

ASH

BENEFICIATION

IN CONSTRUCTION
AND MINING

PRESENTED BY: **CYRIL ATTWELL** AND **ASTRID KIRSTEN**

ARC INNOVATIONS



ARC INNOVATIONS







$$\phi = (1 + \sqrt{5}) / 2$$

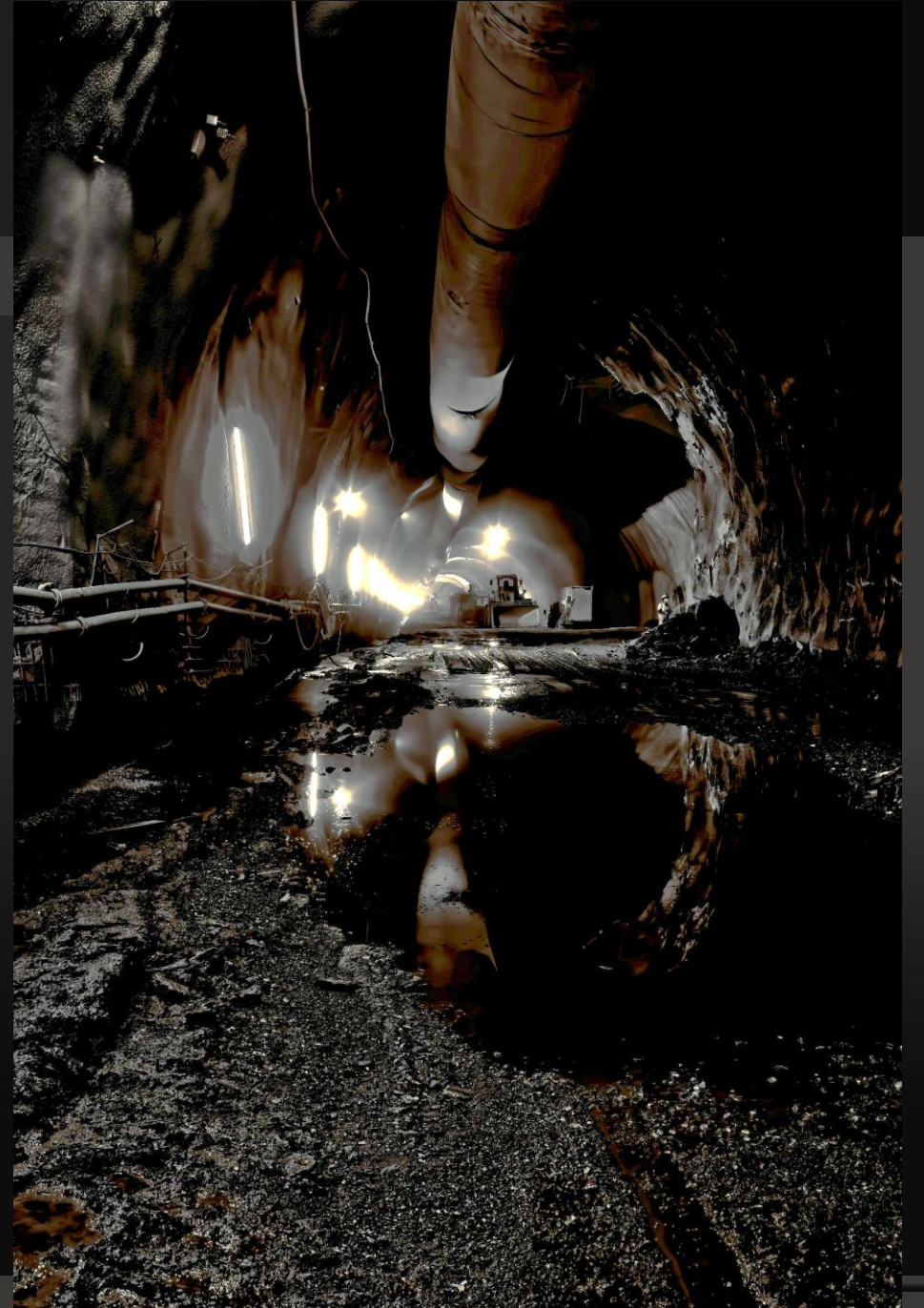
1600



300 000



30 000





25



1 250 000

40 to 10

SO_4

CN



S_2O_3

SCN



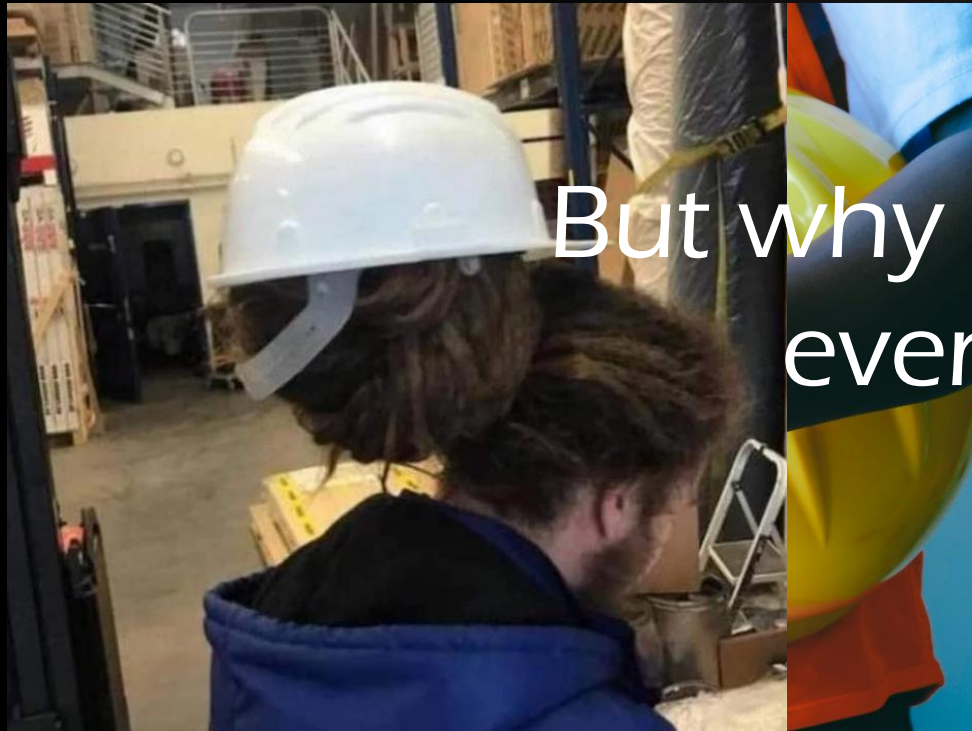


2 625 480



Hybrid Cement

Why is it necessary?

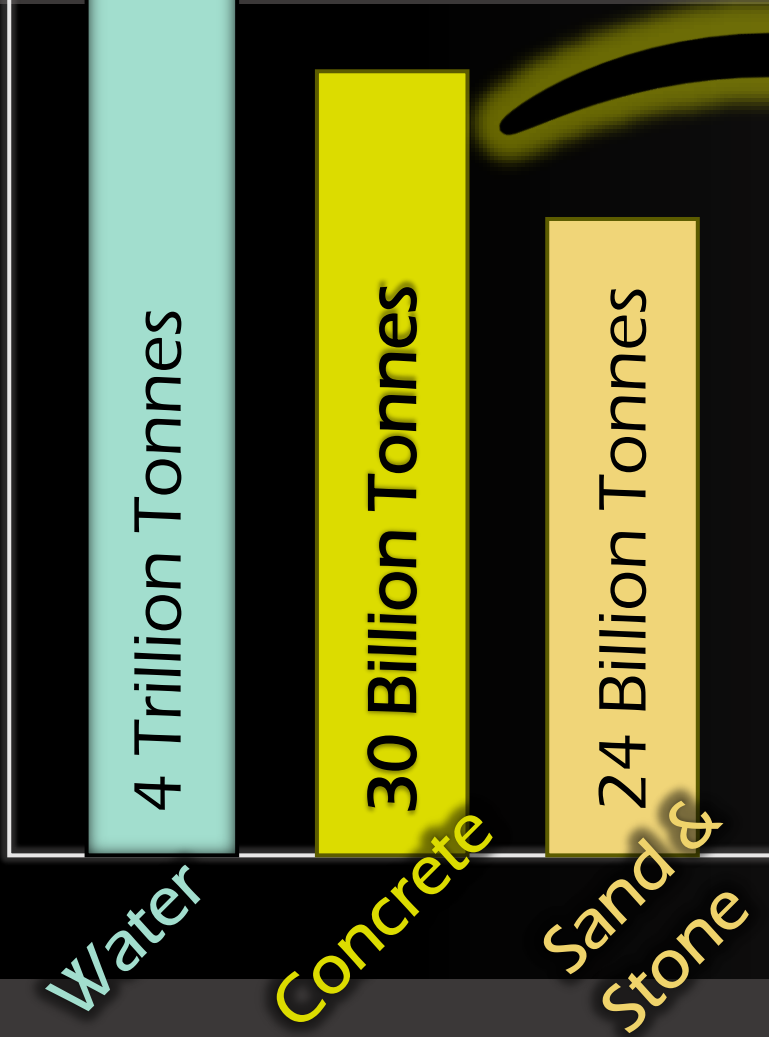
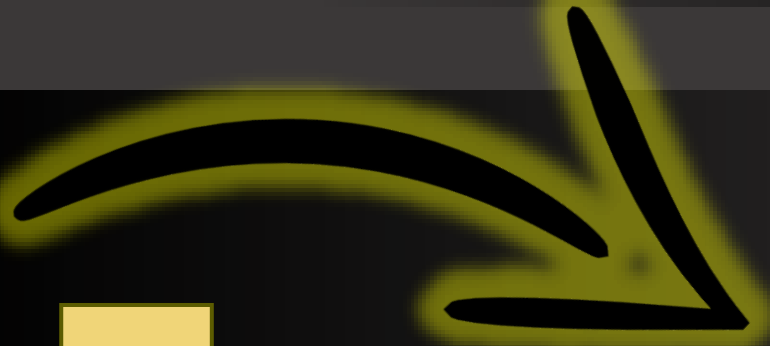


But why is Hybrid Cement

needed? Because lower pH = safer working conditions
even in the presence of constituents as the user...

Hybrid Cement

Why is it necessary?



This means that

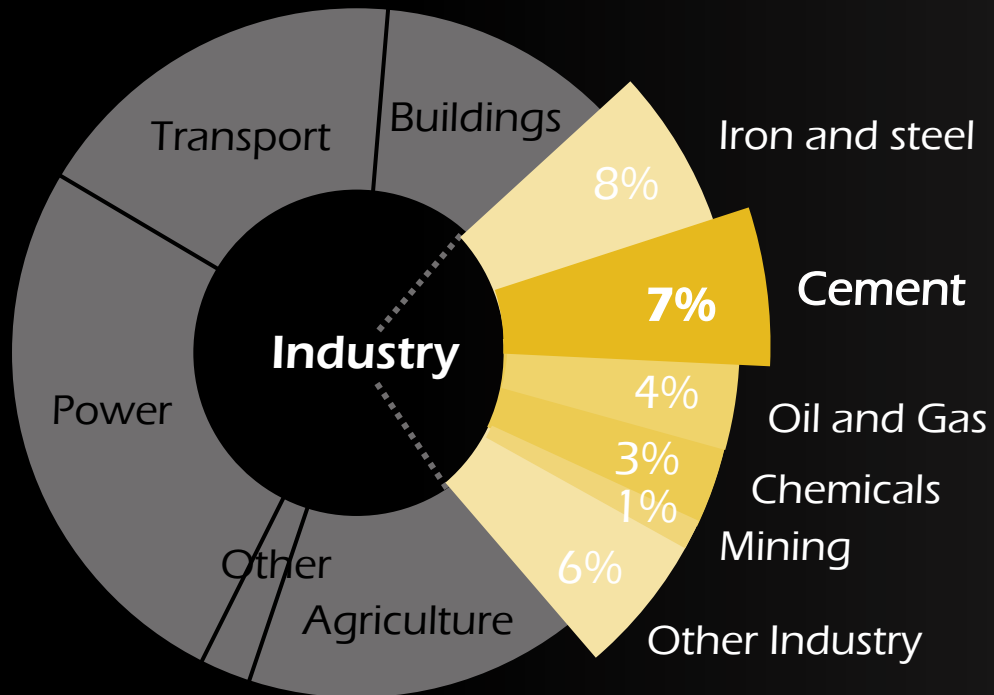
11,4 Trillion

kg CO_{2e}

Is released annually

Portland Cement

Is it really so bad?



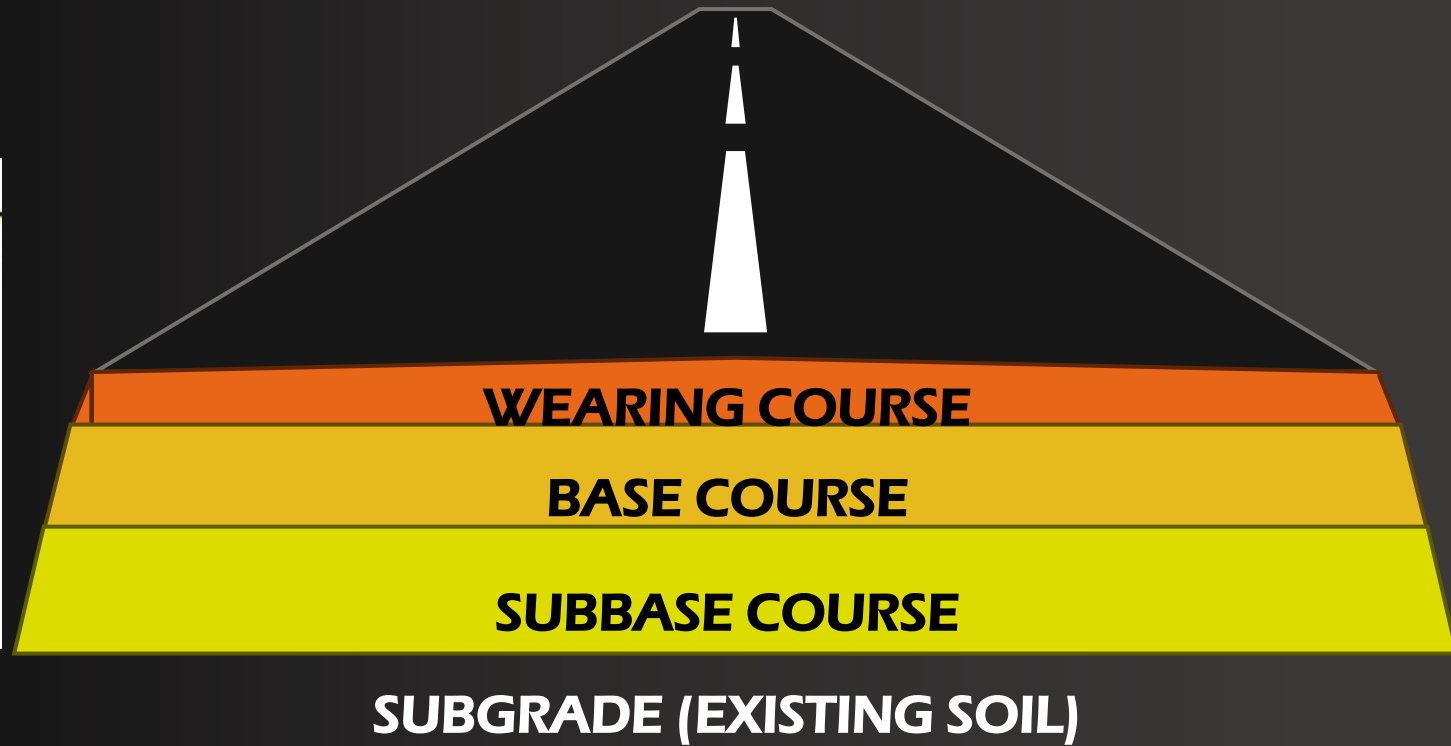
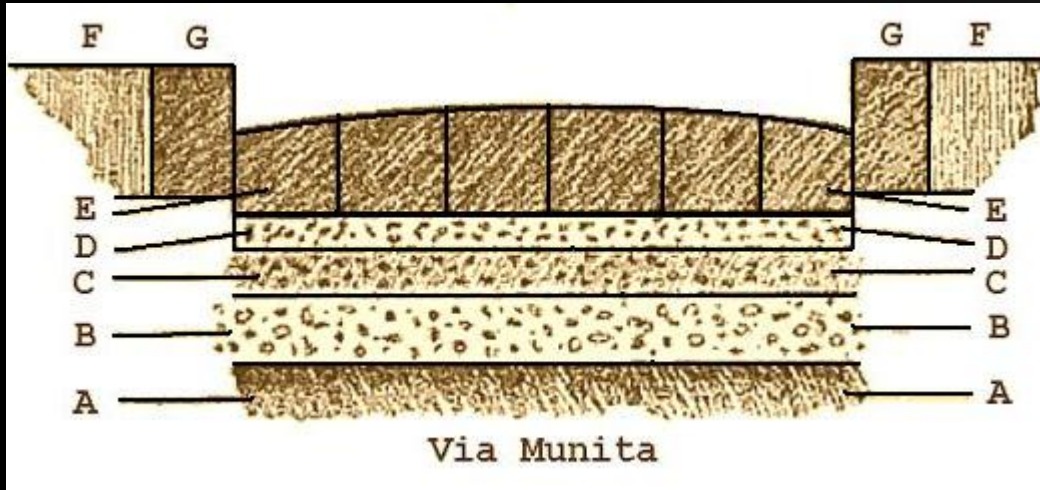
This means that Portland cement accounts for

7%

of emissions produced
in the world.

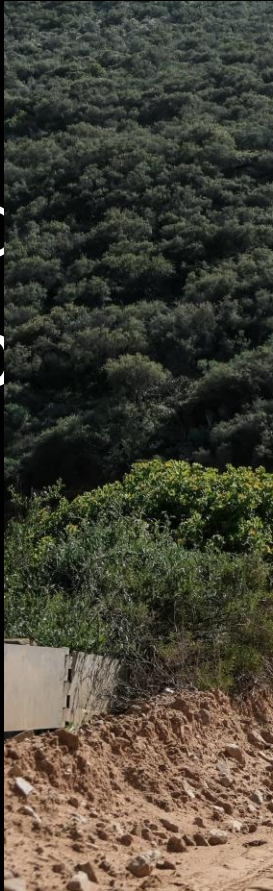
The History of Roads

A Long and Winding Story



Roads In South Africa

So
road
app



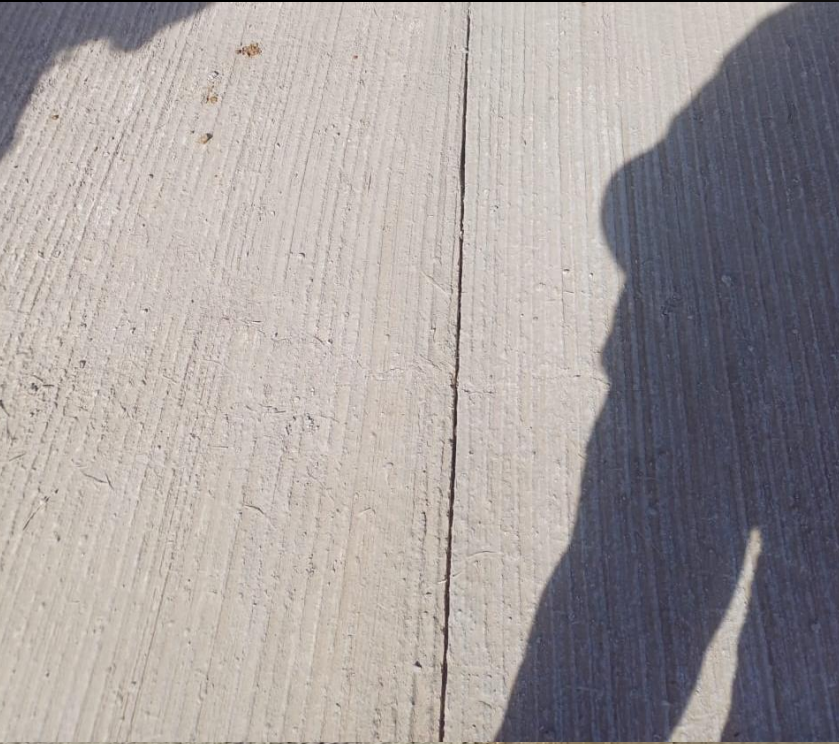
Unearthing New Soil stabilisation Technology





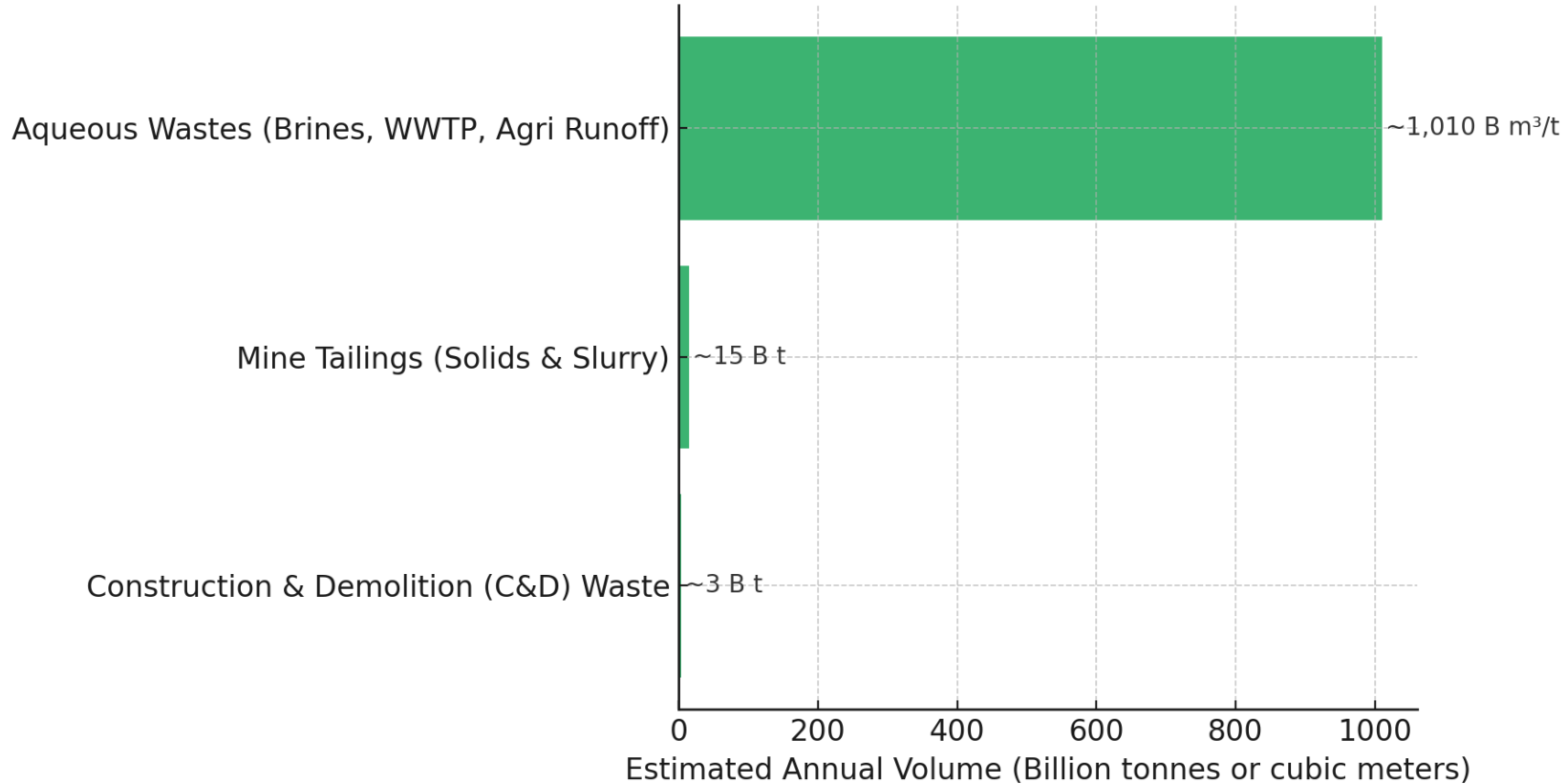
Roads

Unearthing New Soil stabilisation Technology



We track solid waste in tons But most Waste is water-based

Redefined Waste Streams by Functional Group (Indicative)



Refining The Challenge

Infrastructure from Brine

Refining The Challenge

Jones, E., Qadir, M., van Vliet, M. T. H., Smakhtin, V., & Kang, S. M. (2019). **The state of desalination and brine production: A global outlook.** *Science of The Total Environment*, 657, 1343–1356. <https://doi.org/10.1016/j.scitotenv.2018.12.076>

Infrastructure from Brine

Refining The Challenge

Van Meter, K. J., Basu, N. B., & Veenstra, J. J. (2021).
**Legacy nitrogen may prevent achievement of water
quality goals.** *Science Advances*, 7(1), eabd7356.
<https://doi.org/10.1126/sciadv.aaz6031>

Infrastructure from Brine

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Circle of Blue (2019). **Desalination Has a Waste Problem.**
Retrieved from:
<https://www.circleofblue.org/2019/world/desalination-has-a-waste-problem>

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Aznar-Sánchez, J. A., Velasco-Muñoz, J. F., López-Felices, B. (2022). **Environmental Impact of Mine Tailings: A Review**. *Metals*, 12(6), 905. <https://www.mdpi.com/2075-4701/12/6/905>

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UN Water (2024). **Progress on Wastewater Treatment – 2024 Update.**

<https://www.unwater.org/publications/progress-wastewater-treatment-2024-update>

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Global Newswire (2024). **Global Construction & Demolition Waste Management Market to Reach USD 369.9 Billion by 2033.**

<https://www.globenewswire.com/news-release/2024/07/30/2921185>

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IWMI (2021). **Global and regional potential of wastewater as a water, nutrient and energy source**. International Water Management Institute.
<https://archive.iwmi.org>

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United Nations Environment Programme (2024). **Global Waste Management Outlook 2024.**

<https://www.unep.org/resources/global-waste-management-outlook-2024>

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World Economic Forum (2022). **The environmental cost of desalination is rising. Here's what to know.**

<https://www.weforum.org/stories/2022/12/desalination-process-freshwater-negative-environmental-cost>

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UN Water (2023). **State of Water Report**. Global progress on access and safety of water resources.
<https://www.unwater.org>

Infrastructure from Brine

Refining The Challenge

Lux Research (2022). **Desalting Waste Streams: The Future of Brine Concentration Technologies.**

<https://luxresearchinc.com>

Infrastructure from Brine

Brine Chemistry

Problem or Activator Feedstock?

Jones, E., Qadir, M., van Vliet, M. T. H., Smakhtin, V., & Kang, S. M. (2019). **The state of desalination and brine production: A global outlook.** *Science of The Total Environment*, 657, 1343–1356. <https://doi.org/10.1016/j.scitotenv.2018.12.076>

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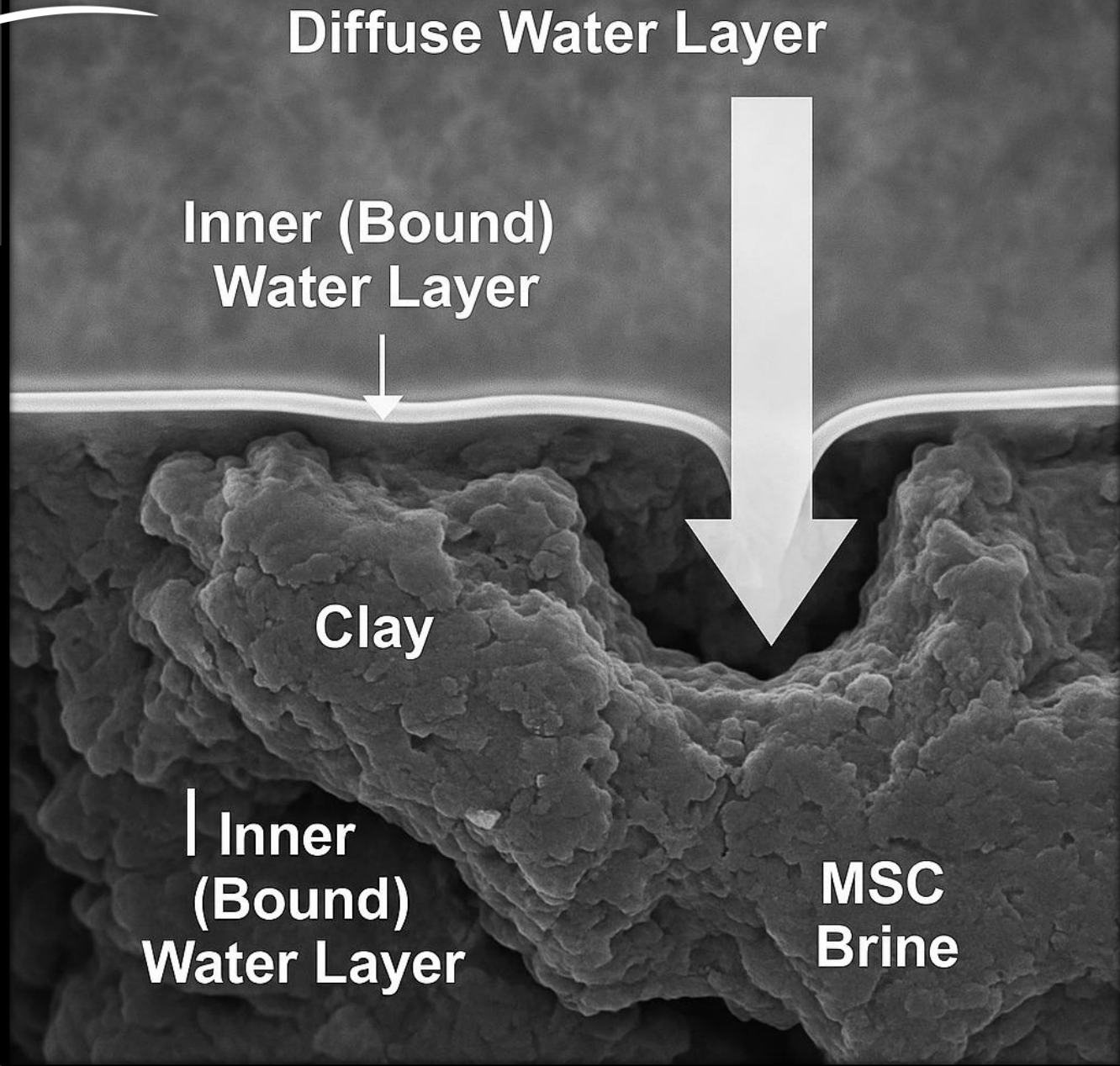
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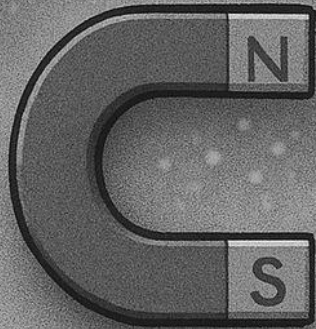
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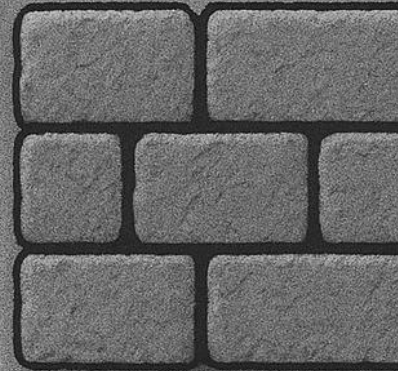
Fog of Static
Electricity



Diffuse Water
Layer



MSC

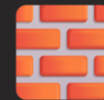
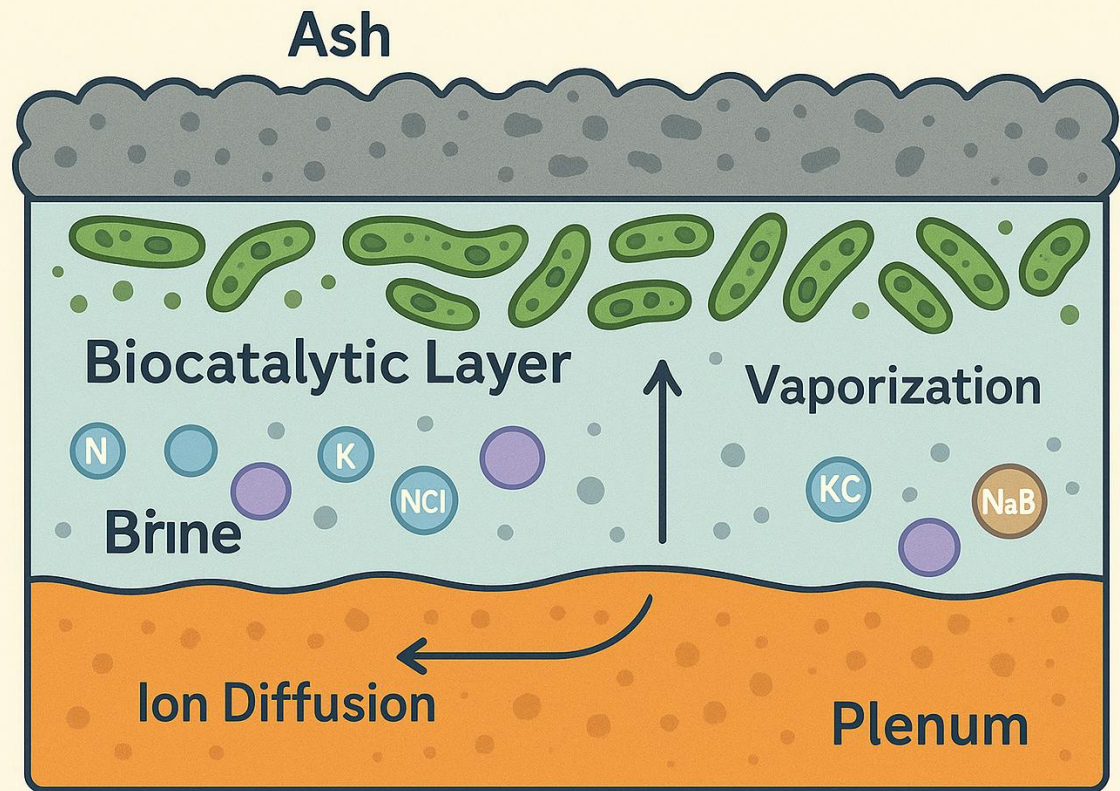


Clay

Moody
Sponge

Cohesive
Brick





High Strength



Impermeable



Low Carbon



Self-Healing



Bacteria Controlled



Waste-to-Resource

Micro Bio-Organisms

Tiny Titans of emerging Technology

Mycelium The networks of nature

- Industrial contaminant breakdown (Mycodegradation)
- Land remediation (Mycoremediation)
- Soil stabilisation

“Mathematics unveils the universe's design. By aligning with nature's patterns, we harmonise economic growth and ecological balance.”

Cyril Attwell

The ARC Times

THURSDAY, MAY 29, 2025

WWW.THEARCTIMES.COM

JOBURG, SOUTH AFRICA



THE FUTURE IS HERE

Tomorrows Dirt Today!

by ARC Innovations

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ART

Symphony of Soil and Science

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TECHNOLOGY

Push Past the Conventional

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