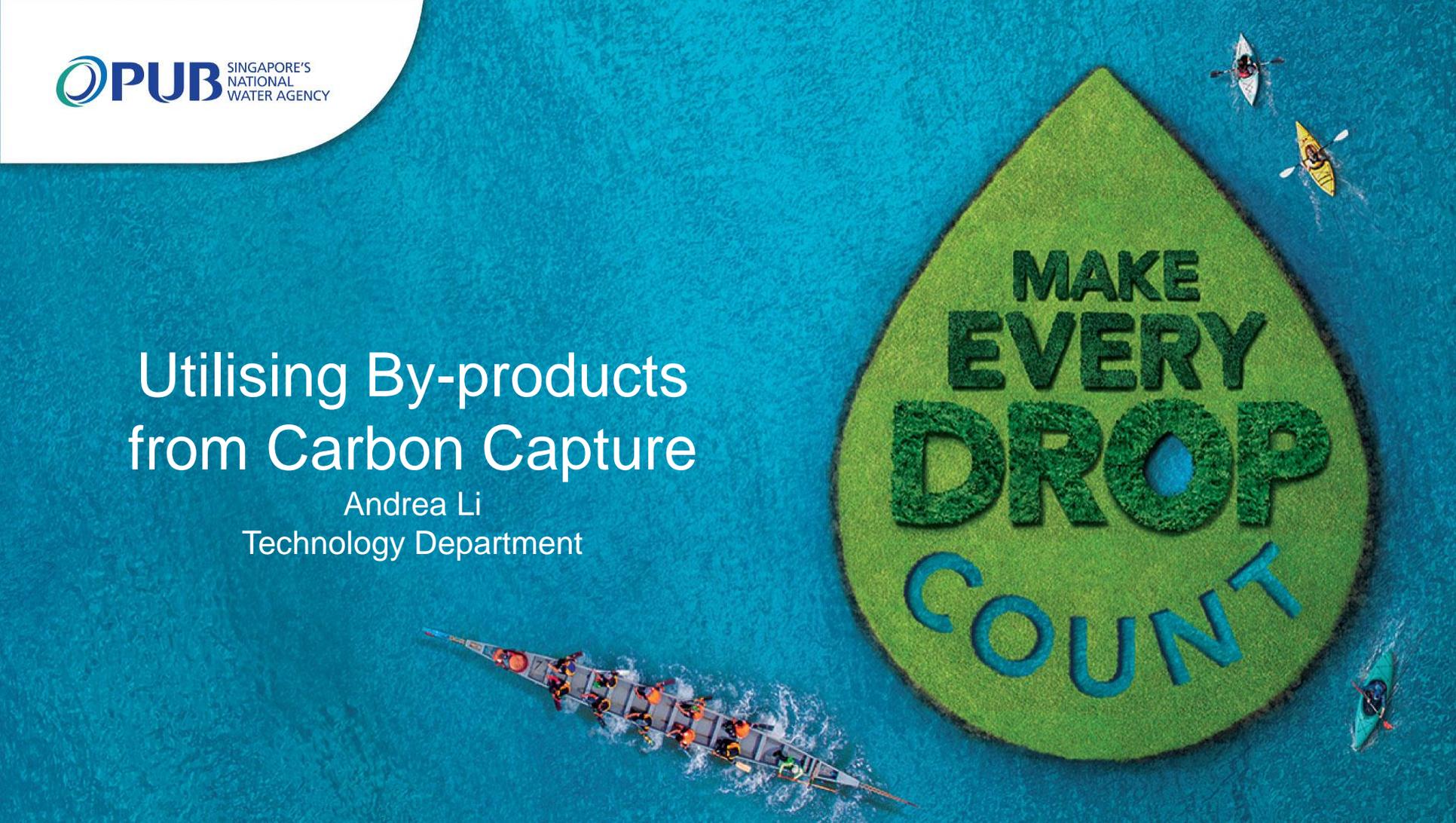


Utilising By-products from Carbon Capture

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MAKE
EVERY
DROP
COUNT

Background & Current Practice

PUB's Target: To achieve net zero emissions by 2045 (in line with GreenGov.SG)

Decarbonising PUB's Operations

Replace With Renewables

- ❖ Solar deployment on reservoirs and rooftops of PUB installations

Reduce Emissions

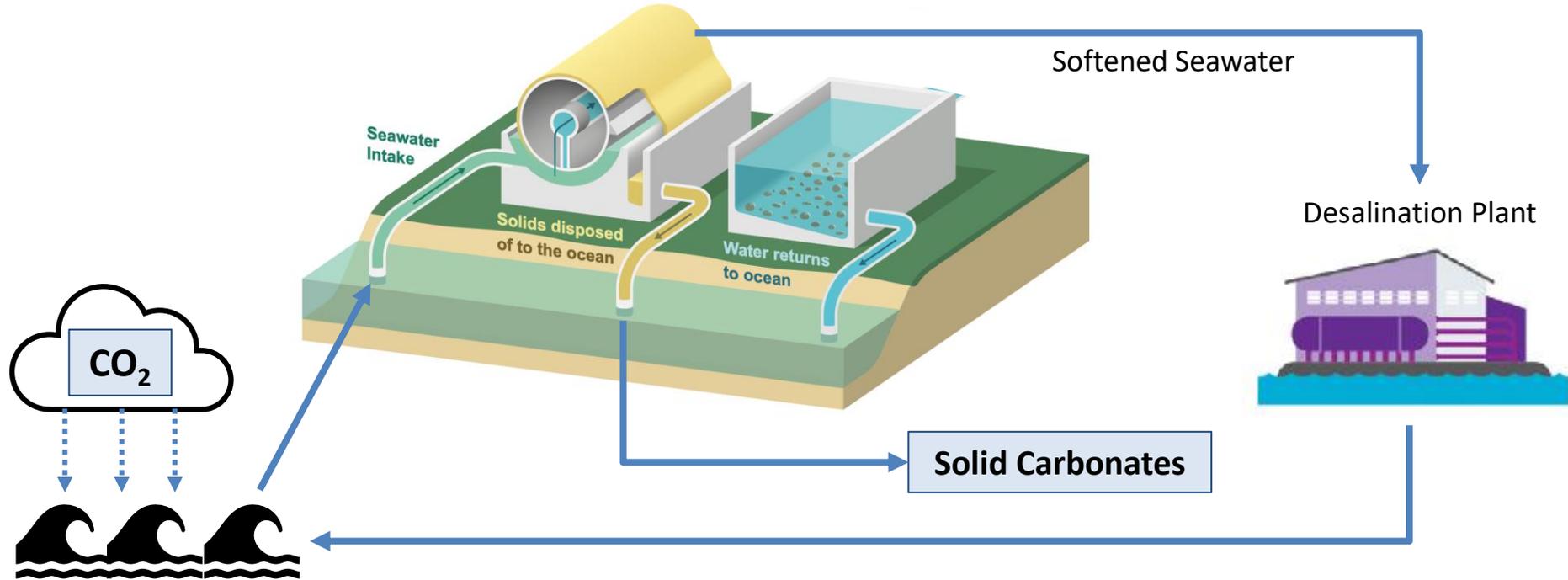
- ❖ Reduce Desalination Energy
- ❖ Energy Self-Sufficiency for WRPs
- ❖ Reduce water demand

Remove Emissions

- ❖ **Carbon Capture, Utilisation & Storage Solutions**
- ❖ Blue Carbon – carbon capture by coastal ecosystem

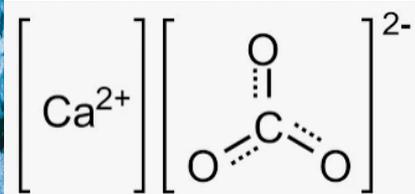
Project with UCLA on CO₂ Capture from Seawater

- Process produces calcium carbonate and magnesium hydroxide, which are used to capture CO₂.
- Pilot trial with removal capacity of 50-100 kg CO₂/day.

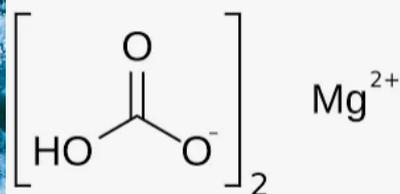


Areas of Opportunity

Valuable resources that can be recovered for industrial and commercial use:



Calcium
Carbonate
1kg / m³ seawater



Magnesium
Carbonate
4.6 kg / m³ seawater

OR



Magnesium
Hydroxide
3.2 kg / m³ seawater

Key Considerations and Challenges

Treatment Considerations

- By-products are recovered from the process by sedimentation
- In the form of slurry and may contain
 - 50 to 99% saline water content
 - Other minerals and precipitates
- Additional treatment processes may be required to achieve the necessary purity for the proposed application
- Treatment of the slurry may be required to facilitate transportation to the point of use

Key Considerations and Challenges

Application Considerations

- Regulatory requirements and standards related to the proposed application shall be complied with
- Applications for magnesium hydroxide shall enable the magnesium hydroxide to capture CO₂ permanently while it is used
- The proposed application shall not compromise the permanence of the CO₂ captured in the calcium and magnesium carbonates

Potential Applications of By-products

Calcium Carbonate	Magnesium Carbonate / Hydroxide
<ul style="list-style-type: none">• Construction : <i>cement, plaster, sealants</i>• Agriculture : <i>fertilizer, animal dietary supplements</i>• Food : <i>additive E170, deacidify</i>• Consumer goods : <i>cosmetics, powders, toothpaste</i>	<ul style="list-style-type: none">• Construction : <i>insulation, fireproofing</i>• Manufacturing : <i>stabilizer, filler and reinforcement agent for plastics and rubber</i>• Food : <i>desiccant</i>• Consumer goods : <i>cosmetics, powders, toothpaste</i>

New types of applications are desirable !!!

Expected Outcomes

A proof-of-concept in the form of a lab-scale or pilot trial within 18 months



Use PUB slurry (containing ~15-25 kg of calcium carbonate and 50-80 kg of magnesium hydroxide per day)



Demonstrate feasibility



Demonstrate techno-economics

Details to Include in Your Application

- Technical merits of the proposed application
- How the calcium carbonate and magnesium hydroxide slurries might be utilised either directly or repurposed before they could be used
- An assessment of the quantity and purity of calcium carbonates and magnesium hydroxides/carbonates
- Total system techno-economics (inclusive of transportation to point of use, additional treatment processes and other considerations)

Thank You



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