

Smart Diaspora 2023

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Timișoara

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Eveniment aflat sub înaltul patronaj
al Președintelui României





Cimentul cu potențial de auto-reparare - o posibilă soluție pentru o infrastructură sustenabilă

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From Newcastle. **For the world.**



@southshields360



The College of Physical
Science established in 1871.



The School of Medicine and Surgery established in 1834.



@LouiseMesma



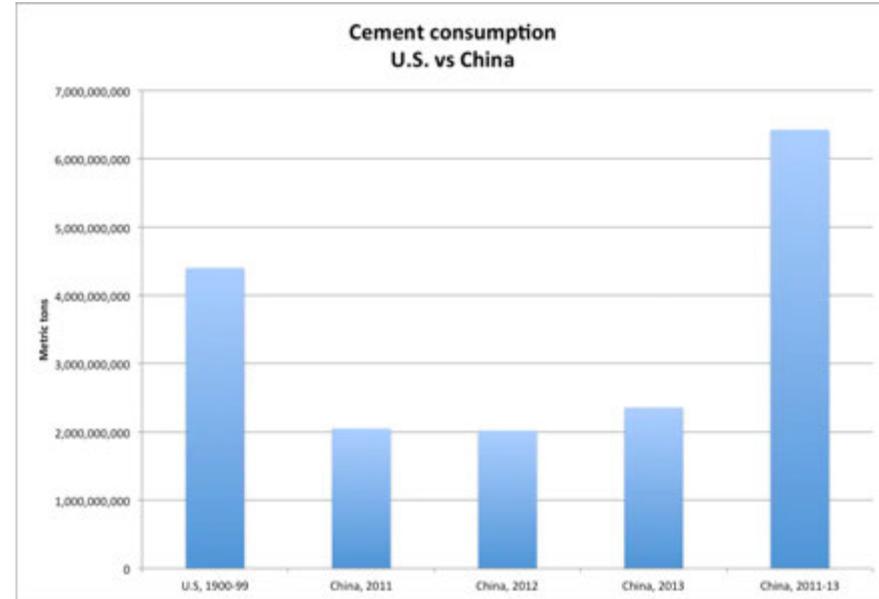
Stephenson redevelopment

Merz Court



The problem

- a city equivalent of New York will be built every month for the next 40 years
- concrete generates ~8% of total anthropogenic CO₂ emissions

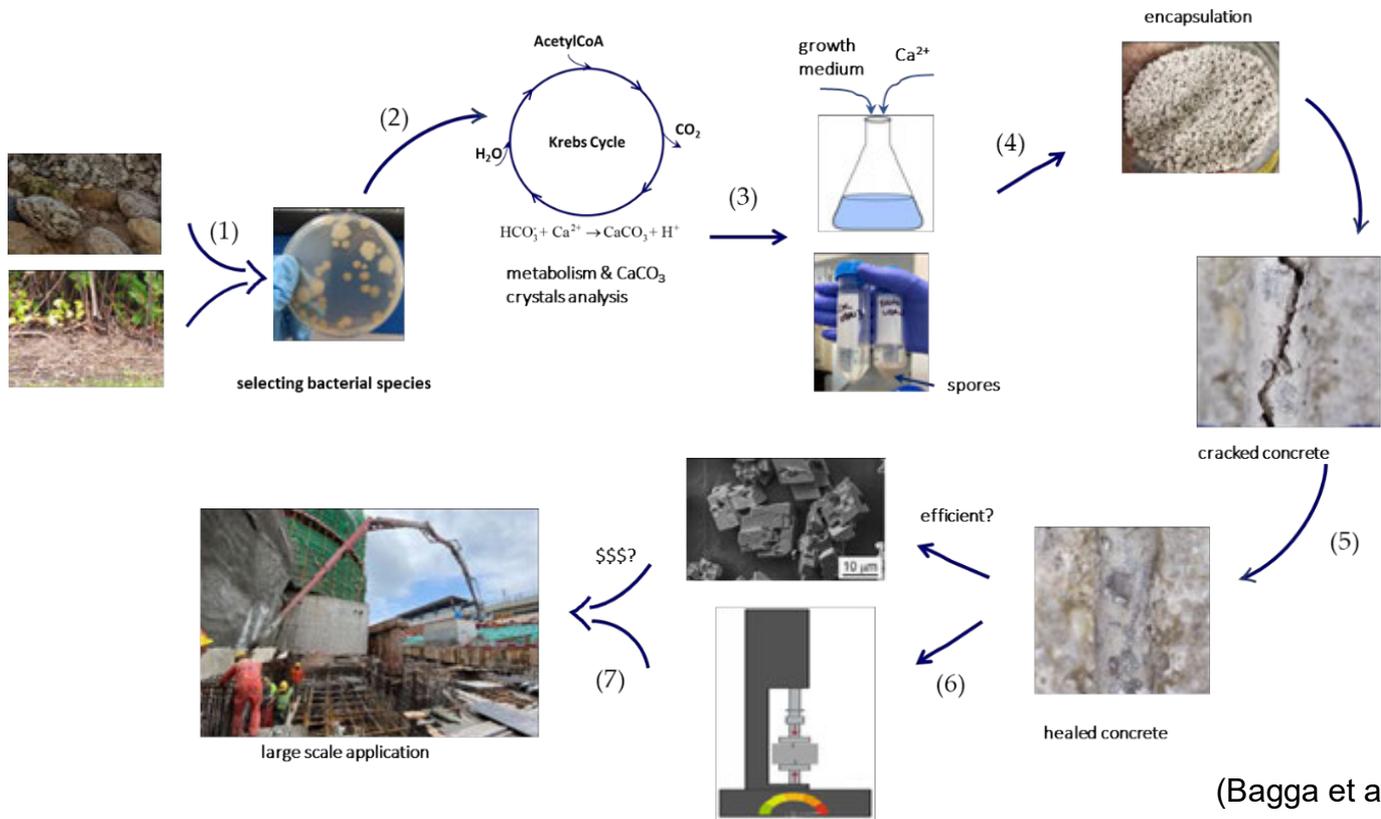


U.S. Geological Survey and International Cement Review

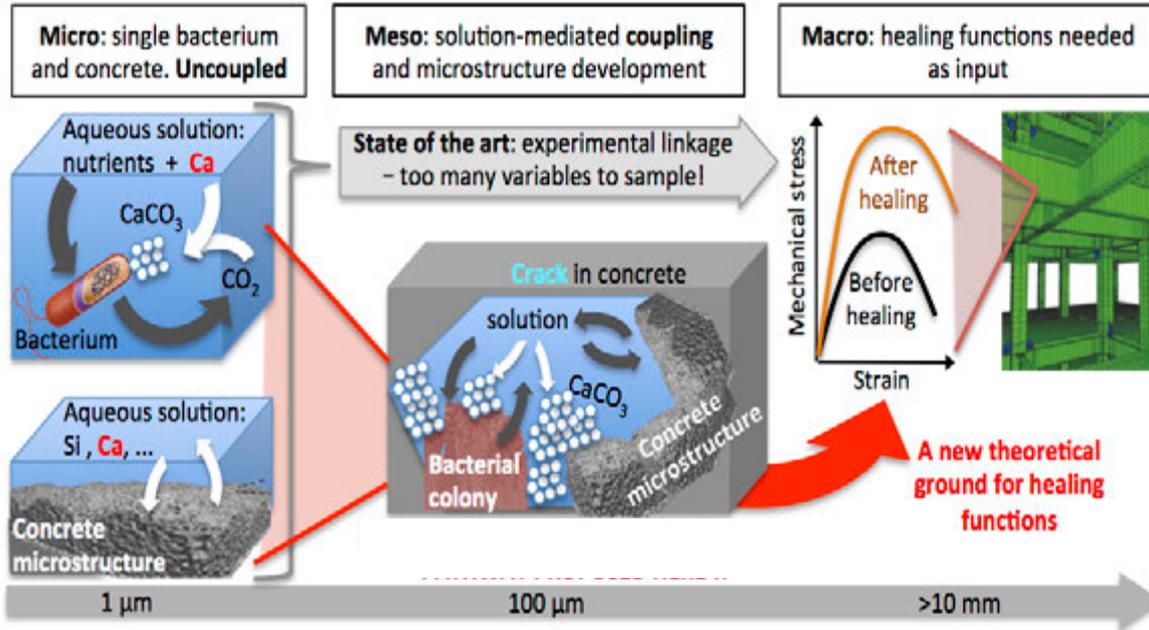
- water stress, soil erosion and loss of natural habitats
- concrete susceptible to physical, biological and chemical weathering, which decay and increase porosity affecting durability
- repairing cracks is more expensive than the current production cost



A solution: Microbial-Induced Calcite Precipitation



(Bagga et al., 2022)



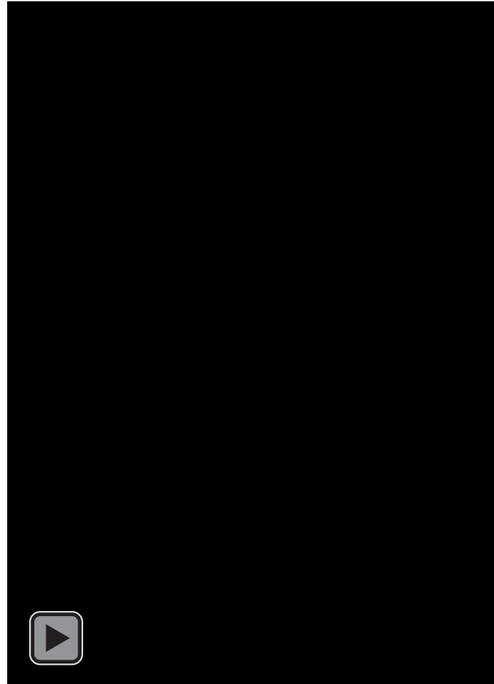
EPSRC

Engineering and Physical Sciences Research Council



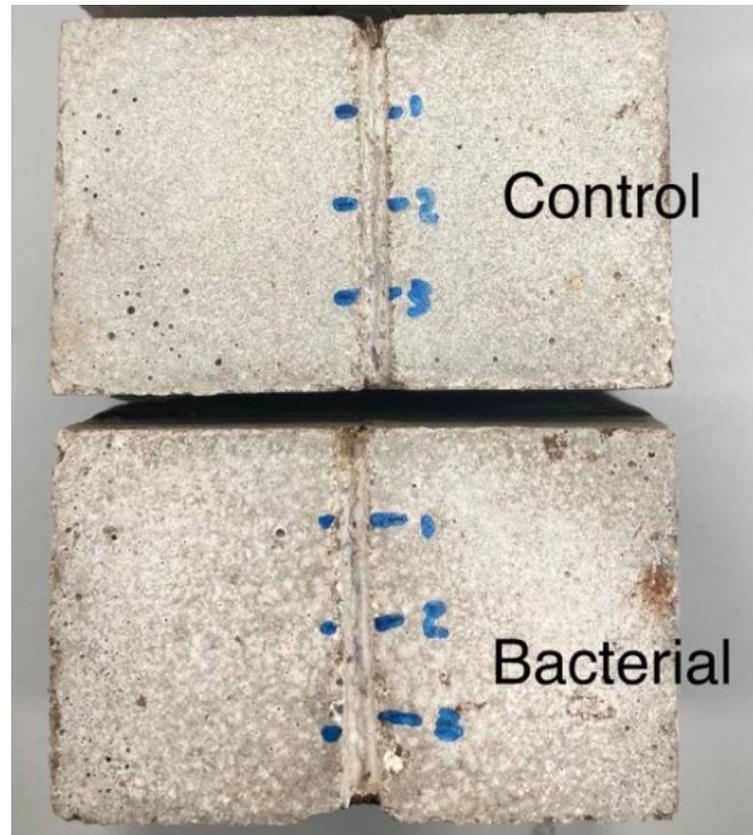
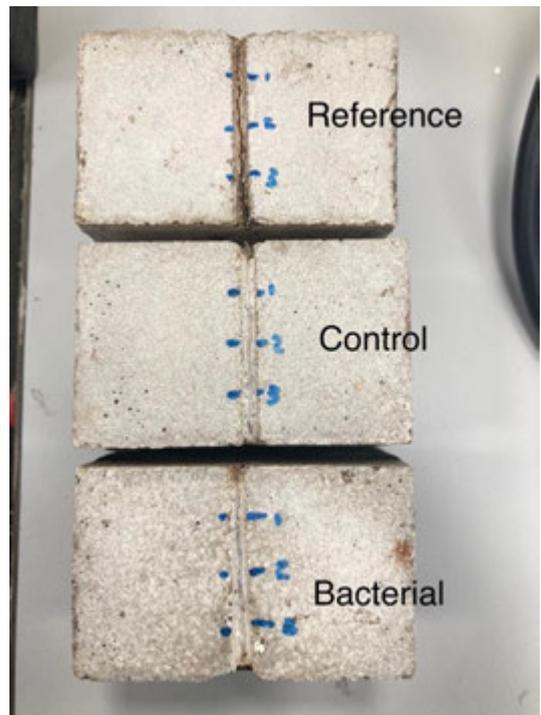
frontiers in engineering biology





Be:Wise pilot plant

After 2 months of healing (yeast extract samples)



Conclusions

- bacterial spores are crucial for the cracked samples exposed to water where a low and not diverse bacteria community is present (e.g., tap water)
- the abundant rich bacterial community inherently present in wastewater can effectively induce CaCO_3 precipitation if a combination of an organic carbon source and enough Ca^{2+} ions are readily available within the cement matrix
- this finding has the potential to significantly reduce costs and simplify the production process for this specific application.
- better simulation tools are needed to increase the pace of progress in the field (*digital twin?*)