

# Rafael Ramírez Eudave

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**About me.** I am an Architect with an MSc degree in Structural Analysis of Monuments and Historical Constructions, an MSc in Heritage and Project, and a PhD in Civil Engineering. I worked on historical constructions damaged after the 2017 earthquakes in Mexico. I have authored 14 journal articles in international peer-reviewed journals and participated in relevant dissemination events. My h-index is 6 (Scopus) with a total of 77 citations by 62 documents.

## Education.

09/2019-07/2023 **PhD in Civil Engineering** (Cum Laude) at **Universidade do Minho**, Portugal.

- **Research periods** at the University of the West of England and Universidad Nacional Autónoma de México.
- **Dissertation:** «Towards an integrated vulnerability-based approach for evaluating, managing, and mitigating earthquake risk in urban areas», supervised by Dr Tiago Ferreira and Dr Paulo B. Lourenço.
- **Highlights:** The research achieved new insights for assessing the seismic vulnerability of large sets of historical constructions by combining Geographical Information System databases, Python-based software and training Machine-Learning algorithms on empirical evidence from the 2017 Earthquakes in Mexico (more than 250 buildings surveyed).
- **Achievements:** 8 peer-reviewed articles in international journals published in the context of the doctoral research; presentations in 9 international dissemination events and the development of a standalone software for the acquisitions and management of data related to the seismic vulnerability of masonry constructions.

09/2017-07/2018 **Master in Heritage and Intervention Design** at **Università degli Studi della Basilicata**, Italy.

- **Dissertation:** «The Rupestrian Church of San Pietro da Morrone in Matera, Italy: survey and project of use». Grading 108/110.
- **Highlights:** Knowledge, protection and legislation for the management of Heritage, intervention design and laboratory of training and architectural practice within the “Sassi di Matera” (UNESCO World Heritage Site).

09/2019-07/2023 **Master in Structural Analysis of Monuments and Historical Constructions** at **Universidade do Minho**, Portugal.

- **Dissertation:** «Interaction between Rammed-Earth walls and LC-TRM strengthening bond and shrinkage». Grading 17/20.
- **Highlights:** Structural analysis (with Finite Element Analysis), seismic behaviour and structural dynamics, inspection and diagnosis (with photogrammetry), repairing and strengthening techniques, and restoration and conservation of materials.

08/2010-10/2015 **Architecture** (Cum Laude) at **Universidad Nacional Autónoma de México**, Mexico.

- **Semester abroad** at Universidad CEU San Pablo (Madrid, Spain).
- **Dissertation:** «Project of research, intervention and recovery of historical architectonic heritage: El Pensil Mexicano, an outstanding case of Novohispanic architecture in Mexico City». Grading 9.81/10.0.
- **Highlights:** Diploma for obtaining one of the three highest grades of the 2010-2015 generation. Internship at the National Institute of Anthropology and History. Voluntary work for the damage assessment of the parish of Cotija, Michoacán.

## Work Experience.

02/2024-Current **Postdoctoral Researcher** at **Swiss Federal Institute for Forest, Snow and Landscape Research**, Zurich, Switzerland.

- Develop methods to integrate digital plan data in 3D digital environmental digital twins. Visualize 3D morphological configurations of the urban fabric based on detail environmental data and parcel-specific zoning regulations within the SILAR (Bringing urban land-change simulation to the next level) project, supervised by Prof. h.c. Dr. Anna Hersperger.

08/2018-09/2019 **Structural consultant** at **Grupo Tares (Taller de Arquitectura y Restauración)**, Mexico City, Mexico.

- Leader of the inspection and structural diagnosis for six seismically damaged historical churches in Mexico. Coordinator of the architecture and engineering teams for three intervention projects and on-site building manager in one of them.

08/2015-08/2016 **Designer Architect** at **TO - Amozurrutia + Facio**, Mexico City, Mexico.

- Designer and manager of 3 executive projects and on-site supervision for residential remodelling in historical neighbourhoods. Developer of the executive project for the Hermès Pavilion (Salone del Mobile 2016, Milano, Italy).

07/2014-07/2015 **Catalogue Auxiliar** at **Mexican National Coordination of Historical Monuments**, Mexico City, Mexico.

- Manager of field inspections for more than 150 historical monuments for enlarging or updating the National Catalogue of Historical Monuments. Trainer and students' mentor during their internship at the Coordination.

06/2013-12/2013 **Design assistant** at **ARQ Studio México**, Mexico City, Mexico.

- Designer for urban furniture and equipment. Executive project developer and 3D modeller.

## Teaching experience.

04/2022 **Invited lecturer** at **Universidad Católica Boliviana** (Online). Seminar: "Opportunities for the GIS-BIM-HBIM integration for the protection of Cultural Heritage", part of Module 5 of the Advanced BIM course.

## Language skills.

Spanish ●●●●● English ●●●●●○ Portuguese ●●●●●○ French ●●●●○○ Italian ●●●○○○

## Technical skills.

**Photogrammetry:** Agisoft Metashape, CloudCompare; **Structural Analysis:** Finite Elements Analysis (DIANA); **GIS:** QGIS; **Data analysis:** Machine Learning in Python (Pandas, GeoPandas, Scikit), SPSS; **BIM and 3D modelling:** AutoCAD, Revit, SketchUp, Artlantis Studio; **Production Software:** Adobe CC (Photoshop, Lightroom, InDesign), LaTeX; **Photography:** Analogic and digital processes; **NDT techniques:** Elastic Wave methods; Rebound (Schmidt) Hammer; Resistograph; Rebar detector; Radar GPR; Digital Image Correlation (DIC).

## Affiliations and memberships.

**ICOMOS** - International Council on Monuments and Sites.

**ISCARSAH** - International Scientific Committee on the Analysis and Restoration of Structures of Architectural Heritage.

**ESACH** - European Students' Association for Cultural Heritage.

**Europa Nostra**

## Grants and awards.

**2019-2023:** PhD Grant from the Portuguese Foundation for Science and Technology (FCT). Analysis and Mitigation of Risk in Infrastructures (5 grants offered in 2019).

**2016-2018:** Master Grant in the Erasmus Euro-Latin America partnership in natural Risk mitigation and protection of the Cultural Heritage project (20 grants offered).

**2017:** Diploma for achieving one of the top three grades of the 2011-2015 generation of Architecture.

**2013-2014:** UNAM - DGECl Academic Exchange grant at the University CEU San Pablo (Madrid, Spain).

**2010-2011:** Bernardo Quintana Arrijoja medal for Academic Excellence (National Polytechnic Institute).

## List of peer-reviewed publications in international journals.

1. Ramírez Eudave, R. and Ferreira, T. M. (2024). **Empirical evidence-based semantic models for Seismic Vulnerability Assessments of masonry Historical Buildings: lessons from Mexican experiences** (in Spanish). *Revista de Estudios Latinoamericanos sobre Reducción del Riesgo de Desastres*. <https://doi.org/10.55467/reder.v8i1.142>.
2. Bernardini, G.; Ferreira, T. M.; Baquedano, P.; Ramírez Eudave, R.; Quagliarini, E. (2023) **Assessing the spatiotemporal impact of users' exposure and vulnerability to flood risk in urban built environments**. *Sustainable Cities and Society*. <https://doi.org/10.1016/j.scs.2023.105043>.
3. Urbina Leal, O.; Fekete, A.; Ramírez Eudave, R.; Matos, J. C.; Sousa, H. and Teixeira, E. (2023). **A Systematic Review of Integrated Frameworks for Resilience and Sustainability Assessments for Critical Infrastructures**. *Structural Engineering International*, <https://doi.org/10.1080/10168664.2023.2265965>.
4. Ramírez Eudave, R.; Rodrigues, D.; Ferreira, T.M. and Vicente, R. (2023). **Implementing Open-Source Information Systems for Assessing and Managing the Seismic Vulnerability of Historical Constructions**. *Buildings*, 13(2), 540. <https://doi.org/10.3390/buildings13020540>.
5. Ramírez Eudave, R.; Ferreira, T. M.; Vicente, R.; Lourenço, P. B. and Peña, F. (2023). **Parametric and Machine Learning-Based Analysis of the Seismic Vulnerability of Adobe Historical Buildings Damaged After the September 2017 Mexico Earthquakes**. *International Journal of Architectural Heritage*. <https://doi.org/10.1080/15583058.2023.2200739>.
6. Ramírez Eudave, R.; Ferreira, T. M.; Lourenço, P. B., Peña, F and Chávez, M. (2023). **Mechanical characterisation of adobe samples from the state of Morelos, Mexico**. *Construction Materials*. <https://doi.org/10.1680/jcoma.23.00021>.
7. Ramírez Eudave, R.; Silva, R.; Pereira, E. and Romanazzi, A. (2022). **Early-age shrinkage and bond of LC-TRM strengthening in rammed earth**. *Construction and Building Materials*, 350, 128809. <https://doi.org/10.1016/j.conbuildmat.2022.128809>.
8. Ramírez Eudave R.; Ferreira, T. M. and Vicente, R. (2022). **Parameter-based seismic vulnerability assessment of Mexican historical buildings: Insights, suitability, and uncertainty treatment**. *International Journal of Disaster Risk Reduction*, 74, 102909. <https://doi.org/10.1016/j.ijdrr.2022.102909>.
9. Ferreira, T. M. and Ramírez Eudave, R. (2022). **Assessing and Managing Risk in Historic Urban Areas: Current Trends and Future Research Directions**. *Frontiers in Earth Science*, 10, 847959. <https://doi.org/10.3389/feart.2022.847959>.
10. Columbro, C.; Ramírez Eudave, R.; Ferreira, T.M.; Lourenço, P.B. and Fabbrocino, G. (2022). **On the Use of Web Mapping Platforms to Support the Seismic Vulnerability Assessment of Old Urban Areas**. *Remote Sensing*, 14(6), 1424. <https://doi.org/10.3390/rs14061424>.
11. Ramírez Eudave, R. and Ferreira, T. M. (2021). **On the potential of using the Mexican National Catalogue of Historical Monuments for assessing the seismic vulnerability of existing buildings: a proof-of-concept study**. *Bulletin of Earthquake Engineering*, 19, 4945-4978. <https://doi.org/10.1007/s10518-021-01154-5>.
12. Ramírez Eudave, R. and Ferreira, T. M. (2021). **Characterisation of the Historic Urban Landscape through the Aristotelian Four Causes: Towards Comprehensive GIS Databases**. *Remote Sensing*, 13(10), 1879. <https://doi.org/10.3390/rs13101879>.
13. Ramírez Eudave, R. and Ferreira, T. M. (2021). **Towards a Semi-Quantitative Approach for Assessing Evacuation Scenarios in the Context of Popocatepetl Volcano, México - The Case of San Pedro Tlalmimilulpan**. *GeoHazards*, 2(1), 1-16. <https://doi.org/10.3390/geohazards2010001>.
14. Ramírez Eudave, R. and Ferreira, T. M. (2021). **On the suitability of a unified GIS-BIM-HBIM framework for cataloguing and assessing vulnerability in Historic Urban Landscapes: a critical review**. *International Journal of Geographical Information Science* 35(10), 2047-2077. <https://doi.org/10.1080/13658816.2020.1844208>.
15. Ramírez Eudave, R.; D'Amato, M. and Andrisani, G. (2021). **The rupestrian church of San Pietro da Morrone (Matera, Italy): insights and photogrammetric-based characterisation**. *Conservation Science in Cultural Heritage*, 21 (2) 259-278. <https://doi.org/10.48255/1973-9494.JCSCH.21.2021.12>

## Peer-reviewed conference papers with presentation.

1. Ramírez Eudave, R.; Rodrigues, D.; Miguel Ferreira, T. and Vicente, R. (2022). **Implementing open-source information systems for assessing and managing the seismic vulnerability of historical constructions**. 10th ReUSO Documentation, Restoration and Reuse of Heritage Congress.

2. Ramírez Eudave, R. and Ferreira, T. M. (2023). **The Functional Schematisation of the City as a Model for Anticipating Post-event Scenarios for Volcanic Hazards**. In *Advances in Natural Hazards and Volcanic Risks: Shaping a Sustainable Future*. Malheiro, A.; Fernandes, F. and Chaminé, H. I., editors. *Advances in Science, Technology & Innovation*. Springer, Cham. [https://doi.org/10.1007/978-3-031-25042-2\\_22](https://doi.org/10.1007/978-3-031-25042-2_22).
3. Ramírez Eudave, R.; Miguel Ferreira, T. and Vicente, R. (2022). **A critical route for the documentation of the seismic vulnerability of Mexican historical cities based on GIS databases** (in Spanish). 9th REHABEND Euro-American Congress Construction Pathology, Rehabilitation Technology and Heritage Management.
4. Ramírez Eudave, R. and Miguel Ferreira, T. M. (2021). **Proposal for a suitable workflow for assessing the seismic vulnerability of historical buildings. Atlixco (Puebla, México) as a case study**. 1st Croatian Conference on Earthquake Engineering CroCEE. <https://doi.org/10.5592/CO/1CroCEE.2021.22>.
5. Ramírez Eudave, R. and Andrisani, G. (2018). **The Aristotelian causes principle as an approach to the architectural object: the case of San Pietro in Morrone, Matera**. XIV Congresso Internazionale di Riabilitazione del Patrimonio.
6. Silva, R.; Oliveira, D.; Barroso, C.; Ramirez, R.; Pereira, E.; Lourenço, P. (2018). **Investigation of the bond and shrinkage behaviour of TRM strengthening for rammed earth**. 8th REHABEND Euro-American Congress: Construction Pathology, Rehabilitation Technology and Heritage Management proceedings.

### Book chapters.

1. Baquedano, J.; Ramírez, R.; Navia, F., Graus, S. (2021). **Traditional Earth Construction in Latin America: A review on the construction systems and reinforcement strategies**. In *Masonry Construction in Active Seismic Regions*. Rupakhety, R; Gautam D., ed. Elsevier, Woodhead Publishing. <https://doi.org/10.1016/B978-0-12-821087-1.00011-9>.
2. Ramírez Eudave, R.; Rodrigues, H.; Ferreira, T. M. (2021). **Building survey and characterization techniques at different scales**. In *Seismic Vulnerability Assessment of Civil Engineering Structures at Multiple Scales: From Single Buildings to Large-Scale Assessment*. Ferreira, T. M. and Rodrigues, H., editors. Elsevier, Woodhead Publishing. <https://doi.org/10.1016/B978-0-12-824071-7.00012-3>.
3. Granda S.; Lopez, S.; Navia, F.; Ramirez, E.; Ramirez, R.; Ramos, L. F.; Mendes, N. (2019). **Diagnosis and Structural Assessment of the Fortress and Convent of Ínsua de São Isidro**. In *RILEM Bookseries* (Vol. 18, pp. 2386–2394). Springer Netherlands. [https://doi.org/10.1007/978-3-319-99441-3\\_256](https://doi.org/10.1007/978-3-319-99441-3_256).

### Presentations at conferences and dissemination events.

**International Seminar: Which Future for Vernacular Architecture & Earthen Architecture?** Ramírez Eudave, R. and Ferreira, T. Enhancing Knowledge and Preservation of Rural Vernacular Assets: A GIS-Based Approach for Surveys and Cataloguing. 15-16/06/2023 Porto, Portugal.

**Canadian Society for Civil Engineering (CSCE) Annual Conference**. Ramírez Eudave, R.; Baquedano, P.; Ferreira, T. and Qureshi, T. On-site evaluation of the quality of old constructions' masonry using real-time distributed online GIS databases. 24-27/05/2023 Moncton, Canada.

**10th ReUSO Documentation, Restoration and Reuse of Heritage**. Ramírez Eudave, R.; Rodrigues, D.; Miguel Ferreira, T. and Vicente, R. Implementing open-source information systems for assessing and managing the seismic vulnerability of historical constructions. 02-04/11/2022 Porto, Portugal.

**International Congress of Civil Engineering in World Heritage Cities**. Ramírez Eudave, R.; Flores Rodríguez, A.; Ferreira, T. M. and Montero Pantoja, C. Integrating the seismic vulnerability in the National Catalogue of Historical Monuments for risk management in Historic Urban Landscapes. 19-22/10/2022 Puebla, Mexico.

**CABE Research Forum - Building Engineers Embedding Sustainability and Resilience in the Built Environment**. Ramírez Eudave, R. and Ferreira, T. M. Machine-Learning-based vulnerability analysis of the HUL (poster). 13/10/2022 Newport, UK.

**9th Euro-American Congress Construction Pathology, Rehabilitation Technology and Heritage Management**. Ramírez Eudave, R.; Miguel Ferreira, T. and Vicente, R. Towards a critical route for the documentation of the seismic vulnerability of Mexican historical cities based on GIS databases. 12-16/09/2022 Granada, Spain.

**International Workshop on Natural Hazards NatHaz22**. Ramírez Eudave, R. and Ferreira, T. M. The Functional Schematisation of the City as a Model for Anticipating Post-event Scenarios for Volcanic Hazards. 22-27/05/2022 Angra do Heroísmo, Portugal.

**Experiences in risk management for the Cultural Heritage in Iberoamerica.** Ramírez Eudave, R. and Ferreira, T. M. On the potential use of the National Catalogue of Historical Monuments for a parameter-based assessment of seismic vulnerability. 16/11/2021 Mexico City, Mexico.

**INFRARISK Summer Workshop.** Ramírez Eudave, R. Towards an Integrated Vulnerability-Based Approach for Evaluating, Managing and Mitigating Earthquake Risk in Urban Areas. 17/09/2021 Lisbon, Portugal.

**1st Croatian Conference on Earthquake Engineering. CroCEE.** Ramírez Eudave, R. and Miguel Ferreira, T. M. Proposal for a suitable workflow for assessing the seismic vulnerability of historical buildings. Atlixco (México) as a case study. 22/03/2021 Zagreb, Croatia.

**Portugal. INFRARISK Summer Workshop.** Ramírez Eudave, R. Towards an Integrated Vulnerability-Based Approach for Evaluating, Managing and Mitigating Earthquake Risk in Urban Areas. 11/09/2020 Aveiro.

**5th International Congress on Cultural Heritage and New Technologies.** Ramírez Eudave, R. Interaction between rammed earth walls and LC-TRM strengthening bond and shrinkage. 07/11/2018 Mexico City, Mexico.

**XIV International Congress of Heritage's Rehabilitation - YOCOCU.** Ramírez Eudave, R. and Andrisani, G. The Aristotelian causes principle as an approach to the architectural object: the case of San Pietro in Morrone, Matera. 20/06/2018 Matera, Italy.

**The Concept of the Risk Chart of Cultural Heritage in Latin America.** Ramírez Eudave, R. Improvement of seismic performance of rammed earth building through the use of LC-TRM strengthening. 19/06/2018 Rome, Italy.

**2018 Structural Analysis of Historical Constructions Congress.** Granda S.; Lopez, S.; Navia, F.; Ramirez, E.; Ramirez, R.; Ramos, L. F.; Mendes, N. Diagnosis and Structural Assessment of the Fortress and Convent of Ínsua de São Isidro. 11-13/09/2018 Cuzco, Perú.

**8th Euro-American Congress Construction Pathology, Rehabilitation Technology and Heritage Management.** Silva, R.; Oliveira, D.; Barroso, C.; Ramirez, R.; Pereira, E.; Lourenço, P. Investigation of the bond and shrinkage behaviour of TRM strengthening for rammed earth. 15-18/05/2018 Cáceres, Spain.

**UNESCO Chair in Mediterranean Cultural Landscapes and Knowledge Communities.** Workshop: From the Concept to the Practice: Is it possible to talk about World Heritage and Cultural Authenticity? 27/04/2018 Matera, Italy.

**UNESCO Chair in Mediterranean Cultural Landscapes and Knowledge Communities.** Workshop: The ethics of architecture and the social function of art history. 27/03/2018 Matera, Italy.

## Courses and qualifications.

**Excel: Tables & Pivot Tables.** (16h) 11/2023 | Order of Engineers, North Region.

**From Temporary Shelter to Semi-Permanent Homes.** 05/2023 | Smart Shelter Foundation.

**Protecting our future. War and Cultural Heritage.** 04/2023 | The American University of Rome.

**IMFAHE's Online Quarter Course on Professional Development.** (30h) 04/2023 | IMFAHE Foundation Inc.

**Nature-based Solutions for Disaster Resilience.** (40h) 10/2022 | Partnership for Environment and Disaster Risk Reduction.

**Introduction to emergency and risk management in cultural heritage.** 04/2023 | Spanish Institute of Cultural Heritage (IPCE).

**Soil-structure interaction.** (42h) 07/2022 | Mexican Societies of Structural, Geotechnical and Seismic Engineering.

**Communication of Risk.** (30h) 12/2022 | Mexican National Centre for the Prevention of Disasters.

**Management of Disaster Risk.** (20h) 12/2022 | Mexican National Centre for the Prevention of Disasters.

**Disasters and Psychological Effects.** (25h) 12/2022 | Mexican National Centre for the Prevention of Disasters.

**Use and representation of Geospatial Information.** (30h) 07/2022 | Centre for Research in Geospatial Information Sciences.

**Disaster Risk Management Online Training Series.** 05/2022 | Coventry University.

**Structural Assessment basic course.** (10h) 12/2022 | National Centre for the Prevention of Disasters.

**Aerial Mapping with Drones.** (17h) 02/2022 | Order of Engineers, North Region.

**Advanced QGIS.** (17h) 01/2022 | Order of Engineers, North Region.

**Management models for social projects.** 06/2021 | UNAM, Mexican Secretary for Social Development.

**Instructor training.** (40h) 11/2018 | UNAM, Mexican Secretary for Social Development.

**Prevention systems and strengthening solutions for masonry buildings.** (40h) 09/2018 | Mexican Institute for Cement and Concrete.

**Structural project: learning from practical cases.** (25h) 04/2018 | Polytechnic University of Madrid, MiríadaX.

**Structural rehabilitation of historical buildings and consolidation processes.** 06/2015 | National School of Conservation, Restoration and Museography (ENCRyM).