley H. [2017] "The purpose and definition of the minimum magnitude limit in PSHA calculations," Seismological Research Letters, Vol. 88, No. 5, pp.1097-1106.
- 44. Crowley H., Polidoro B., Pinho R., van Elk J. [2017] "Framework for developing fragility and consequence models for local personal risk," *Earthquake Spectra*, Vol. 33, No. 4, pp.1325–1345,
- 45. Crowley, H., Pinho, R., Polidoro, B., Van Elk, J. [2017] "Developing fragility and consequence models for buildings in the Groningen field," Geologie en Mijnbouw/Netherlands Journal of Geosciences, 96, Special Issue 5, pp. pp. s247-s257.
- 46. Van Elk, J., Doornhof, D., Bommer, J.J., Bourne S.J., Oates S., Pinho, R., Crowley, H. [2017] "Hazard and risk assessments for induced seismicity in Groningen," Geologie en Mijnbouw/Netherlands Journal of Geosciences, 96, Special Issue 5, pp. pp. s259-s269.
- 47. Sousa L., Silva V., Marques M. and Crowley H. [2018] "On the treatment of uncertainty in seismic vulnerability and portfolio risk assessment," *Earthquake Engineering and Structural Dynamics,* Vol. 47, Issue 1.
- 48. Rodrigues D., Crowley H. and Silva V. [2018] "Earthquake loss assessment of precast RC industrial structures in Tuscany (Italy)," *Bulletin of Earthquake Engineering*, Vol. 16, Issue 1., pp. 203-228
- 49. Michel C., Crowley H., Hannwald P., Lestuzi P. and Fah D. [2018] "Deriving fragility functions from bilinearized capacity curves for earthquake scenario modelling using the conditional spectrum," *Bulletin of Earthquake Engineering,* https://doi.org/10.1007/s10518-018-0371-3
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- 53. Nievas, C., Bommer J.J., Crowley H., van Elk, J. [2019] "Global Occurrence and Impact of Small-to-Medium Magnitude Earthquakes: A Statistical Analysis" Bulletin of Earthquake Engineering, https://doi.org/10.1007/s10518-019-00718-w
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- 55. Nievas C., Bommer J.J., Crowley H., van Elk J., Ntinalexis M., Sangirardi M. [2020] "A database of damaging small-to-medium magnitude earthquakes," Journal of Seismology, DOI: 10.1007/s10950-019-09897-0
- 56. Cavalieri F., Correia A.A., Crowley H., Pinho R. [2020] "Dynamic soil-structure interaction models for fragility characterisation of buildings with shallow foundations," Soil Dynamics and Earthquake Engineering, https://doi.org/10.1016/j.soildyn.2019.106004
- 57. Hannewald P., Michel C., Lestuzzi P., Crowley H., Pinguet J., Fäh D. [2020] "Development and calibration of simplified mechanics-based capacity curves for scenario-based risk assessment of school buildings in Basel," Engineering Structures, DOI: 10.1016/j.engstruct.2020.110290
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- Crowley, H., Despotaki V., Rodrigues D., Silva V., Toma-Danila D., Riga E., Karatzetsou A., Sousa L., Ozcebe S., Zugic Z. and Gamba P. [2020] "Exposure model for European Seismic Risk Assessment," Earthquake Spectra, DOI: 10.1177/8755293020919429
- 60. Cavalieri F., Correia A.A., Crowley H., Pinho R. [2020] "Seismic fragility analysis of URM buildings founded on piles: influence of dynamic soil-structure interaction models," Bulletin of Earthquake Engineering, DOI: 10.1007/s10518-020-00853-9
- 61. Malomo D., Morandini C., Penna A., Crowley H., Pinho R. [2021] "Impact of ground floor openings percentage on the dynamic response of URM cavity-wall structures," Bulletin of Earthquake Engineering, DOI: 10.1007/s10518-020-00976-z
- 62. Edwards B., Crowley H., Pinho R., and Bommer J.J. [2021] "Seismic Hazard and Risk due to Induced Earthquakes at a Shale Gas Site," Bulletin of Seismological Society of America, DOI: 10.1785/0120200234
- 63. Faenza L., Michelini A., Crowley H., Borzi B., Faravelli M. [2021] "ShakeDaDO Data Collection," Artificial Intelligence in Geosciences, DOI: https://doi.org/10.1016/j.aiig.2021.01.002
- 64. Riga E., Karatzetzou A., Apostolaki S., Crowley H., Pitilakis JK. [2021] "Verification of seismic risk models using observed damages from past earthquake events," Bulletin of Earthquake Engineering, DOI: 10.1007/s10518-020-01017-5
- 65. Crowley H., Despotaki V., Silva V., Dabbeek J., Romão X., Pereira N., Castro J.M., Daniell J., Veliu E., Bilgin H., Adam C., Deyanova M., Ademović N., Atalic J., Riga E., Karatzetzou A., Bessason B., Shendova

V., Tiganescu A., Toma-Danila D., Zugic Z., Akkar S., Hancilar U. [2021] "Model of Seismic Design Lateral Force Levels for the Existing Reinforced Concrete European Building Stock", Bulletin of Earthquake Engineering, DOI: 10.1007/s10518-021-01083-3

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- 67. Dabbeek J., Crowley H., Silva V., Weatherill G., Paul N., Nievas C. [2021] "Impact of exposure spatial resolution on seismic loss estimates in regional portfolios," Bulletin of Earthquake Engineering, 19 (14), pp. 5819-5841.
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