



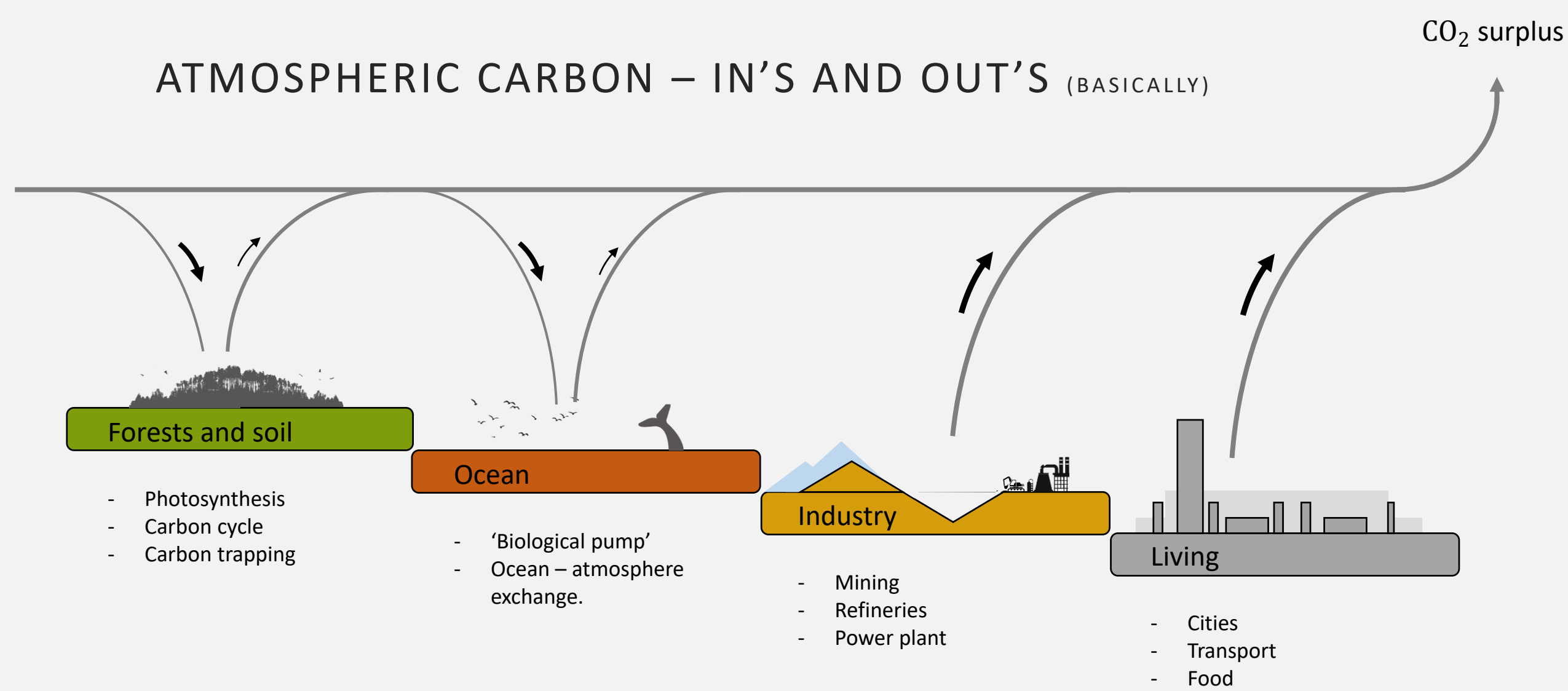
BACTERIALLY ACCELERATED WEATHERING AND MINERAL CARBONATION OF KIMBERLITE TAILINGS.

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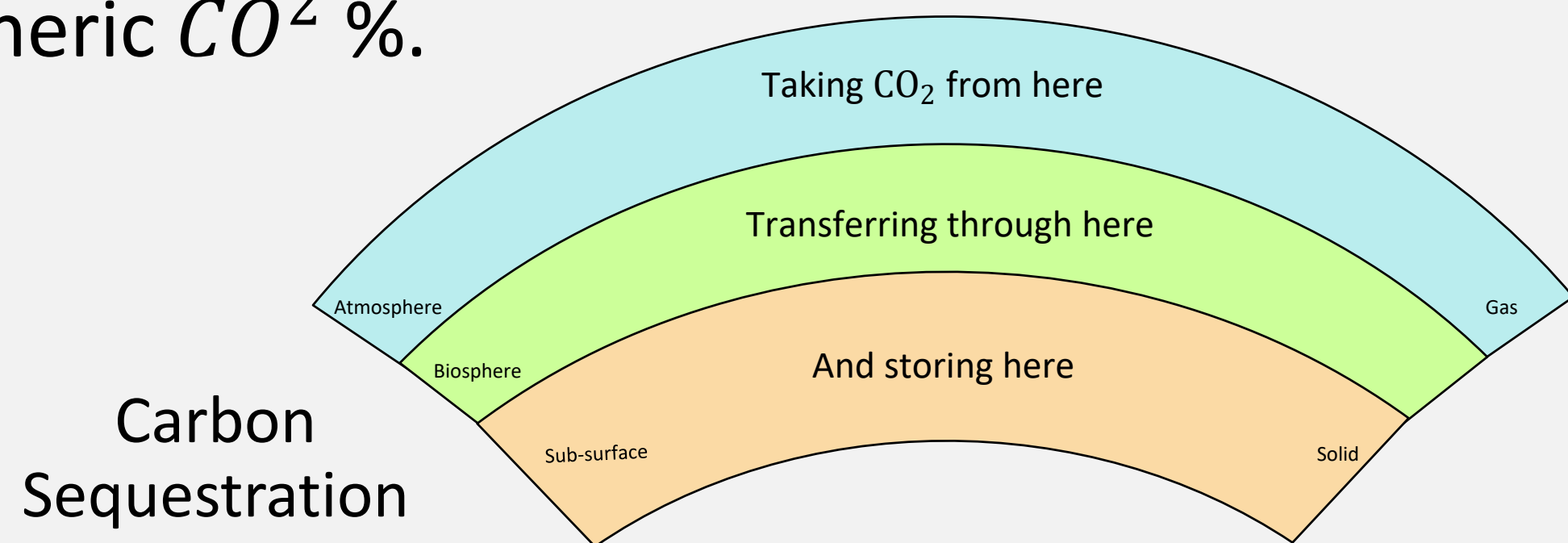
What? Why?

Carbon levels in Earth's atmosphere are increasing – leading to Climate Change and Global Warming.

ATMOSPHERIC CARBON – IN'S AND OUT'S (BASICALLY)

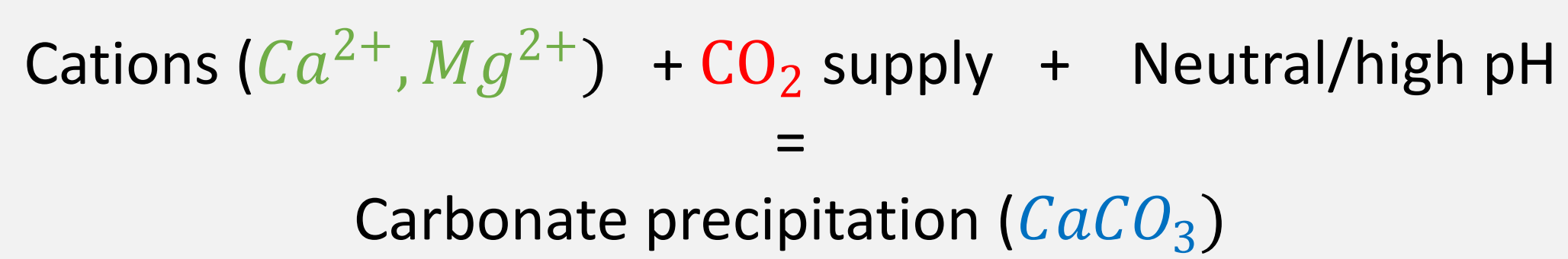


But mechanisms DO exist to help lower the atmospheric CO₂ %.

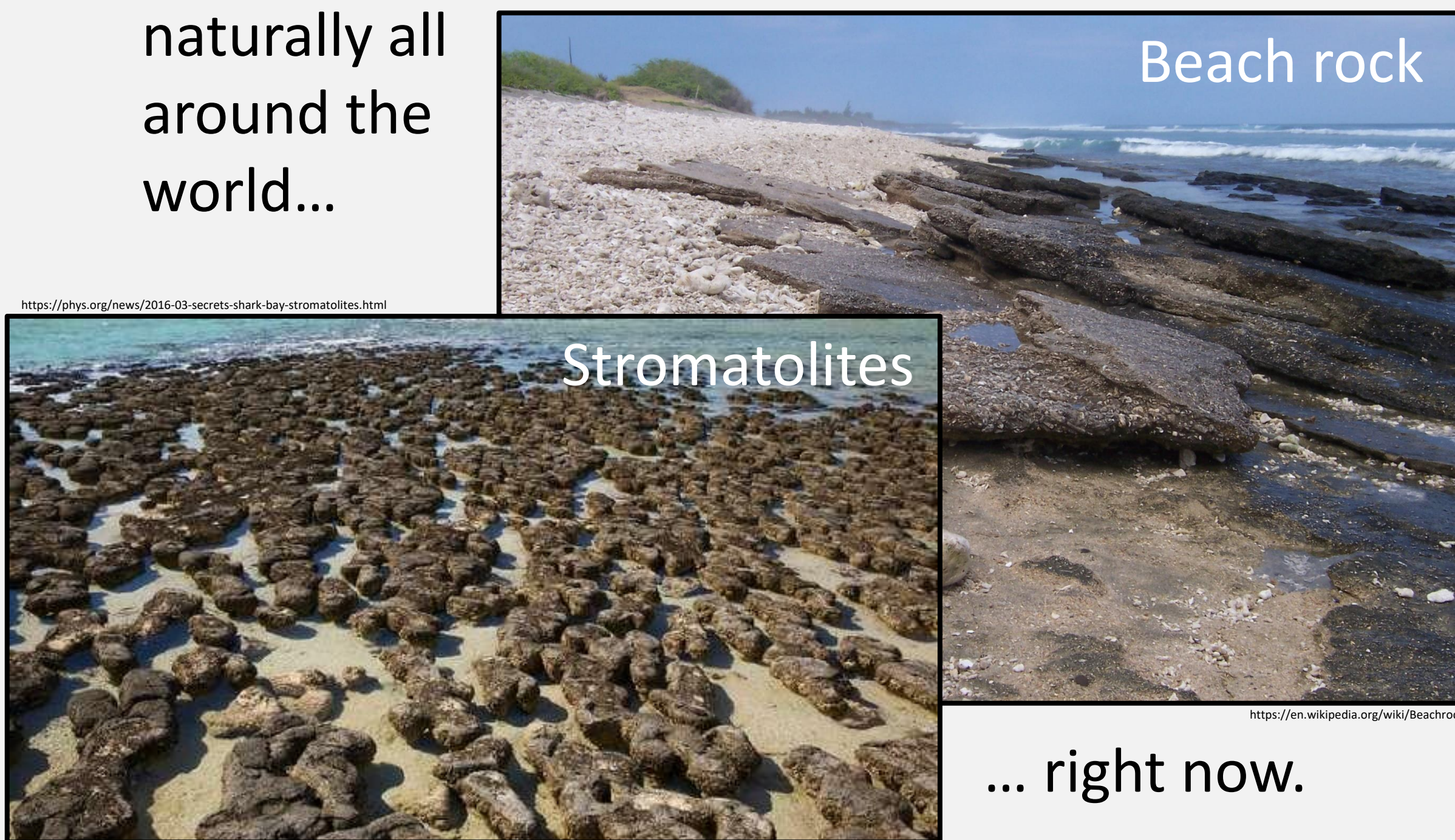


Atmospheric carbon can be sequestered via a process called Mineral Carbonation.

...making carbonate minerals.

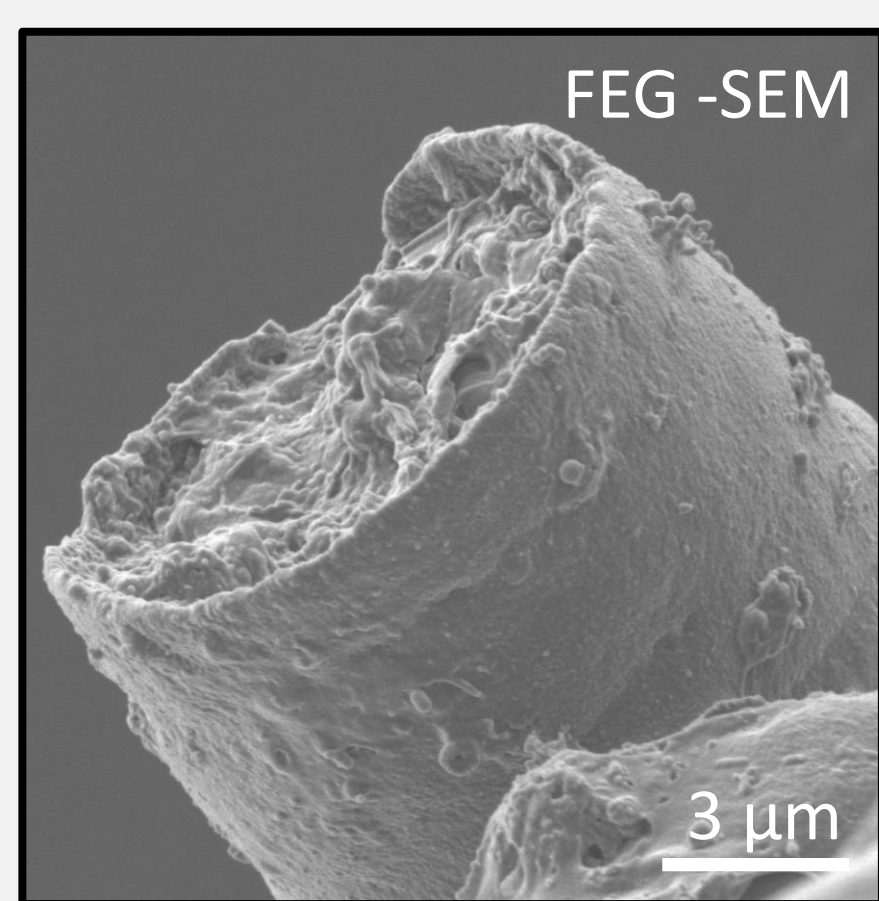
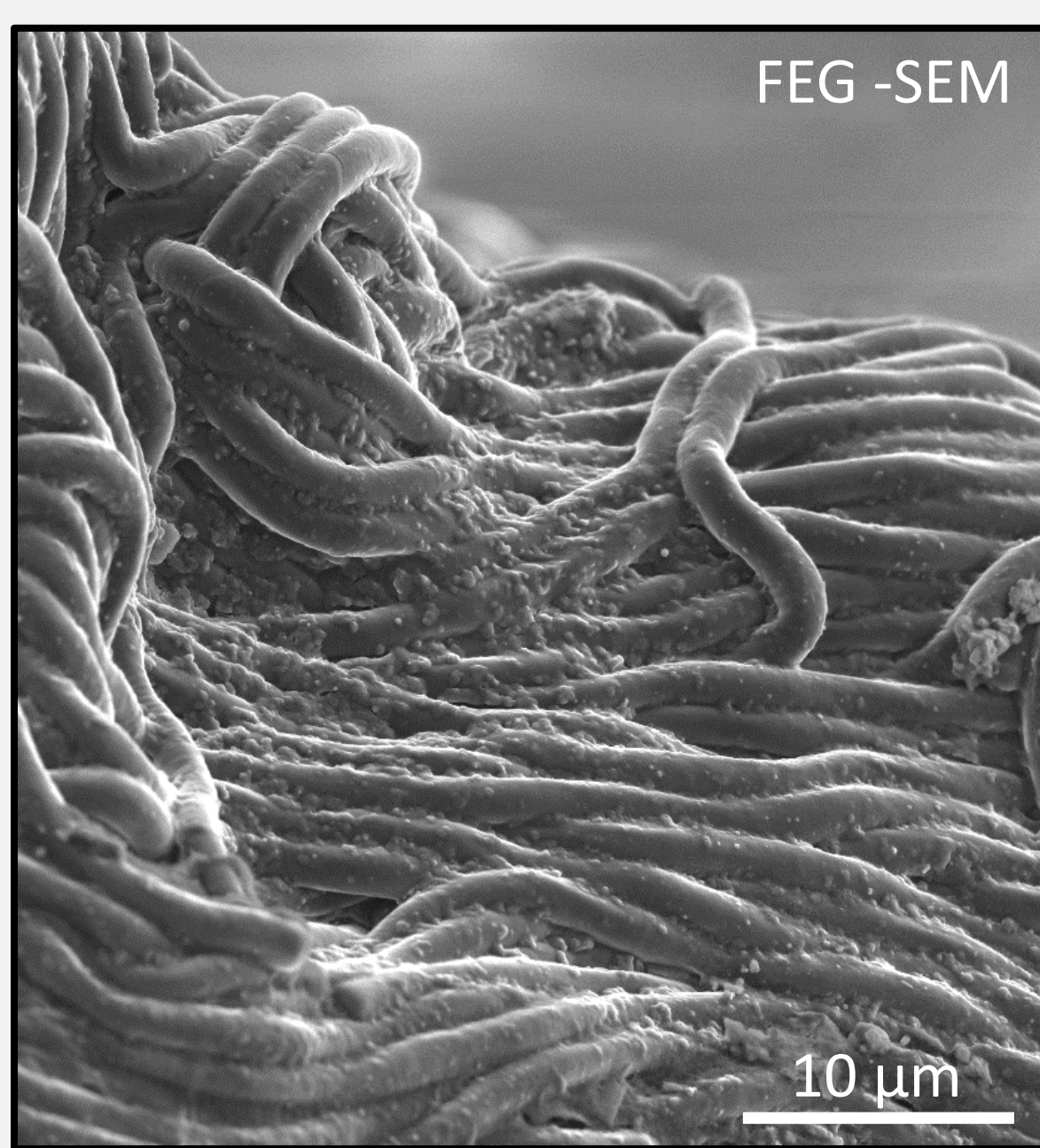


And **microbes** can accelerate this process, in fact they are doing it naturally all around the world...



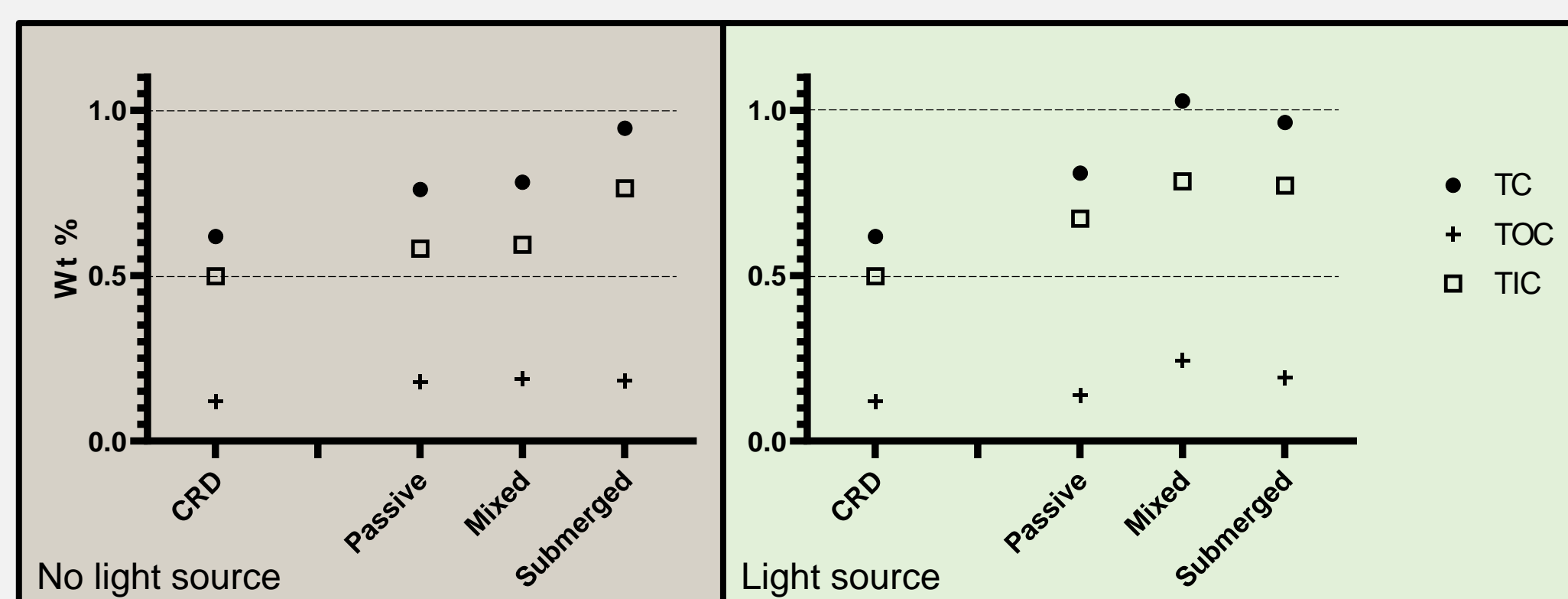
So, can we use microbes to accelerate carbon sequestration in kimberlite tailings?

Well – can we see it happening naturally?



1. Abundance of cyanobacteria throughout system.

2. Phototrophic microbial activity driving up carbonate precipitation – binding together grains.



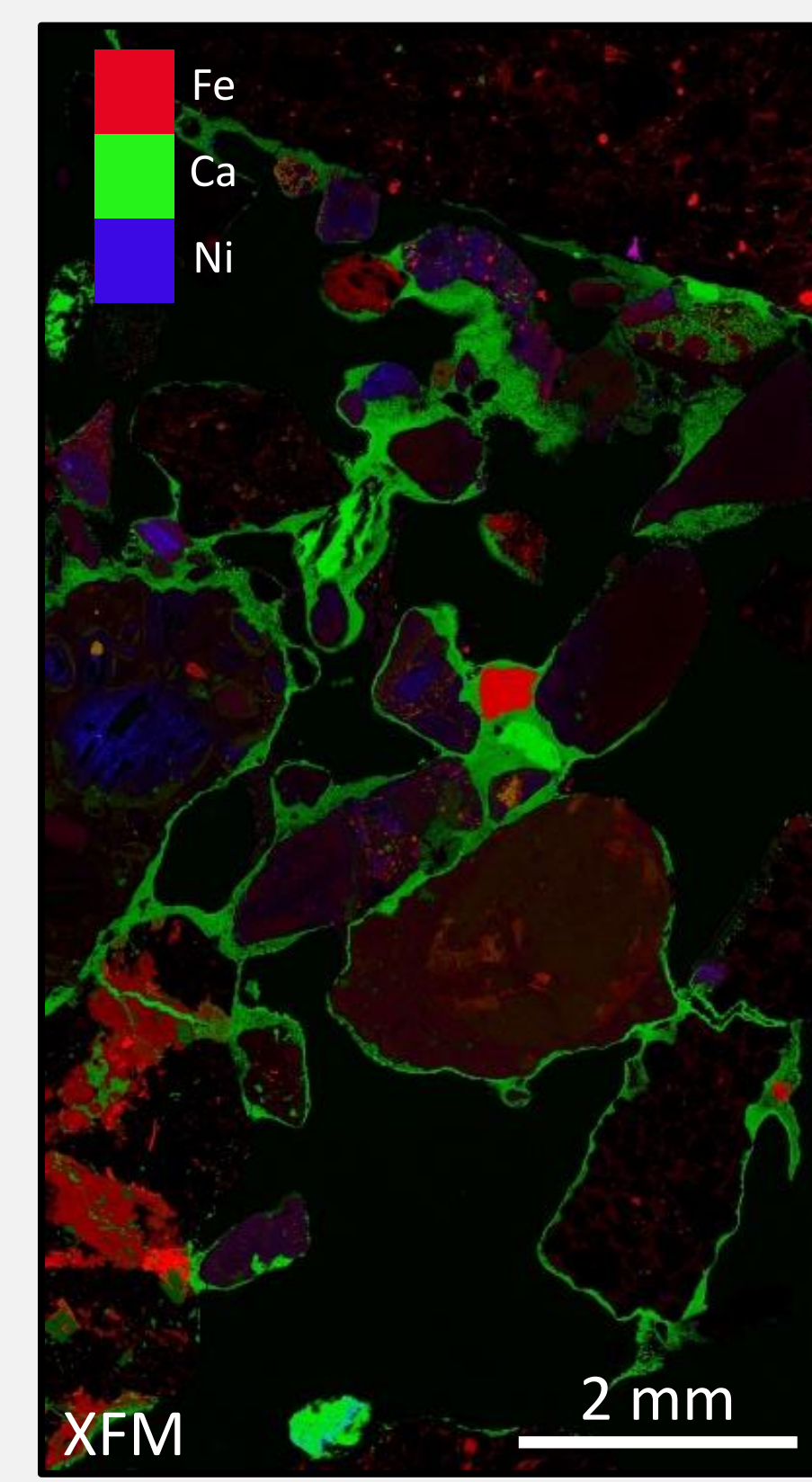
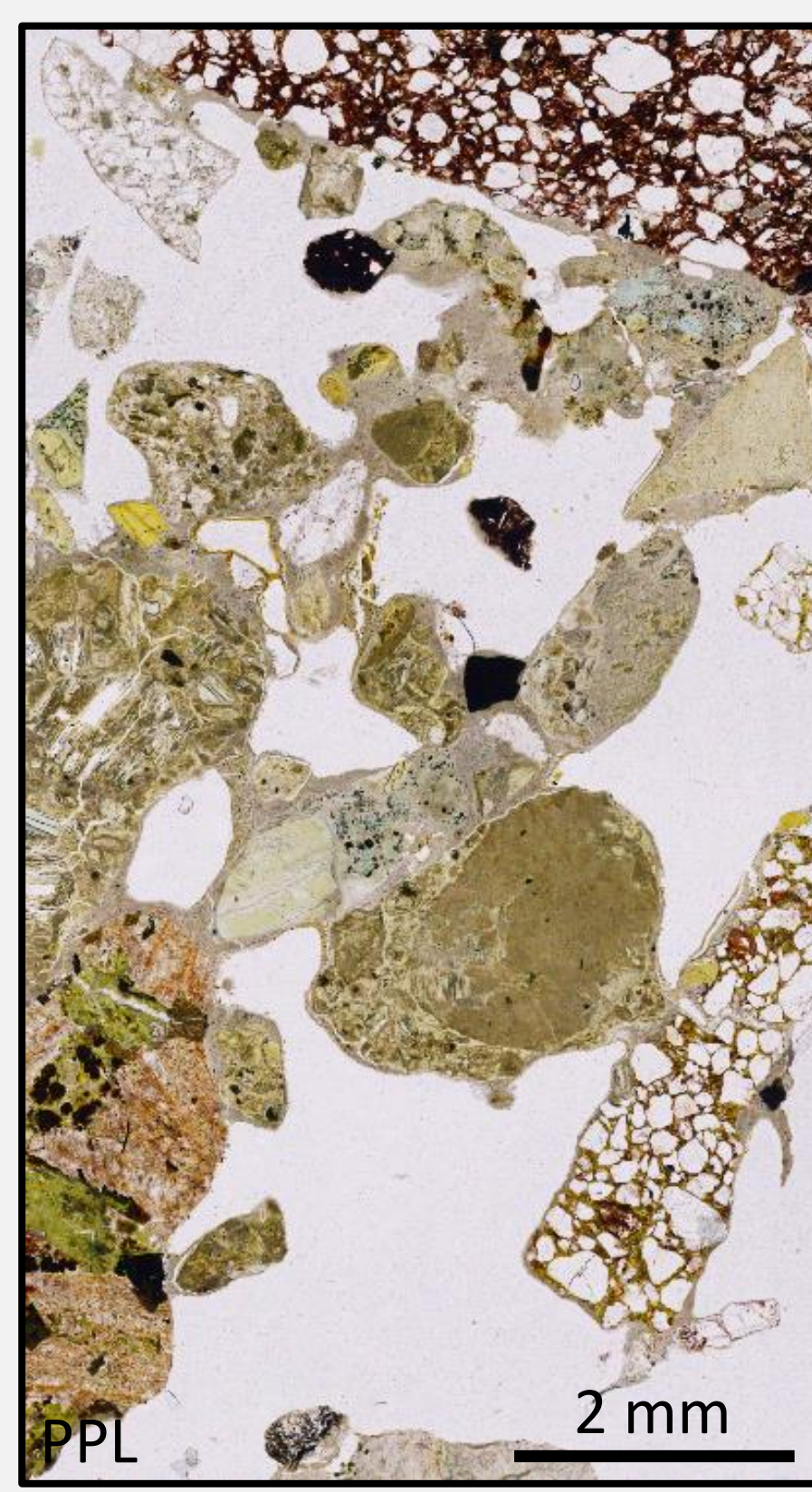
Natural Analogues

To see what *COULD* happen in kimberlite tailings – look at what *IS* happening in historical kimberlite tailings.

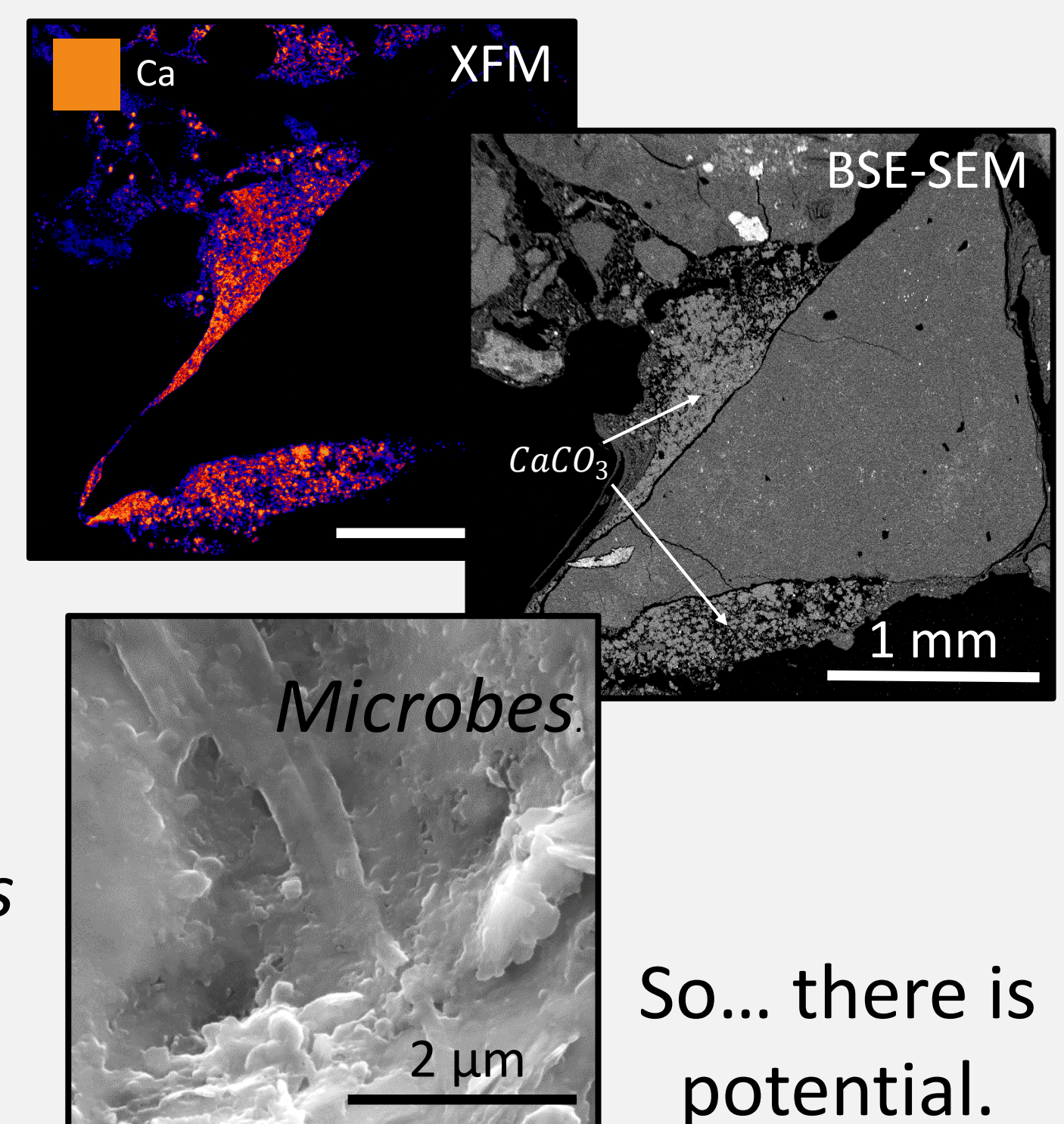
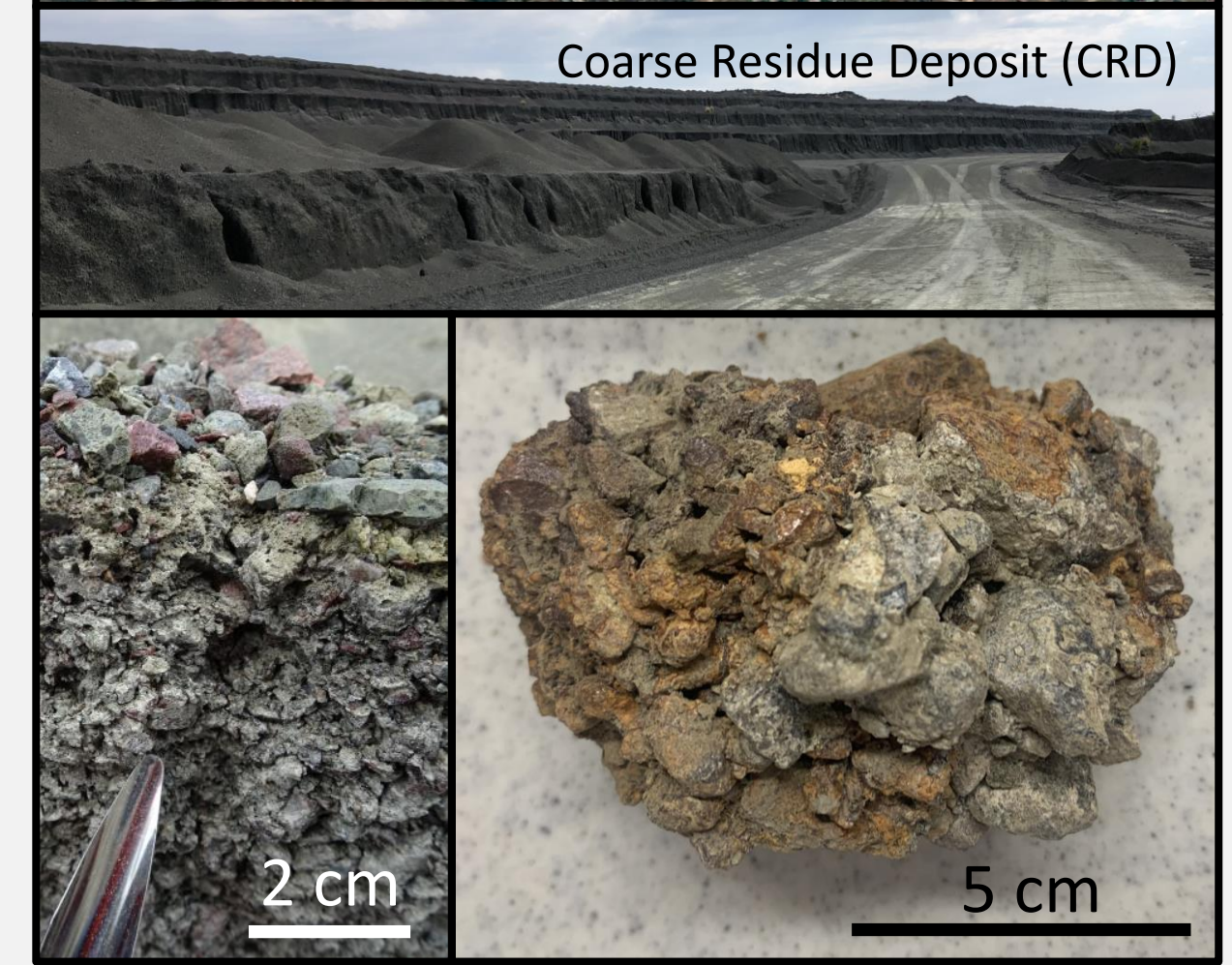
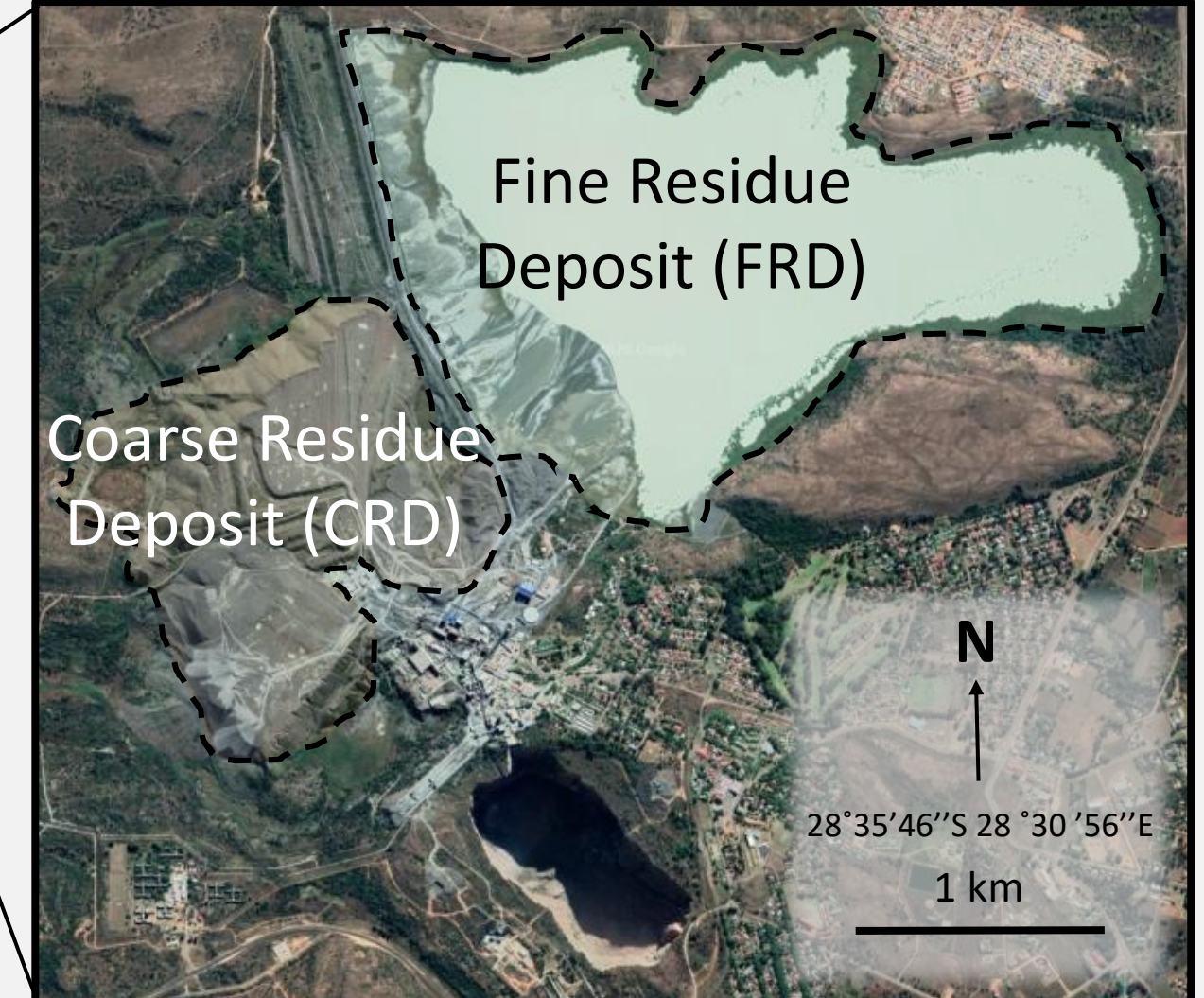


Cullinan Diamond Mine

Historical tailings deposited in the 1920s – 1930s, hand samples collected in 2018.



Carbonate coatings - cementing together discrete grains across a large area of tailings material. Textures and microscopy indicate presence of microbes.



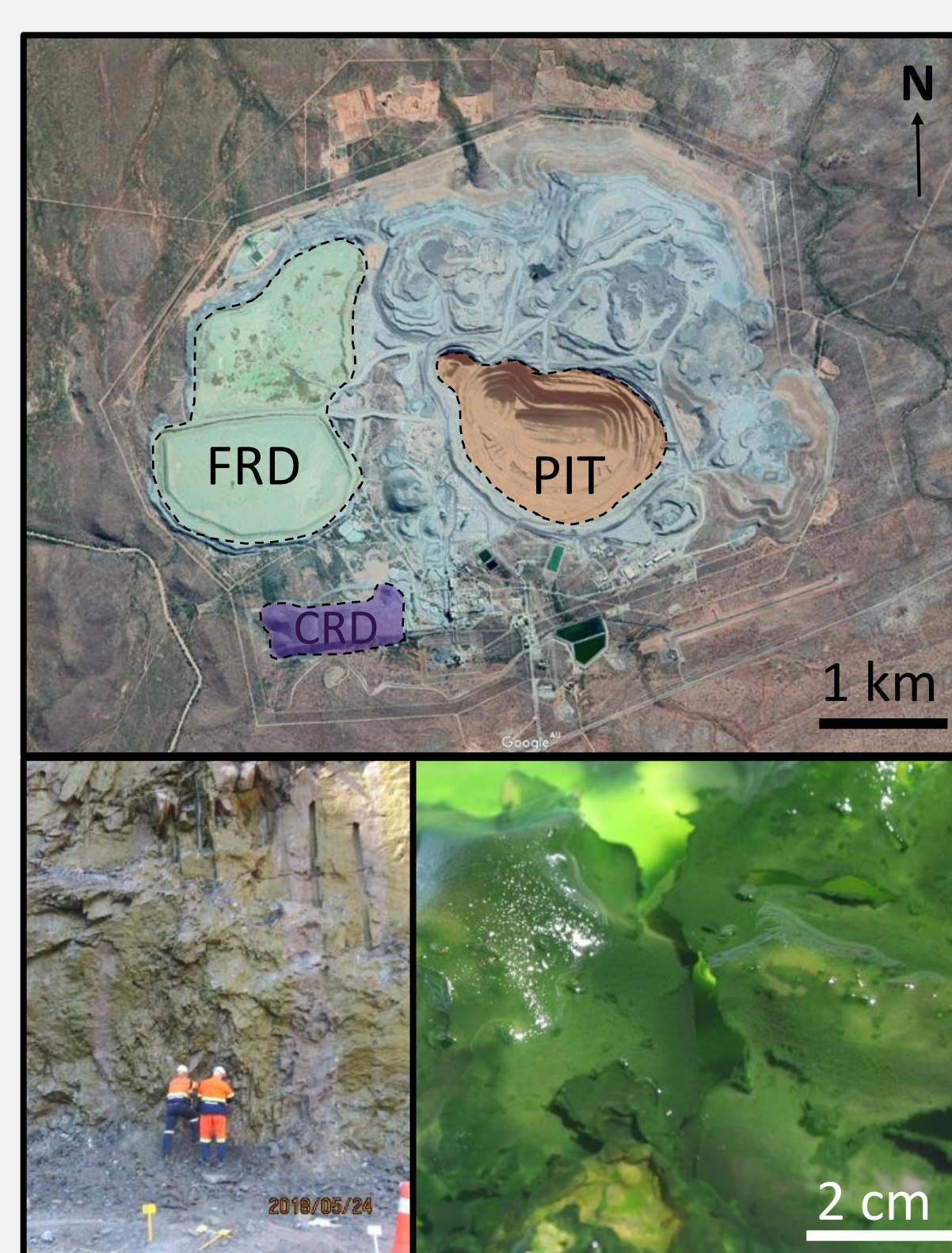
So... there is potential.

But, is it possible to replicate this in the lab?

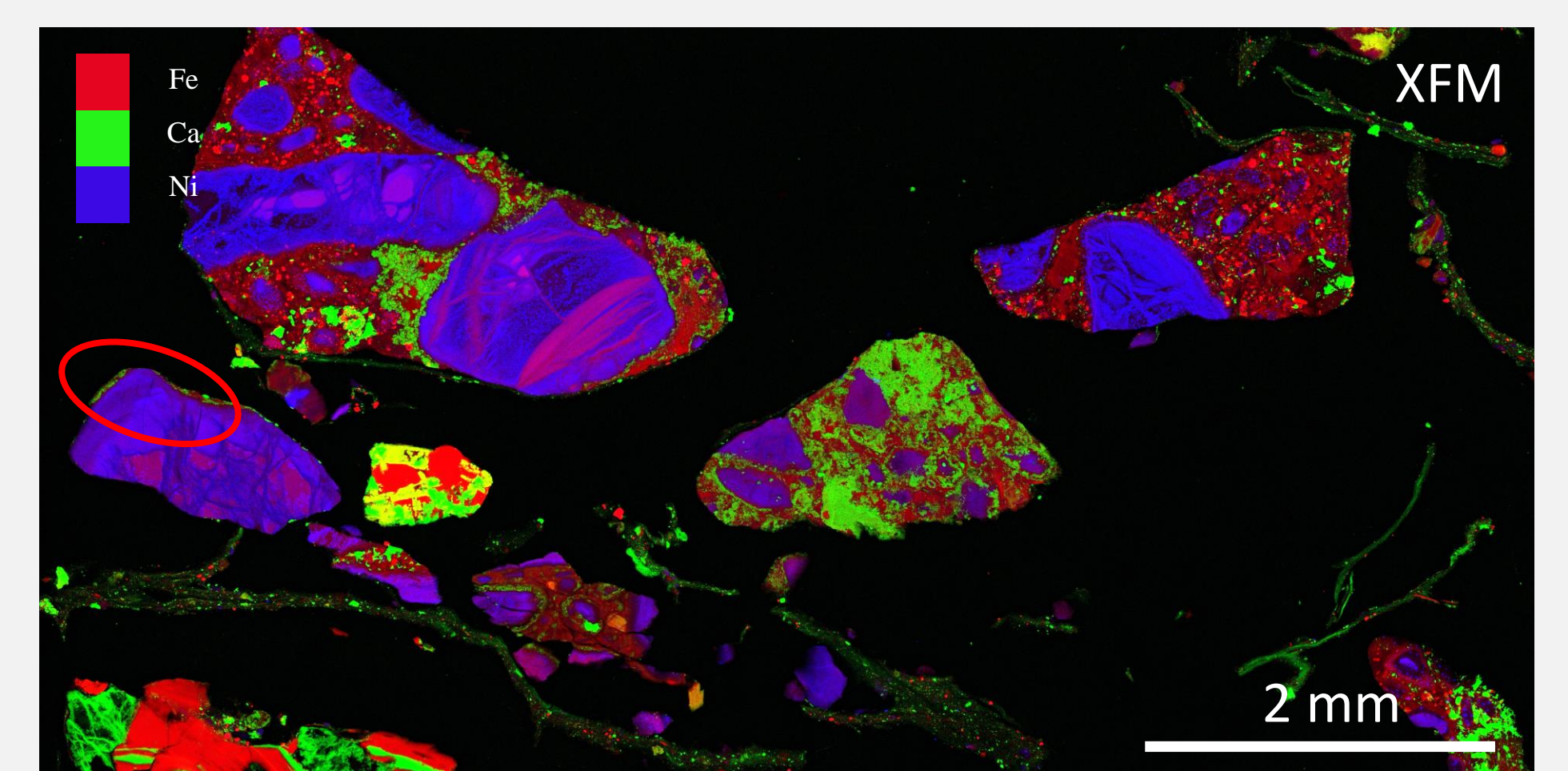
Lab-scale Experimentation

Venetia Mine

Microbes and tailings sampled in Venetia – 2018. One year experiment involving the intermixing of microbes & minerals. Light and dark conditions. Passive, mixed and submerged condition.



Primary outcomes?



3. Microbial binding and trapping of crucial cations. Significant impact across system.

↑ Microbial activity = ↑ Carbonate Precipitation