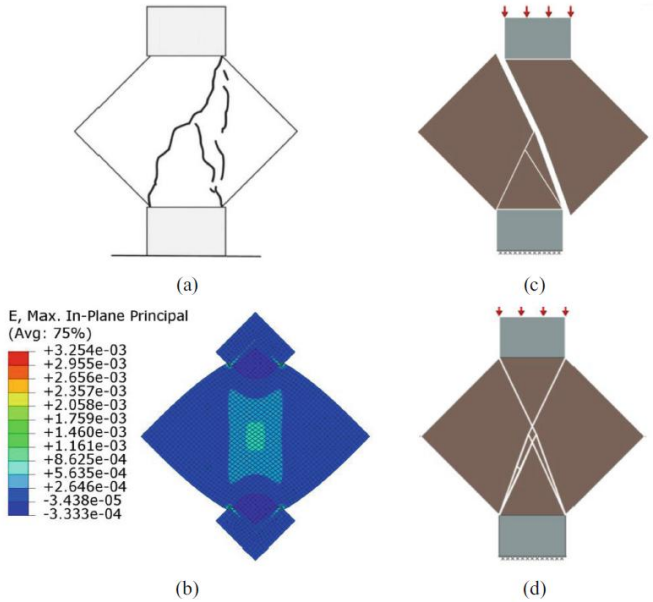
From Vernacular to Digital

Structural Engineering and Built Heritage Conservation

Why vernacular heritage structures matter

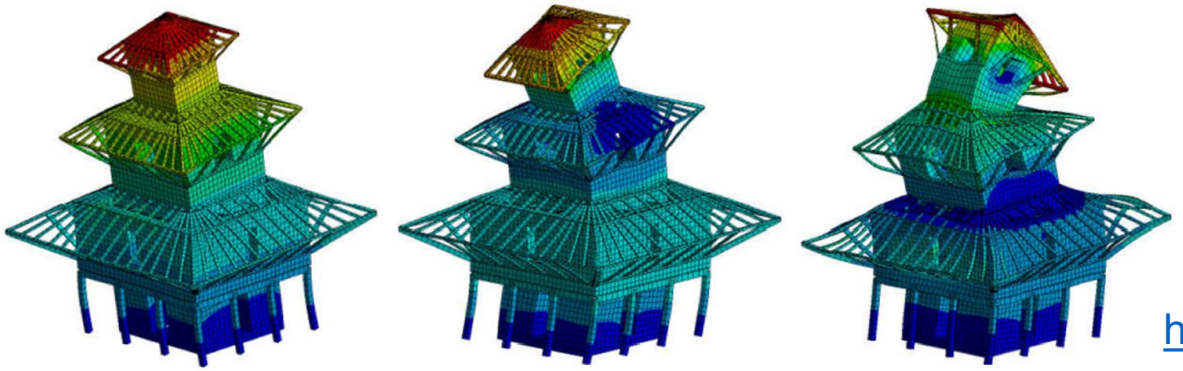
- Built with local materials, knowledge, and environment awareness.
- Low-carbon by default.
- Still house millions of people worldwide.
- Often excluded from modern engineering frameworks.

The conservation challenge



https://doi.org/10.1007/978-3-031-62690-6_24

- Ageing materials and undocumented construction.
- Seismic, climate, and use-change pressures.
- Limited invasive testing allowed in heritage.
- Decisions often based on experience.



https://doi.org/10.3390/heritage7060151

From material to structure: research core

1. Materials & structural systems
   - Earth and masonry
   - Mechanical behaviour and failure modes
2. Testing with care
   - Minor-destructive and non-destructive techniques
   - Flat-jacks, vibration tests, monitoring
3. Modelling & simulation
   - Limit analysis, DEM, FEM, DLO
   - Understanding robustness and collapse mechanisms

https://doi.org/10.1016/j.conbuildmat.2020.119148

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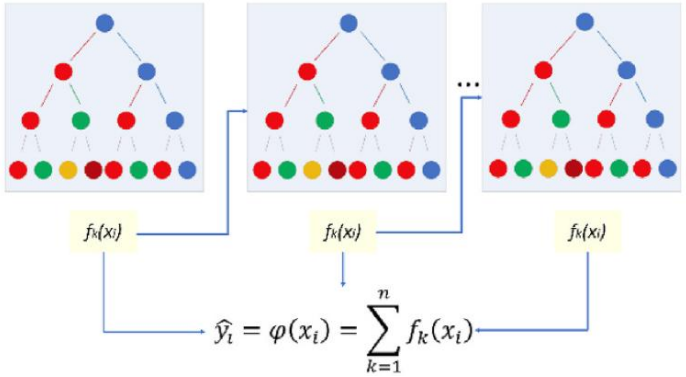
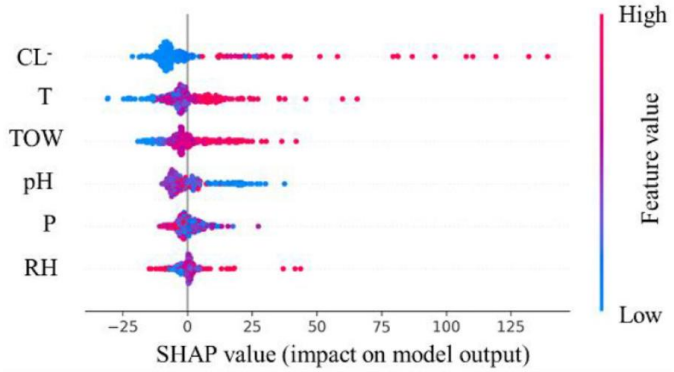
ICOMOS - ISCEAH
International Scientific Committee on Earthen Architectural Heritage

Iscarsah
www.iscarsah.org

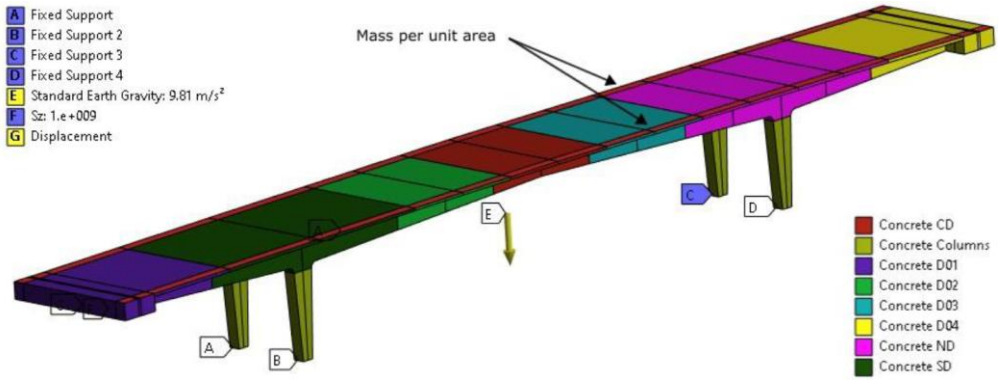
The digital turn: from assessment to digital twins





https://doi.org/10.1016/j.rineng.2024.102723

- Monitoring and 3D visuals
- Data-driven and AI
- Digital twins
- Resilience



https://doi.org/10.23967/eccomas.2024.091

IABSE

IABMAS

Why human-centric/regenerative matters

https://data.europa.eu/doi/10.2777/073781

https://doi.org/10.1016/j.jobe.2024.110542

https://doi.org/10.1080/17567505.2024.2429167

The latest…

- https://reeco-soil.github.io/

- https://safedt-cosec.github.io/

- https://www.ccc-parasols.ed.ac.uk/

Where this is going…

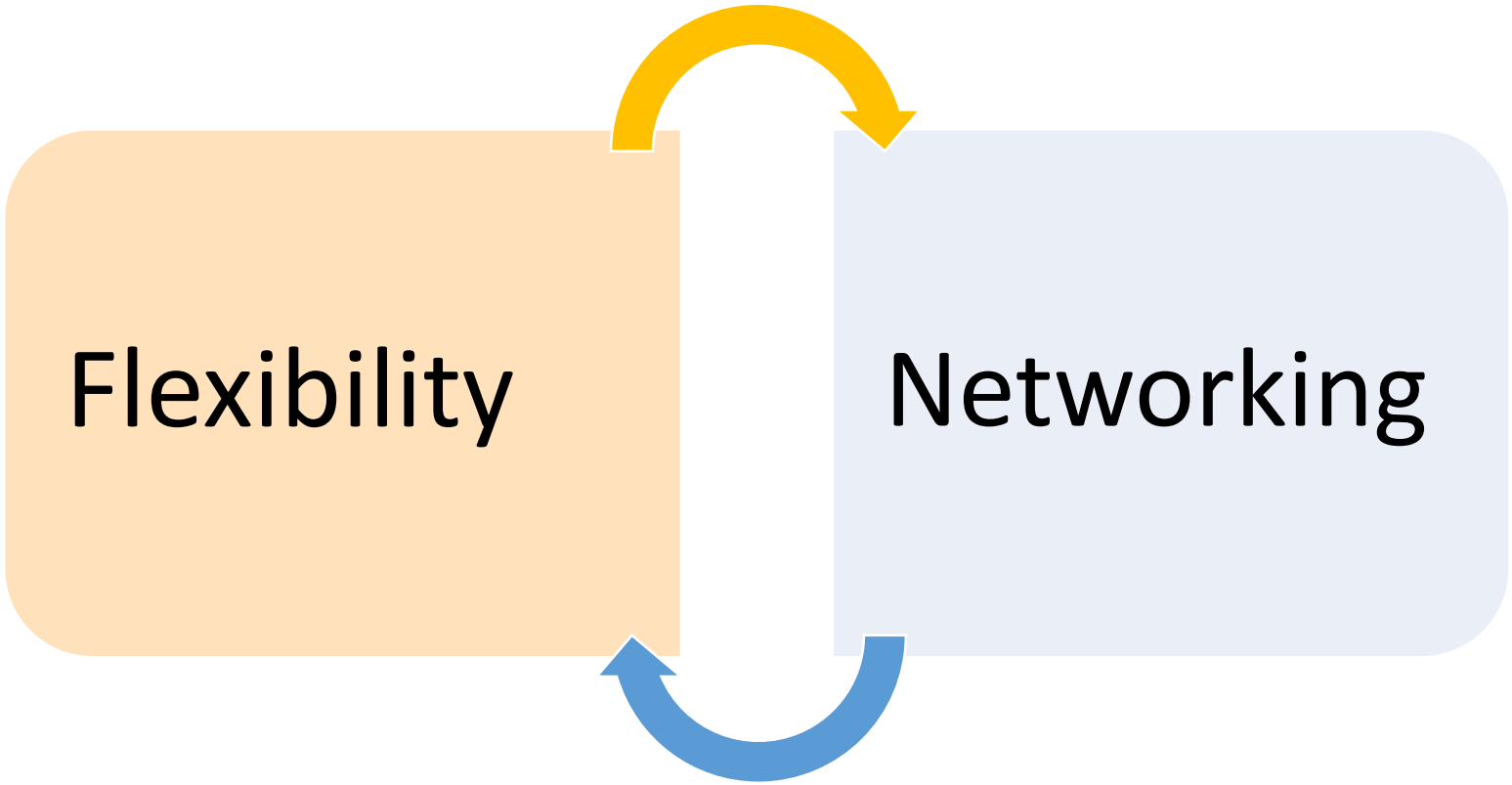
SCALING UP VERNACULAR MATERIALS

PEOPLE-LED DIGITAL TWINS

EDUCATION & CAPACITY BUILDING

INTERDISCIPLINARY COLLABORATION

Conclusions



Useful links:

University of Bath page:
https://researchportal.bath.ac.uk/en/persons/alejandro-jimenez-rios

Personal website:
https://jimnezra.github.io/

LinkedIn profile:
https://www.linkedin.com/in/jimnezra/?locale=en_US

Thank you!

Questions?