

We provide institutions or households with water independence and reduced carbon intensive infrastructure, while promoting community engagement, wellbeing and environmental responsibility.

**WATER = LIFE**

“The Martian”

# Net Zero Water

## Pitch Group 7

David Komet

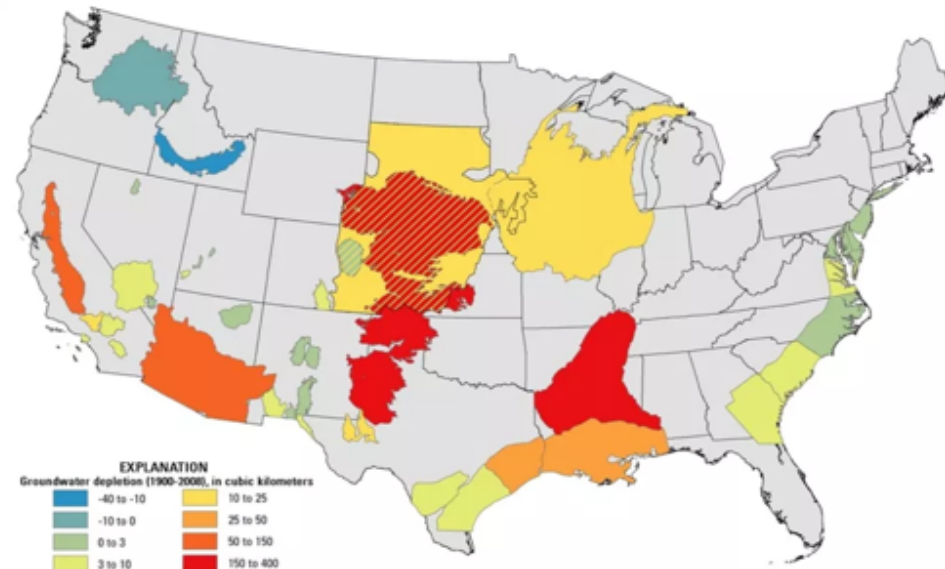
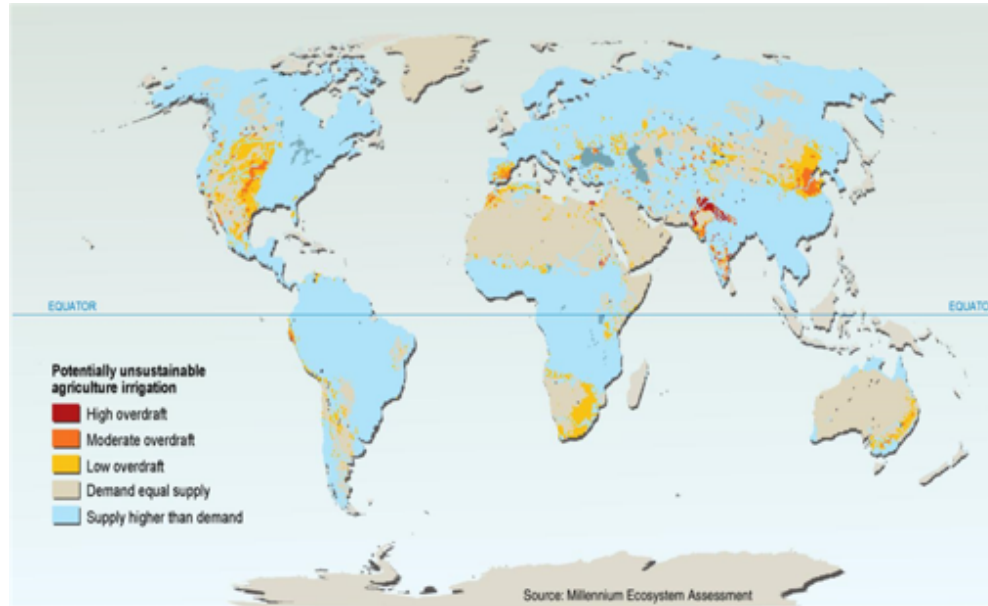
Simon Nummy

ENVR E-119D Zero Energy in the Built Space  
Harvard Extension School  
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## Water Stress

5 - 25% of global freshwater use exceeds long-term accessible supplies.

15 - 35% of irrigation withdrawals exceed supply rates and are therefore unsustainable.



Source: United States Geological Survey,  
<https://water.usgs.gov/edu/gwdepletion.html>

## Net Zero Water Overview

In a time of increasing freshwater scarcity, Net Zero Water (NZW) is the Uberfication of potable water.

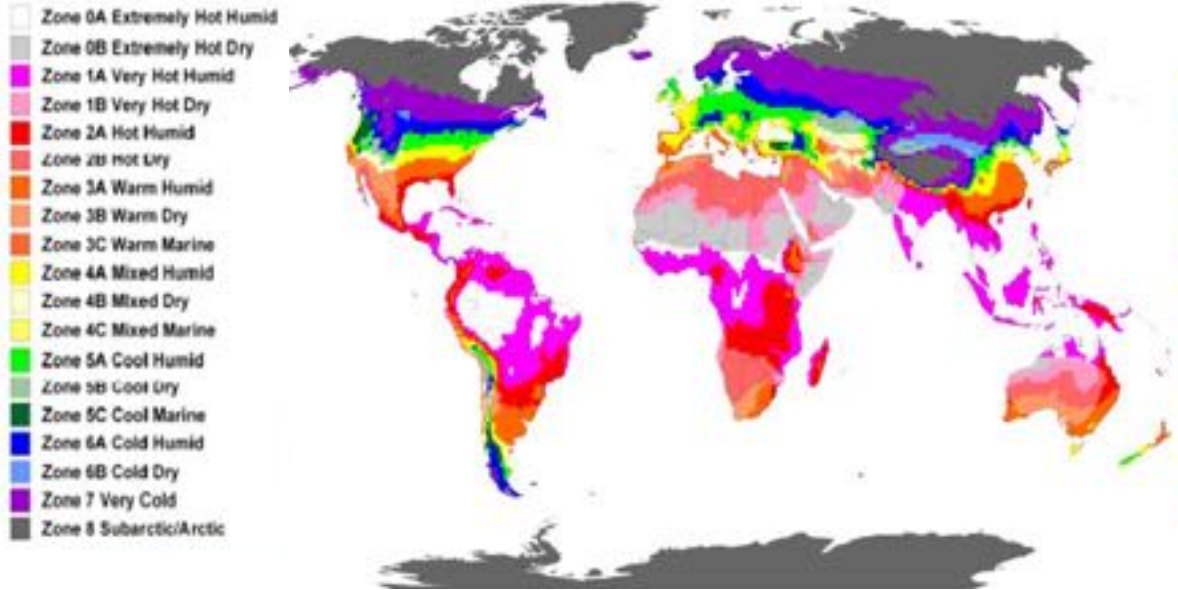
We aim to associate distributed water with distributed energy.

The overriding premise is that zero carbon energy is prioritised for the production of potable water.

We are proposing a system that is scalable, promotes conscious consumer behaviour, promotes health and wellbeing, and reports on the unseen carbon cost of water.

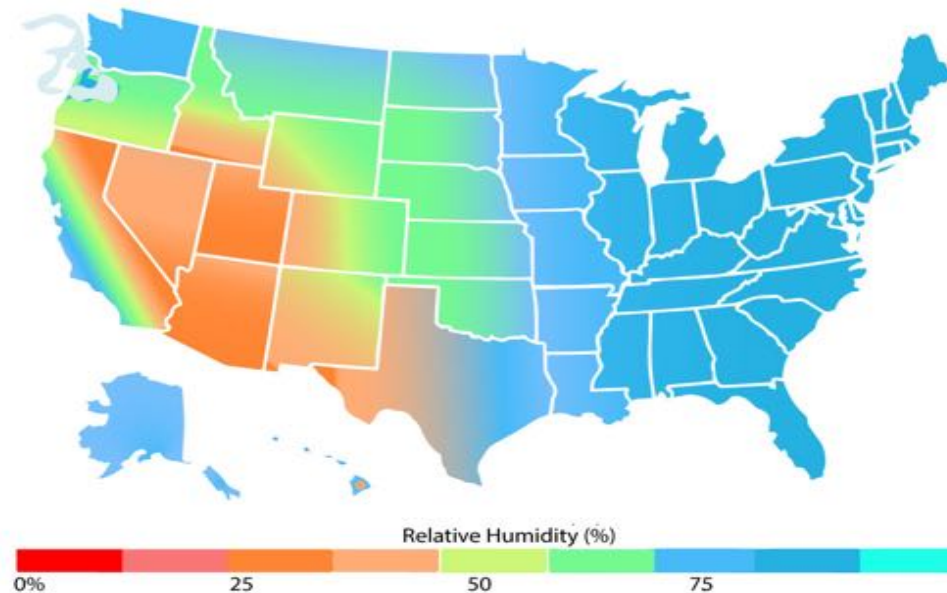
## Global ASHRAE Climate Zones

NZW system viable in all humid zones



## US Annual Average Humidity

NZW system viable in all situations where humidity > RH25%



# Net Zero Water The Market

- NZW is a socio-ecological exploration of the unseen costs of the energy/ water nexus
- Through the exploration of business-as-usual approaches to potable water, we have developed a system that exploits current inefficient and polluting practices, to bring sustainable, cost effective, on-site water production to water stressed communities.
- The NZW system proposed is an integration of existing proven technologies that will be viable in all ASHRAE Humid Zones and situations where average annual Relative Humidity is above 25% (optimal > 45%)

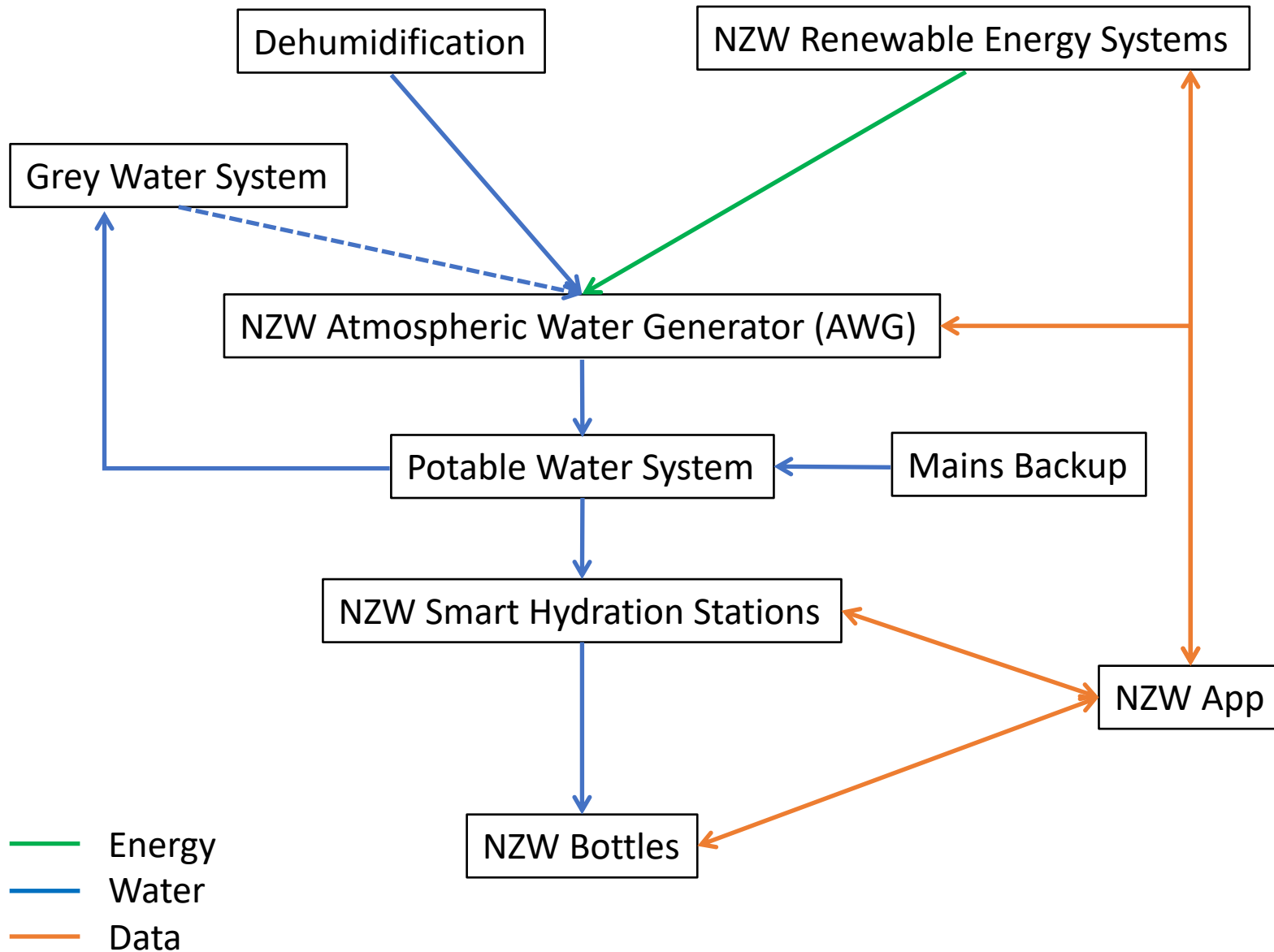


# Net Zero Water

## The Market

- NZW is a socio-ecological exploration of the unseen costs of the energy/ water nexus. The system brings the following benefits:
- Cost effective way of generating water
- Clean water in humid climates
- Clean water in places with constant shortage
- Clean water when disaster strikes
- Best water quality
- Target clients: Individuals, communities, organizations with stated environmental commitments and policies.

# Net Zero Water System Overview



- **NZW Atmospheric Water Generator (AWG)** - either large scale, remote or distributed smaller units.
- **NZW Renewable energy system** - photovoltaic, wind systems - operated and maintained by NZW (ongoing contract, lease agreement)
- **NZW Smart Hydration Stations** - data capture, reverse vending and value add opportunities such as personalized dosing and water cooler display.
- **NZW High quality, smart, reusable water bottles** - RFID or QCode enabled - marketing potential, CSR reporting, promote health and environmentally conscious behaviour.
- **NZW app** - links to popular health tracking apps - tracks hydration etc and also carbon implications - valuable data capture.



## NZW: AWG Systems

### Small - 50 Ltr/day

- TDS & VOC Monitor
- RO Filter
- Ambient Water
- Total Power: 900W
- Water-making Power: 800W
- Refrigerant: R410a
- Water Tank Volume: 19L
- Net Weight: 49kgs
- Dimension: 400\*473\*920mm
- PRICE: \$ 1600

#### Application:

- Small Domestic
- Small Office
- Temporary Installations e.g. construction sites

### Medium - 500 Ltr/day

- Operating conditions: 15–38 C
- Compressor Power: 11KW
- Refrigerant: R407c
- Net Weight: 560kg
- Filtration: 13 Stage
- Operating Humidity: >45%
- Fan Power: 400W
- Tank Volume: 240 ltr
- Dimensions: 235x85x145cm
- Battery bank
- PRICE: \$ 19 470

#### Application:

- Apartments
- Medium Office
- Municipal
- Education
- Disaster Relief

### Large - 5000 Ltr/day

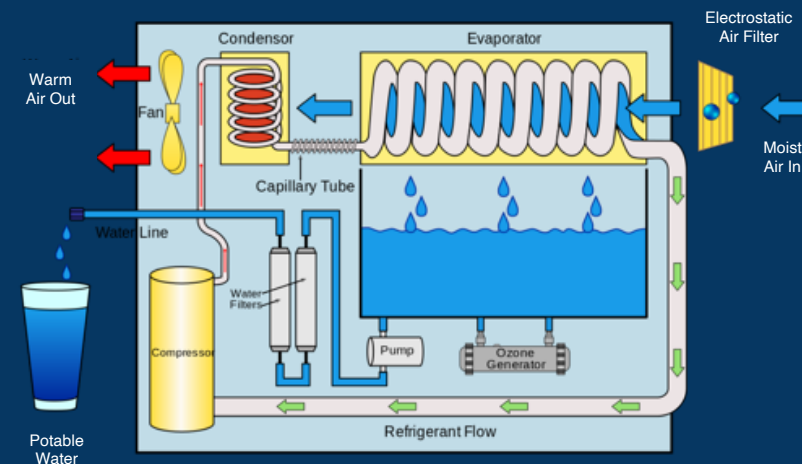
- Operating conditions: 15–38 C
- Compressor Power: 94.6KW
- Refrigerant: R407c
- Net Weight: 3,200kg
- Filtration: 9 Stage
- Operating Humidity: >45%
- Fan Power: 22kW
- Tank Volume: 1,800 ltr
- Dimensions: 530x220x220cm
- Battery bank
- PRICE: \$ 167 885

#### Application:

- High rise
- Large scale Commercial
- Transportation
- Entertainment
- Industrial
- Agricultural e.g. commercial greenhouse

# Net Zero Water Atmospheric Water Generator (AWG)

- Require >25% humidity conditions
- Either large scale remote or distributed smaller units.



<https://www.fivesenses-awg.com/>  
<https://h2omachine.com/>  
<http://www.genaq.com/water/>  
<https://ibispower.eu/>



# Net Zero Water NZW Renewable Energy System

## NZW: Photovoltaic Implications

- Photovoltaic, wind, biogas, fog harvesting systems - operated and maintained by NZW (ongoing contract, lease agreement)
- Energy system will be determined by site location and the most appropriate technology for that situation. PV system implications are illustrated here.
- NZW: Community Solar participation which may benefit clients with limited space for renewables.

### Small - 50 Ltr/day

- Total Power: 900W
- Assuming 50% compressor cycling:

$$0.9\text{kW} \times 12\text{hours} = 10.8\text{kWhrs/day}$$

$$10.8 \times 365 = 3,942\text{kWhrs/year}$$

Array size estimate: 14m<sup>2</sup>\*

Array cost estimate: USD 7,560\*\*

CO<sub>2</sub>e (US Ton) / year: 1.8

Net Zero Water produced:

$$50\text{l} \times 365 = 18,250\text{l} / \text{year}$$

$$= 4,821 \text{ gallons/year}$$

### Medium - 500 Ltr/day

- Total Power: 11kW
- Assuming 50% compressor cycling:

$$11\text{kW} \times 12\text{hours} = 132\text{kWhrs/day}$$

$$132 \times 365 = 48,180\text{kWhrs/year}$$

Array size estimate: 169m<sup>2</sup>\*

Array cost estimate: USD 61,854\*\*

CO<sub>2</sub>e (US Ton) / year: 22

Net Zero Water produced:

$$500\text{l} \times 365 = 182,500\text{l} / \text{year}$$

$$= 48,210 \text{ gallons/year}$$

### Large - 5000 Ltr/day

- Total Power: 117kW
- Assuming 50% compressor cycling:

$$117\text{kW} \times 12\text{hours} = 132\text{kWhrs/day}$$

$$132 \times 365 = 512,460\text{kWhrs/year}$$

Array size estimate: 1,798m<sup>2</sup>\*

Array cost estimate: USD 658,068

CO<sub>2</sub>e (US Ton) / year: 235

Net Zero Water produced:

$$1500\text{l} \times 365 = 1,825,000\text{l} / \text{year}$$

$$= 144,634 \text{ gallons/year}$$

\*PV System sizing based on Dubai, UAE data.

\*\*Q1 2018 PV cost benchmarks:  
<https://www.nrel.gov/docs/fy19osti/72399.pdf>



# Net Zero Water

- **NZW Smart Hydration Stations**

## NZW: Smart Hydration

### NZW Smart Stations

- Data capture
- Reverse vending
- Value add opportunities
  - personalized dosing
  - water cooler display
  - targeted information

### NZW Smart Bottles

- RFID or QCode enabled
- Bio-plastic or recycled aluminium
- Marketing potential
- CSR reporting, promote health and environmentally conscious behaviour

### NZW App

- Links to popular health tracking apps - tracks hydration etc and also carbon implications
- Valuable data capture.
- NZW Renewable energy production tracking
- Servicing and performance monitoring

- **NZW Bottles**

- **NZW App**

The NZW System opens up a wide variety of value-add opportunities that potentially generate revenue, promote health and reduce ecological footprints.





1 in 9 people don't have access to clean water\*

Millennial demand for clean tech

Utility mistrust

## NZW: Overview

Small - 50 Ltr/day	Medium - 500 Ltr/day	Large - 5000 Ltr/day
<p>BaU Bottle water estimate @ USD 0.99/gallon: = USD 4,773/ year</p> <ul style="list-style-type: none"> <li>• Array size : 3,942 kWhrs/year</li> <li>• Array cost : USD 7,560</li> <li>• AWG cost : USD 1,600</li> </ul> <p><b>System payback using BaU: = 1.9 years</b></p> <p>CO2e offset: 1.8 Ton/ year</p> <p>Net Zero Water produced (excl. NZW lease fees): 4,821 gallons/year @ <b>USD 0.09/ gallon</b></p>	<p>BaU Bottle water estimate @ USD0.99/gallon: = USD 47,730/ year</p> <p>Array size : 48,180 kWhrs/year Array cost : USD 61,854 AWG cost : USD 19,470</p> <p><b>System payback using BaU: = 1.7 years</b></p> <p>CO2e offset: 22 Ton/ year</p> <p>Net Zero Water produced (excl. NZW lease fees): 48,210 gallons/year @ <b>USD 0.12/ gallon</b></p>	<p>BaU Bottle water estimate @ USD0.99/gallon: = USD 477,292</p> <p>Array size : 512,460 kWhrs/year Array cost estimate: USD 658,068 AWG cost : USD 167,885</p> <p><b>System payback using BaU: = 1.7 years</b></p> <p>CO2e offset: 235/ year</p> <p>Net Zero Water produced (excl. NZW lease fees): 144,634 gallons/year <b>USD 0.42/ gallon</b></p>

# Net Zero Water

## Why NZW?

We provide institutions, communities or households with water independence and reduced carbon intensive infrastructure, while promoting community engagement, wellbeing and environmental responsibility.

We look forward to working with you.

\*<https://www.wateraid.org/us/facts-and-statistics>

\*\*[https://www.eia.gov/electricity/monthly/epm\\_table\\_grapher.php?t=epmt\\_5\\_6\\_a](https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a)



## Net Zero Water



**This is not  
science fiction**

**WATER = LIFE**

Sundrop Farm, Australia