Addressing Water Pollution: A review of Zero Liquid Discharge Policy in Tirupur, India

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Laramie, WY

Environmental pollution

Pictures:
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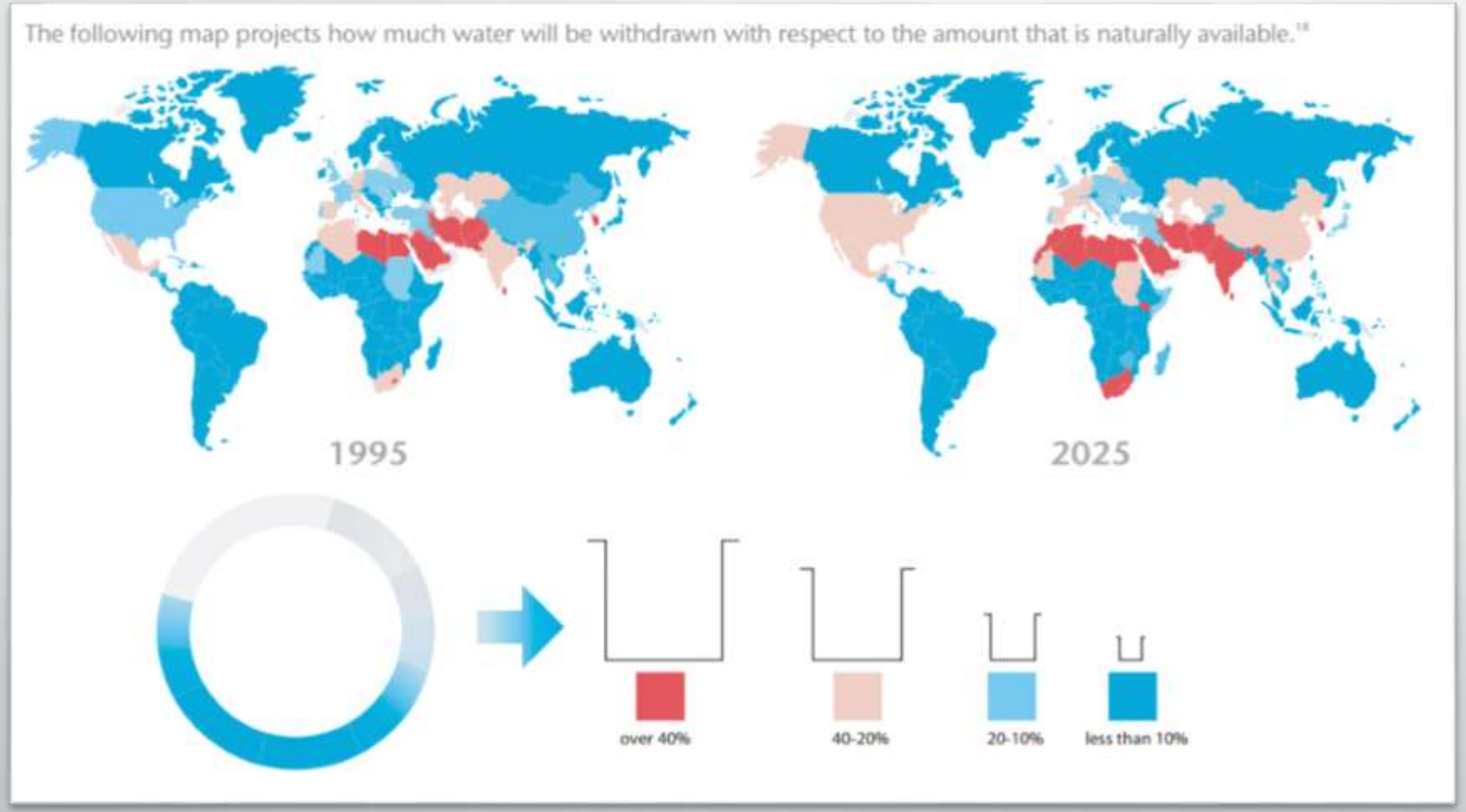
Fresh water stress



Fry, et al. "Facts and trends – water." United Nations WBCSD 2006
http://www.unwater.org/downloads/Water_facts_and_trends.pdf

Outline

I. ZLD. How can it help address the water pollution concerns?
II. Case study: Tirupur (city), Tamil Nadu (state), India
    I. Why ZLD was implemented?
    II. How industries reacted and adapted?
    III. Improvements in water resources since ZLD policy was implemented
III. Does ZLD policy remain viable option?

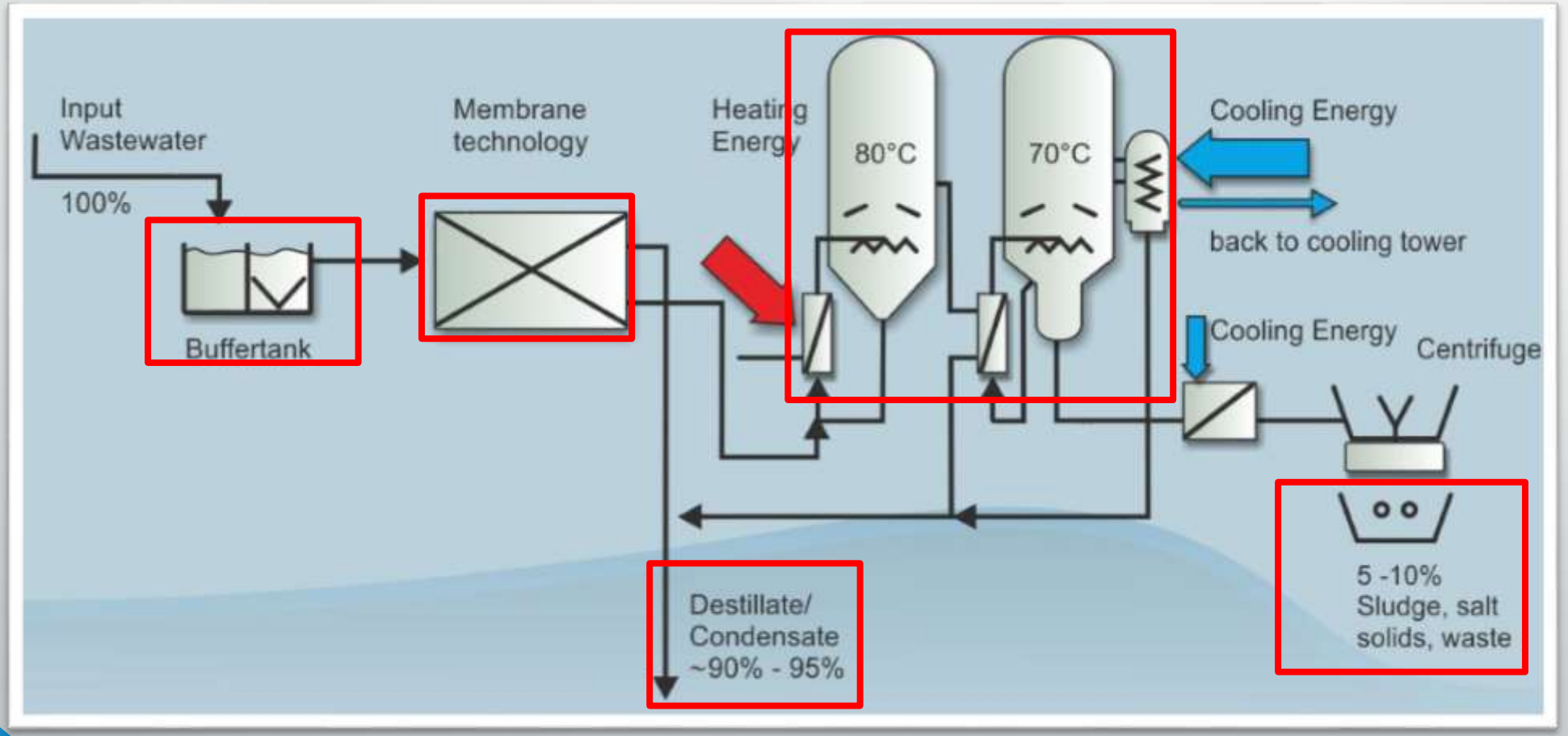
ZLD – Zero Liquid Discharge

- Zero-liquid discharge (ZLD) is a water treatment process in which all wastewater is purified and recycled

  Quality of input and output waters are ~ same

- ZLD treatment involves
  - Biological treatment, reverse osmosis, and crystallizers.
  - 99% water is recovered.
  - Solid waste and other salts are byproducts.

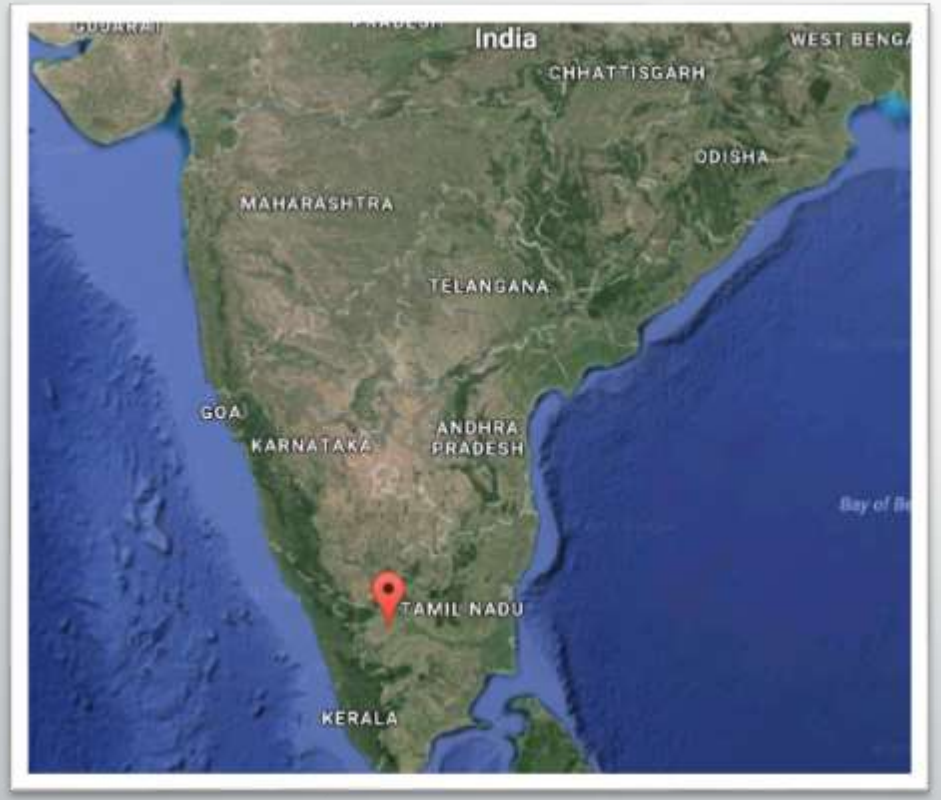
Process



Picture: Aquarion group

Background

Tirupur, a town in Southern India implemented ZLD policy in 2011.



Picture: Google maps

- Home to India's 90% of cotton knitwear industry - $5.6 billion in exports (Zee news)
- Textile industries employ around 500,000 people (Zee news)
- Over 7000 knitting, dyeing, bleaching units
- 728 dyeing and bleaching units discharge more than 95 million liters of water per day (Furn 2004)

Health impacts and Water Quality

- Skin diseases, cancer, respiratory problems, and infertility
- Infertility has also been reported on farm animals – cows and buffaloes (Dailymail.co.uk. July 22, 2012)
- Low yields of milk from livestock
- 2500+ total dissoluble solids (TDS). Drinking water should not exceed 500 TDS and irrigation water should not exceed 1500. (Marimuthu et al., 2015)

Court Ruling

- Controversy over ZLD began in 1998
  - Noyyal Canal Agriculturists Association filed a writ petition to the Madras High Court (1998)
  - The Madras High Court Zero and Tamil Nadu Pollution Control Board, instructed the bleaching and dyeing units in Tirupur to implement effluent treatment plans to meet the Zero Liquid Discharge (ZLD) norms in 2006.
  - Multiple appeals on the court ruling
- Finally, January 28th of 2011, the courts took definitive action and enforced closing all textiles who did not meet the ZLD standard

Picture: India.com

Aftermath of ZLD

- Fleeing the policy
  - Relocation to surrounding states in India that do not have ZLD standards enforced.
  - Bengaluru
    - Illegal dyeing units on the rise along Arkavati River (Rao 2017)

Picture: The Economic Times

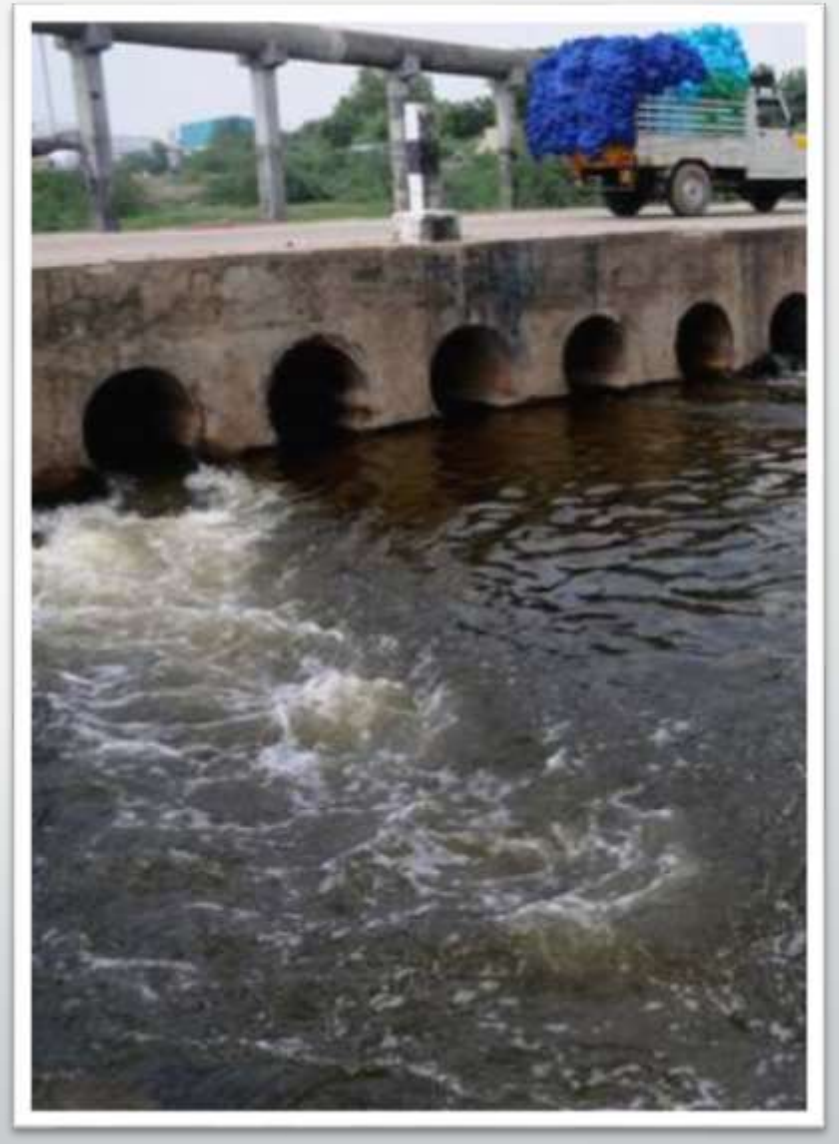
Aftermath of ZLD

- Navigating zoning regulations
  - Flee enforcement of ZLD in industrial zones
  - Development of bleaching and dyeing units in residential zones

Picture: Newsweek

Aftermath of ZLD

- Shutting down
  - Many textiles closed permanently or temporarily to avoid the costs of a ZLD system
    - Impact on the economy
    - Political backlash



Picture: The Hindu

How clear does the Noyyal flow?

- Human industrial activities deteriorated water quality and required treatment before using it for agriculture (Mohan and Vanalakshmi 2012).
- In 2015 water is still unsuitable for agricultural purposes due to high levels of Chloride, Calcium, Magnesium, Sodium, Potassium and Sulfate (Lakshmi, C., Santhi, T).
  - Data supports that the industrial pollution has begun to impact soil, ground water, the ecosystem, and land resources of the Noyyal River basin.

Picture: Newsweek

How clear does the Noyyal flow?

- Why?
  - Moving or shifting
  - Adding clean water to polluted sources
    - Clean water resources require cleaning the source not just the water discharged

Picture: The Hindu

Recommended policy changes

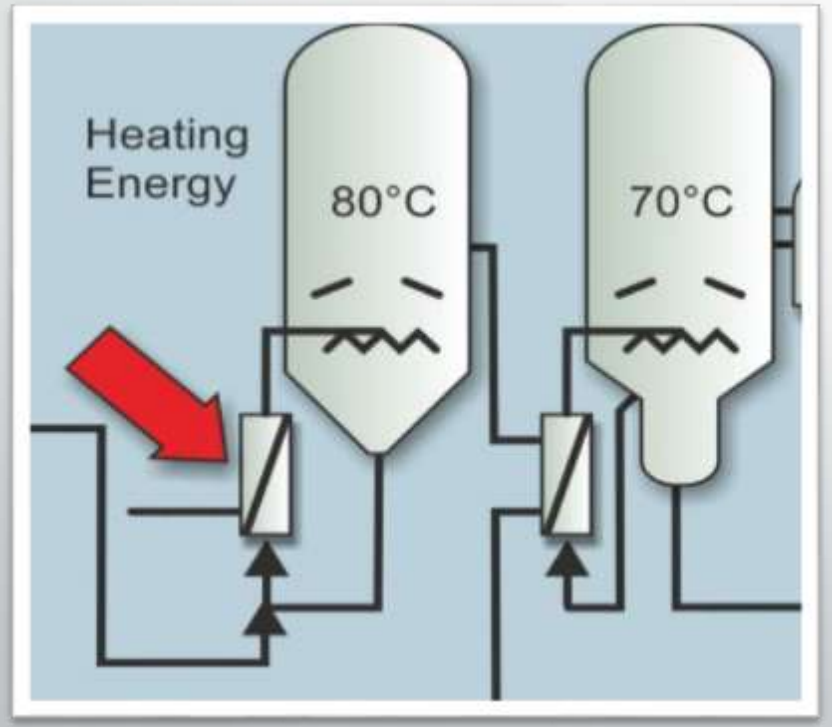
- R&D for effluent treatment is needed
- Promote common instead of individual treatment plants
  - Better monitoring by regulatory agencies and financial viability, and lower operating cost
- State pollution control board (PCB) must provide technical support
- PCB must partner with the operators of treatment plants
  - Ensure proper operation and accurate data reporting
- Uniform ZLD operating standards should be set – salts vs sludge
- Explore alternatives to ZLD

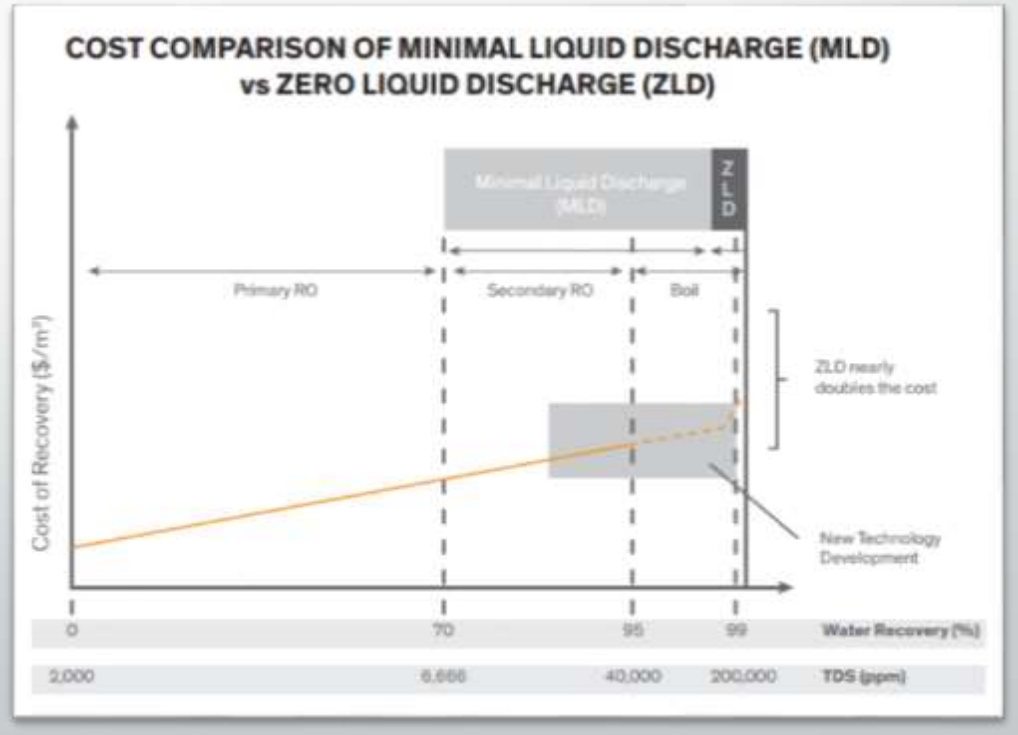
Sludge vs salt

Picture: Sajid Hussain

MLD – Minimal liquid discharge

- ZLD can be expensive and not necessarily environmentally friendly
  - Energy and other resources are required to remove the pollutants
  - Fuelwood is used, which generates its own pollutants (Hussain 2012)
- MLD uses ultrafiltration, reverse osmosis, nano-filtration, and ion exchange





Picture: Dow Chemicals

Conclusion

- Zero Liquid Discharge Policy is an attempt to address water pollution in India, with the goal of reducing water stress.
- Based on the policy evasion, energy consumption, solid waste production ZLD policy does not remain the most viable avenue for water management.

Questions?

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