

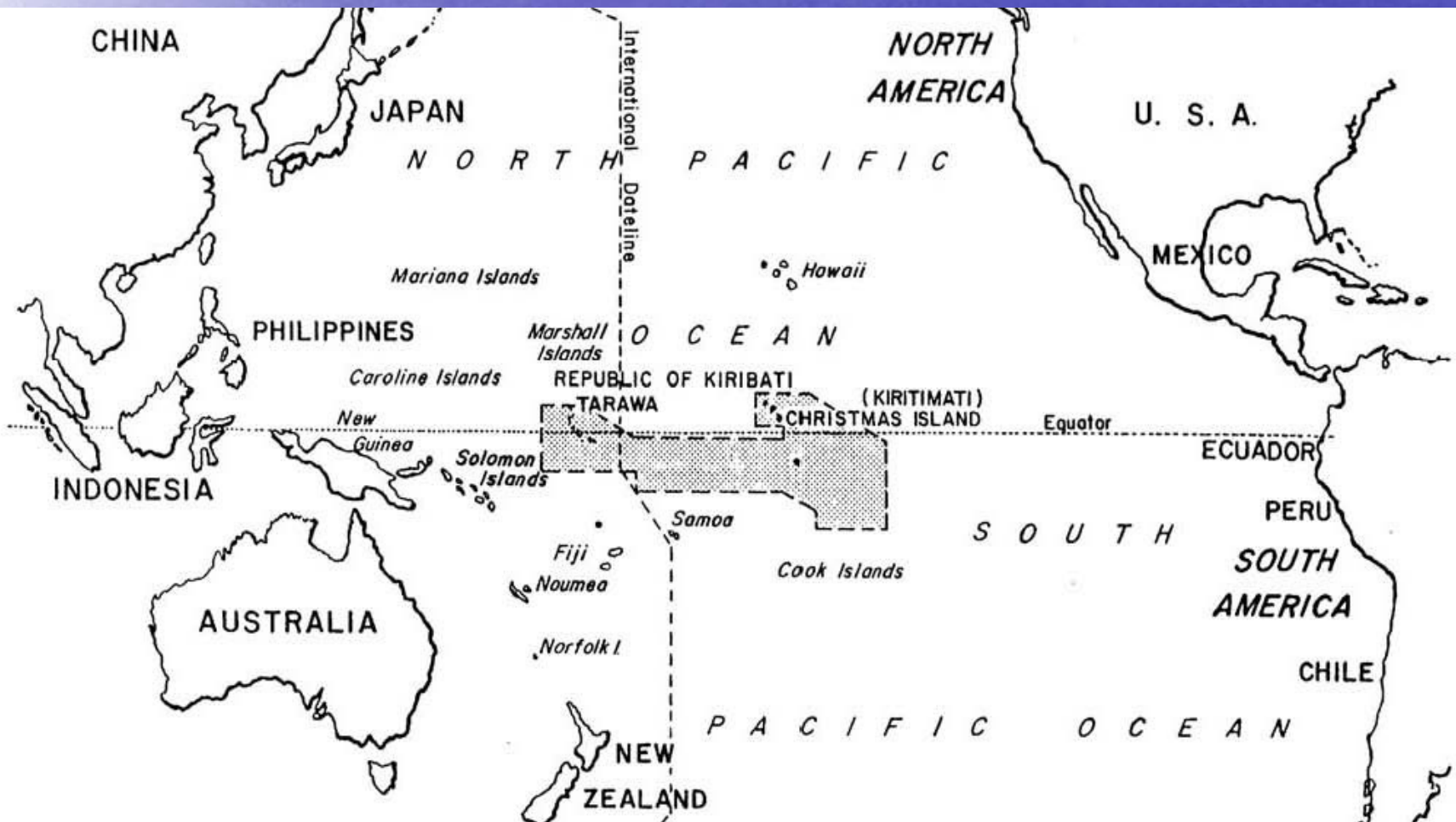
A Nature-based Solution to Landfill Leachate Management in Atoll Nations

By

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(Where is the) Republic of Kiribati (KIRIBAS)



Location of three landfills on South Tarawa

All built into tidal sand flats



1. Betio Landfill: historical sea-side tip, enclosed in 1997;
2. Nanikai landfill, purpose built in 2004, operating for 20 years;
3. Bikenibeu landfill, purpose built in 2004, opened in 2012.

2003 – 2005 three

Landfills constructed

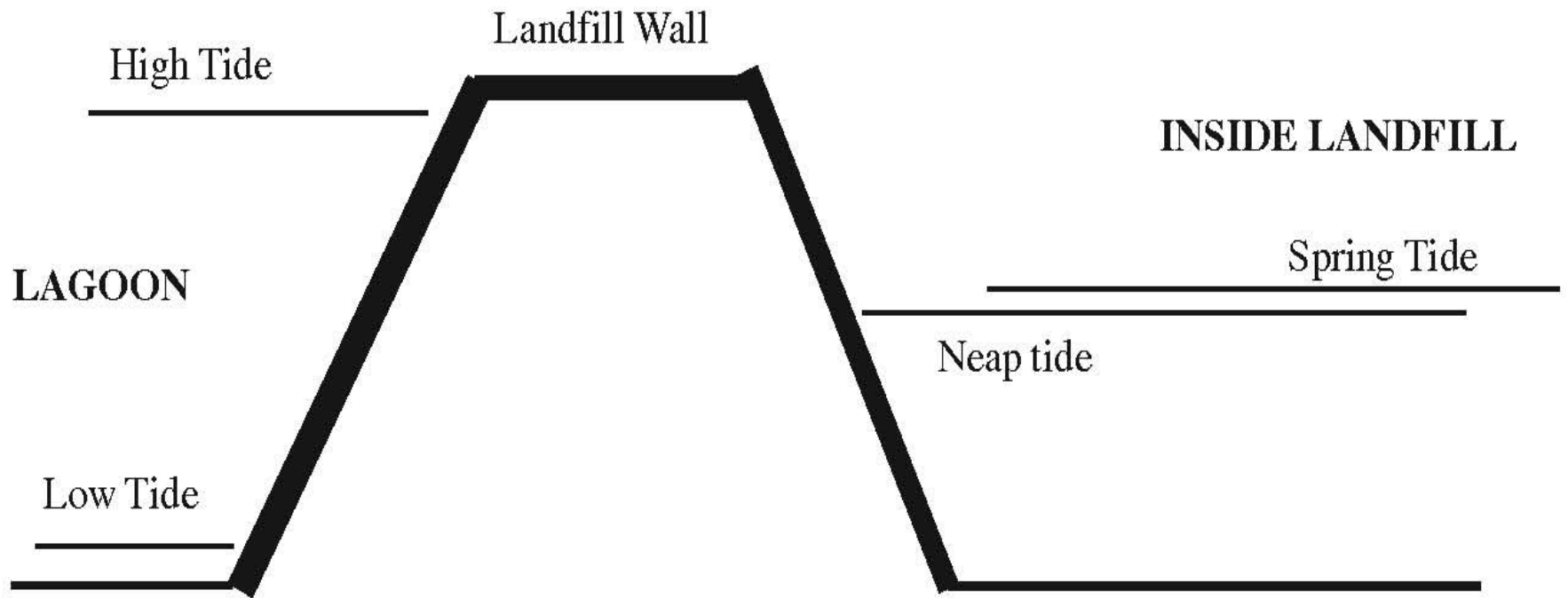
**This is Bikenibeu Landfill:
Filled up with water once built**



Construction Technique

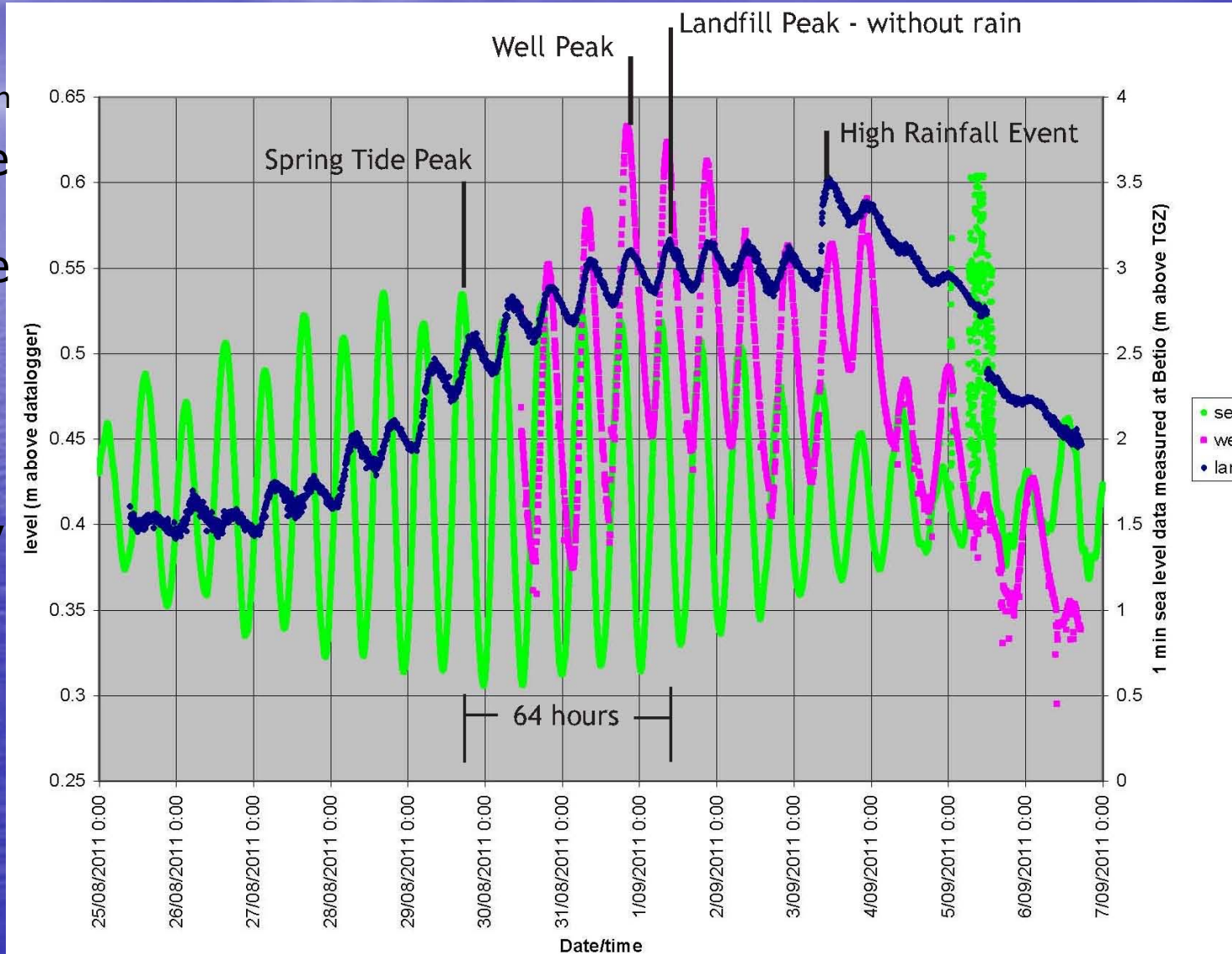


Water Levels in the Landfill



Landfill Water Level Monitoring prior to opening landfill:

- Landfill water moves about 100th LESS than the tide outside;
- Tidal peaks in the landfill lag the outside by **64 hours**;
- Tidal peaks in a nearby well lag by 50 hours.
- There is interaction between sea and landfill water bodies



Water Test Results from 2011 - 2024

- Water Tests conducted in New Zealand for heavy metals, nitrates, phosphorous etc;
- Up to 56 Samples from inside and outside landfill
- Tested one site before opening of landfill;
- Tested 2011, 2012, 2013, then a lag to 2022 and then 2024;
- Results show surprisingly low contamination of surrounding water bodies from landfill leachate;
- APLAS 2012 (Prof. Vassel of Belgium) provided the answer: **Calcium Carbonate.**

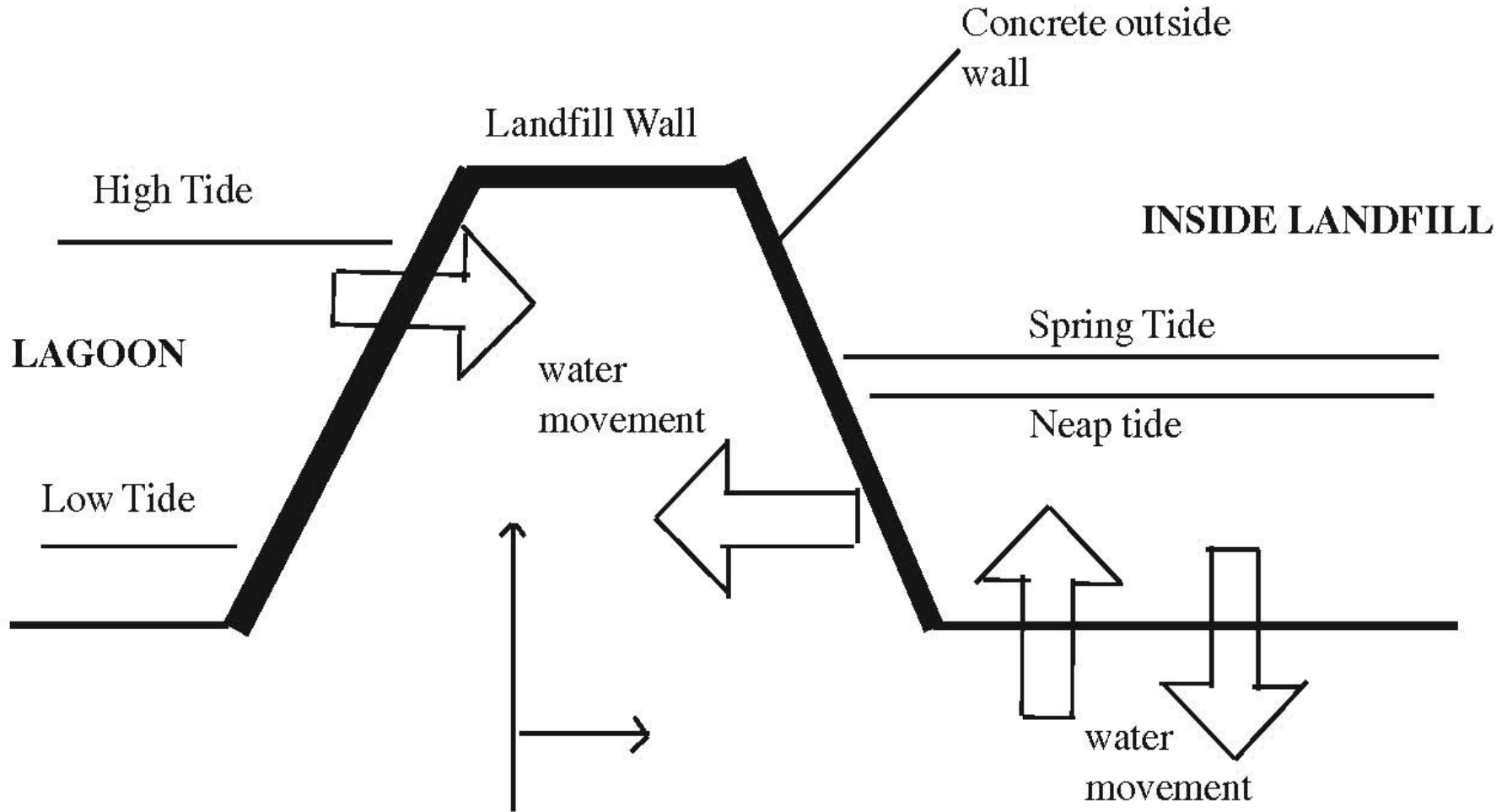
Calcium Carbonate used for Leachate Treatment

- Atoll Sand is all Calcium Carbonate from Marine biological sources;
- Calcium Carbonate treatment medium must be above 15°C and ideally above 25°C;
- Ambient temperatures in Kiribati are 26°C to 33°C;
- Need to keep a gentle hydrostatic gradient across the Calcium Carbonate medium;
- Tidal movement does this in Lagoon landfills.

Calcium Carbonate used for Leachate Treatment

- This is a **Nature Based Solution** to Leachate Management for landfills on Atolls:
- No Pumps
- No Pipes
- No Settling Ponds
- No Power Demand
- No extra land required
- Zero O&M Cost for Leachate Treatment

Water movement through the landfill wall



Sand (Calcium Carbonate) inside the wall and the floor of the landfill

An NbS Atoll Landfill

1. Do not fit a liner to the landfill;
2. Make the walls as impervious as possible, with lots of sand inside the walls too;
3. Allow interaction with surrounding sea through the calcium carbonate sand base.



Kiribati te bobotoo!!

Thank You

Kam Bati N Rabwa