Mining for Water

Water is critical for supporting life anywhere. Our water usage can be broken into two categories:

1. Daily Consumption
2. Daily Hygiene

Daily consumption

According to NASA, an average person needs the following amount of water for daily consumption:

	Consumption Need	Quantity (Kg)
1	Drinking	2.7
2	Water in Food	5.5
3	Food preparation	4.1
	Total	3.5

There are differences in daily water requirement for males vs females, but assuming a 50% split, an average person would require a total of 3.5 Kg water per day. For a 500-person colony, the daily water requirement for consumption would be: 1,765 Kg /day or roughly 1,800 Kg/day.

Daily Hygiene

Humans also need water for daily hygiene. For example, the following table shows the daily hygiene requirements according to the same NASA whitepaper

	Hygiene Need	Quantity (Kg)
1	Shower	2.7
2	Dishwash	5.5
3	Handwash	4.1
4	Urine Flush	0.5
5	Clothes wash	12.5
	Total	25.3

The daily hygiene water requirements are 25 Kg per person/day and for a 500-person colony, 12,650 Kg of water would be required per day.

This is a lot of water. We can't ship it all from Earth as it will be too expensive. While cost to ship to Low Earth Orbit is around $10,000/Kg, shipping to the Moon is a lot more expensive, potentially > $100,000 / Kg. We need to find water on the Moon.

Permanently Shadowed Regions

Permanently Shadowed Regions (PSRs) are regions near the South and the North pole of the moon that never receive direct sunlight. These are some of the coldest places in the solar system with temperatures in the range of 25K to 70K. NASA's Lunar Reconnaissance Orbiter (LRO) and India's Chandrayaan mission both have detected water on the Moon in these PSRs, e.g the Shackleton Crater near the South Pole.

In order for humans to establish a permanent base on the Moon, we need to mine the PSRs for water.