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Guadalajara, Mexico



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SECRETARÍA DE
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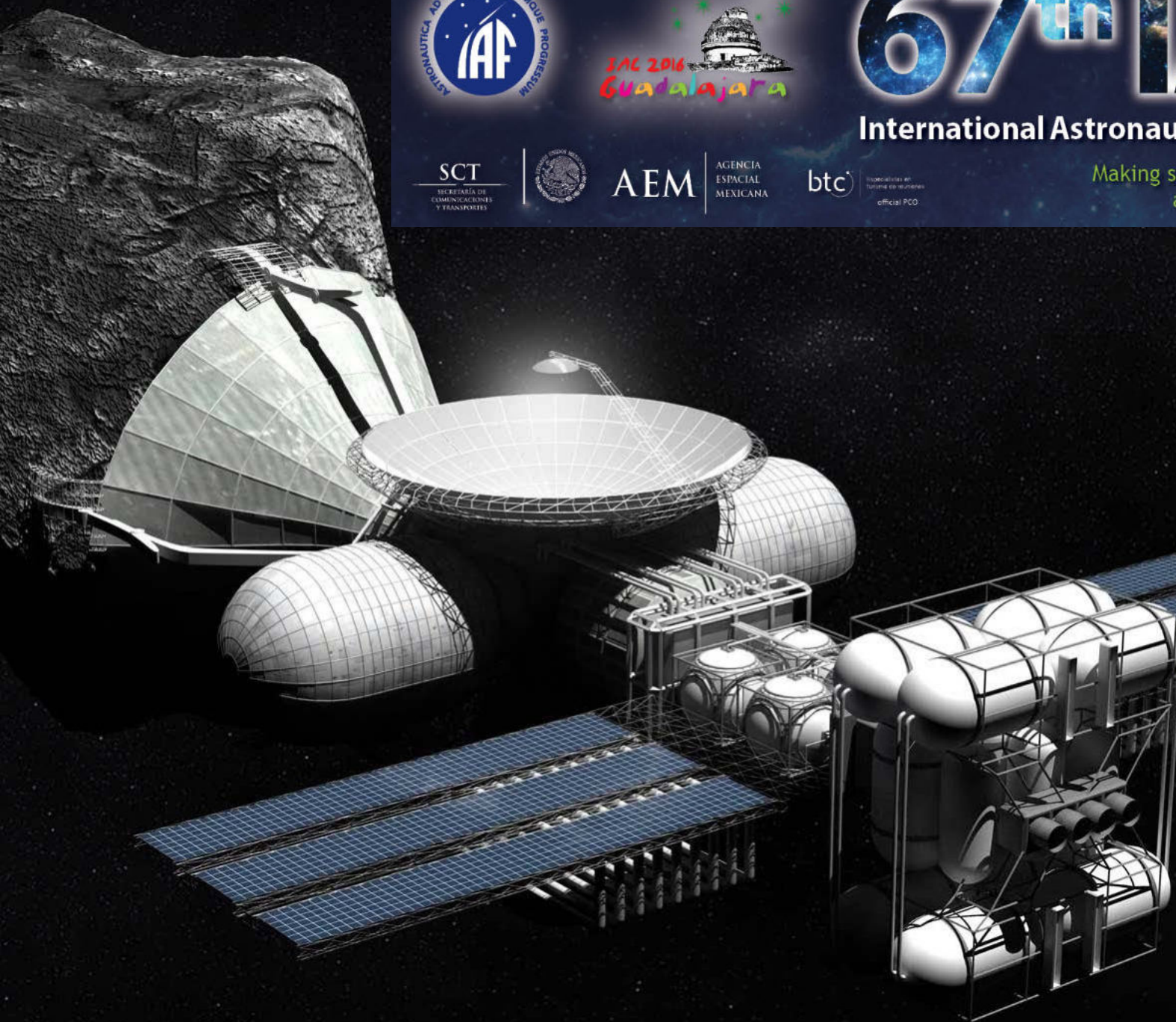
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Making space accessible and
affordable to all countries



ASTEROID MINING & ITS LEGAL IMPLICATIONS

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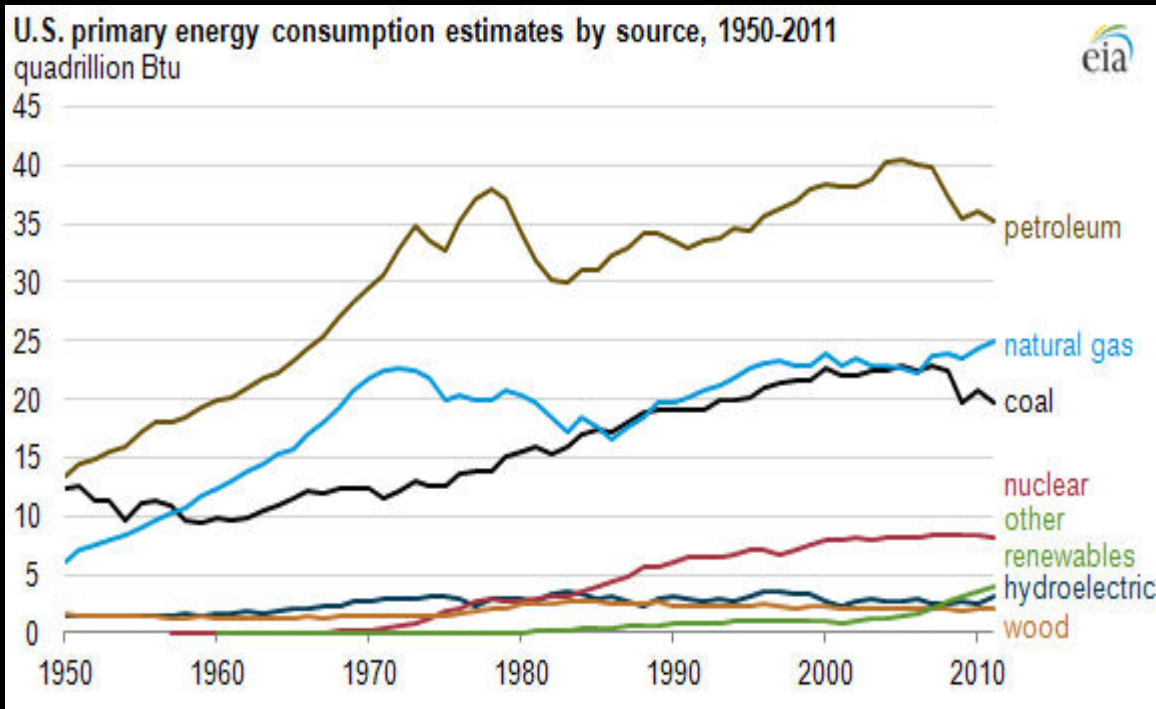
REASONS TO MINE ASTEROIDS

With the rapid progress made in technology, humans are taking huge steps in space today. There is huge potential in space, and particularly in asteroid mining.

ENERGY CRISIS

- Non-renewable fossil fuels like coal, oil currently account for 81% of the world's primary energy.
- EARLIER, renewable energy could not compete with non-renewable sources because it relied on metals in short supply. Resources found on asteroids would solve this problem completely.

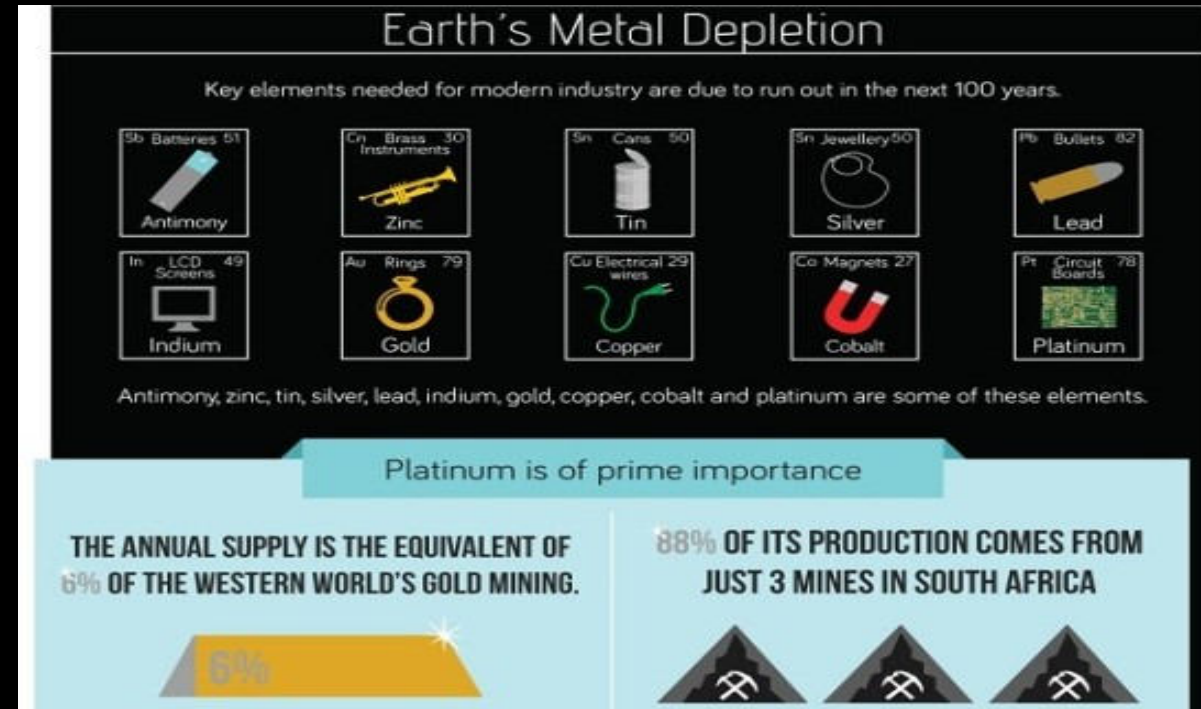
Image Credit-The U.S. Energy Information Administration



RARE EARTH METALS

- Many of the metals widely used in almost all industrial products were always limited and are now in SHORT SUPPLY leading to skyrocketing manufacturing costs.
- These include **Platinum Group Metals (PMGS)** and others like gold, cobalt, iron, molybdenum etc.

Image Credit- FuelSpace.org- 'How Asteroids Can Save Mankind'



PROJECTED SCARCITY OF RESOURCES ON EARTH



Resources

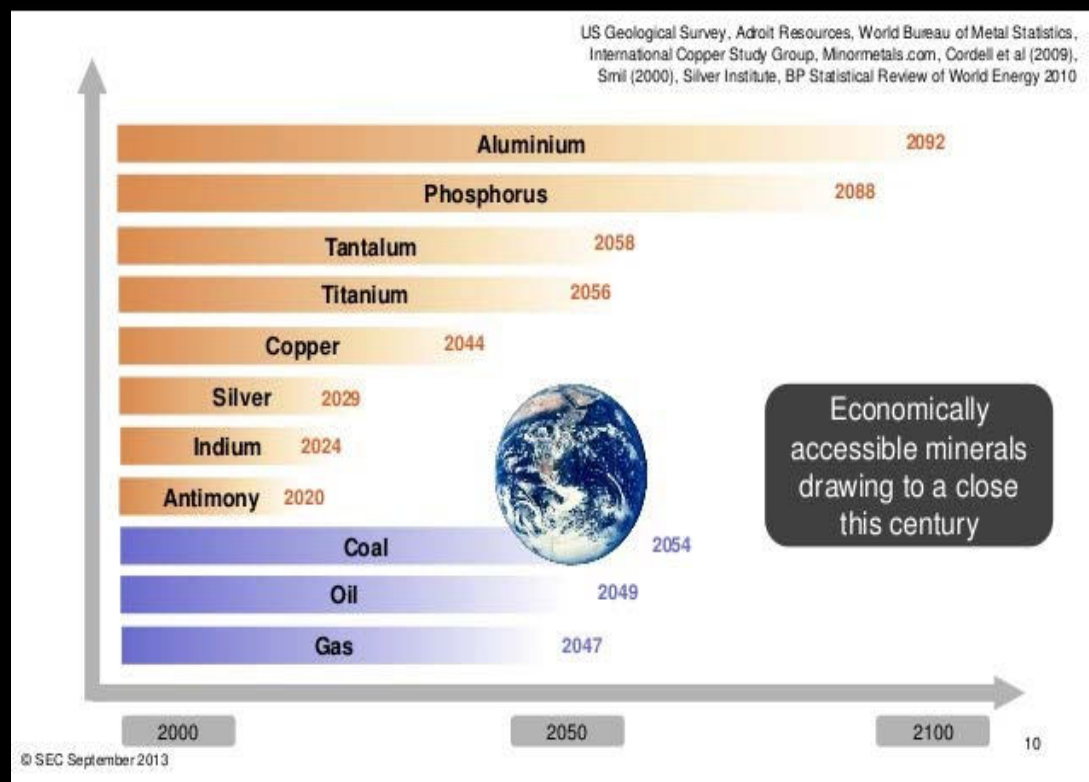


Image Credit-Shackleton Energy Company

Pre-recession (2000-2008) Global NNR Scarcity Summary

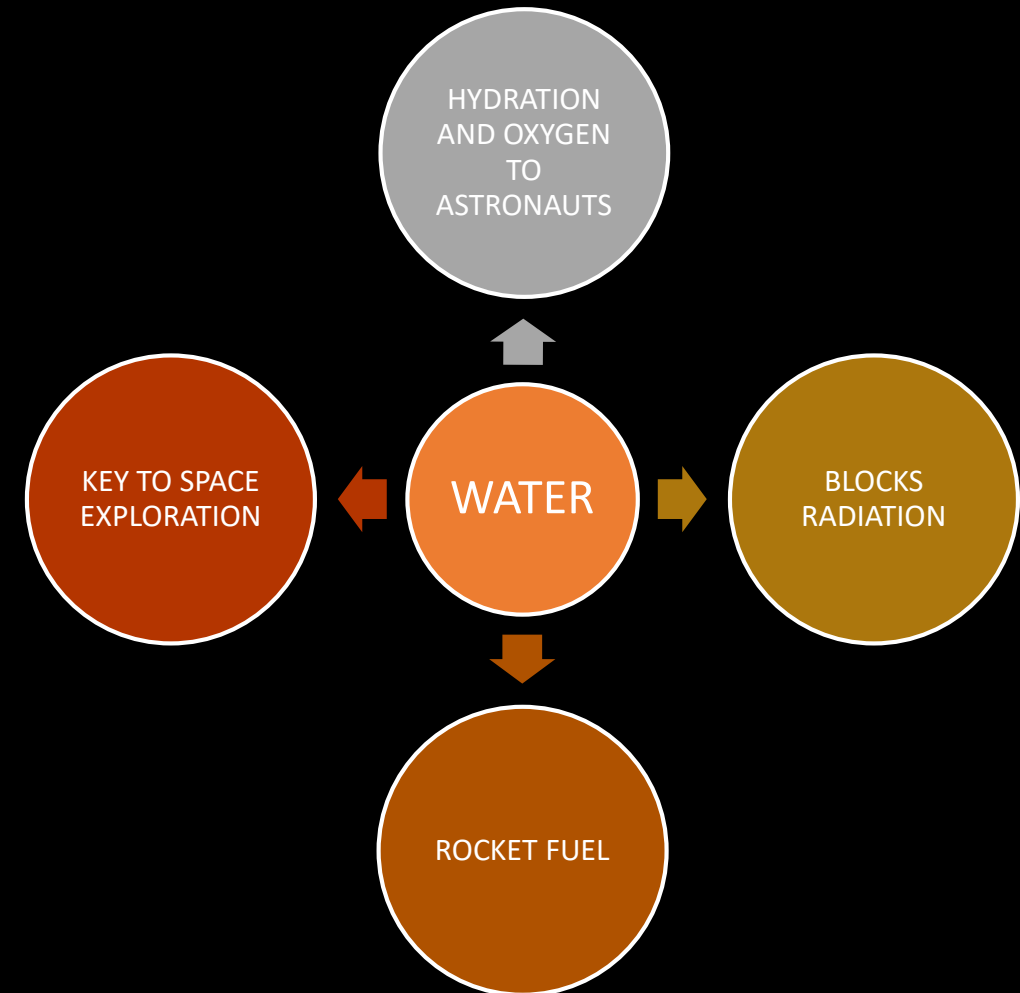
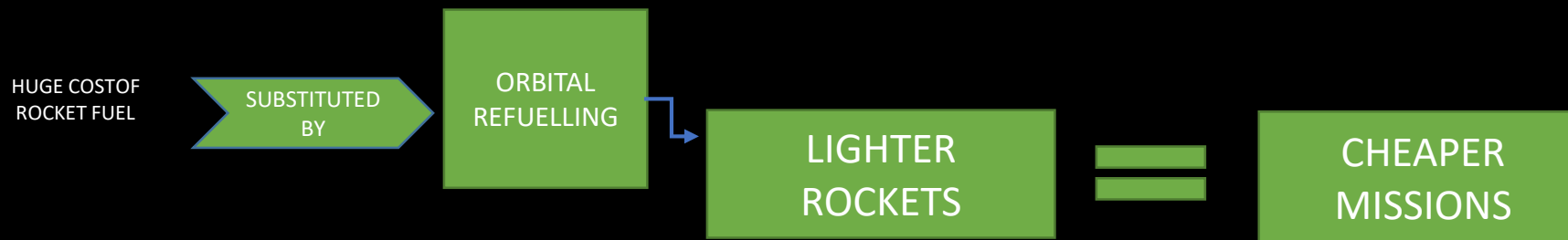
Extremely Scarce (6)	Very Scarce (21)	Moderately Scarce (22)	Marginally Scarce (1)	Not Scarce (7)
Bromine	Aluminum	Antimony	PGM	Arsenic
Gold	Bauxite	Beryllium		Barite
Mercury	Cadmium	Bismuth		Boron
Tantalum	Cement	Coal		Diamond
Tellurium	Chromium	Cobalt		Garnet
Thallium	Copper	Gallium		Lithium
	Fluorspar	Germanium		Niobium
	Magnesium Compounds	Graphite		
	Molybdenum	Gypsum		
	Natural Gas	Indium		
	Nickel	Iron Ore		
	Nitrogen (Ammonia)	Lead		
	Oil	Lime		
	Phosphate Rock	Manganese		
	Potash	Salt		
	REM	Silicon		
	Rhenium	Silver		
	Selenium	Soda Ash		
	Strontium	Tin		
	Sulfur	Vanadium		
	Tungsten	Zinc		
		Zirconium		

Image Credit- Chris Clugston's 'An Oil Drum- An Analysis' (2010)

THE NEED FOR WATER

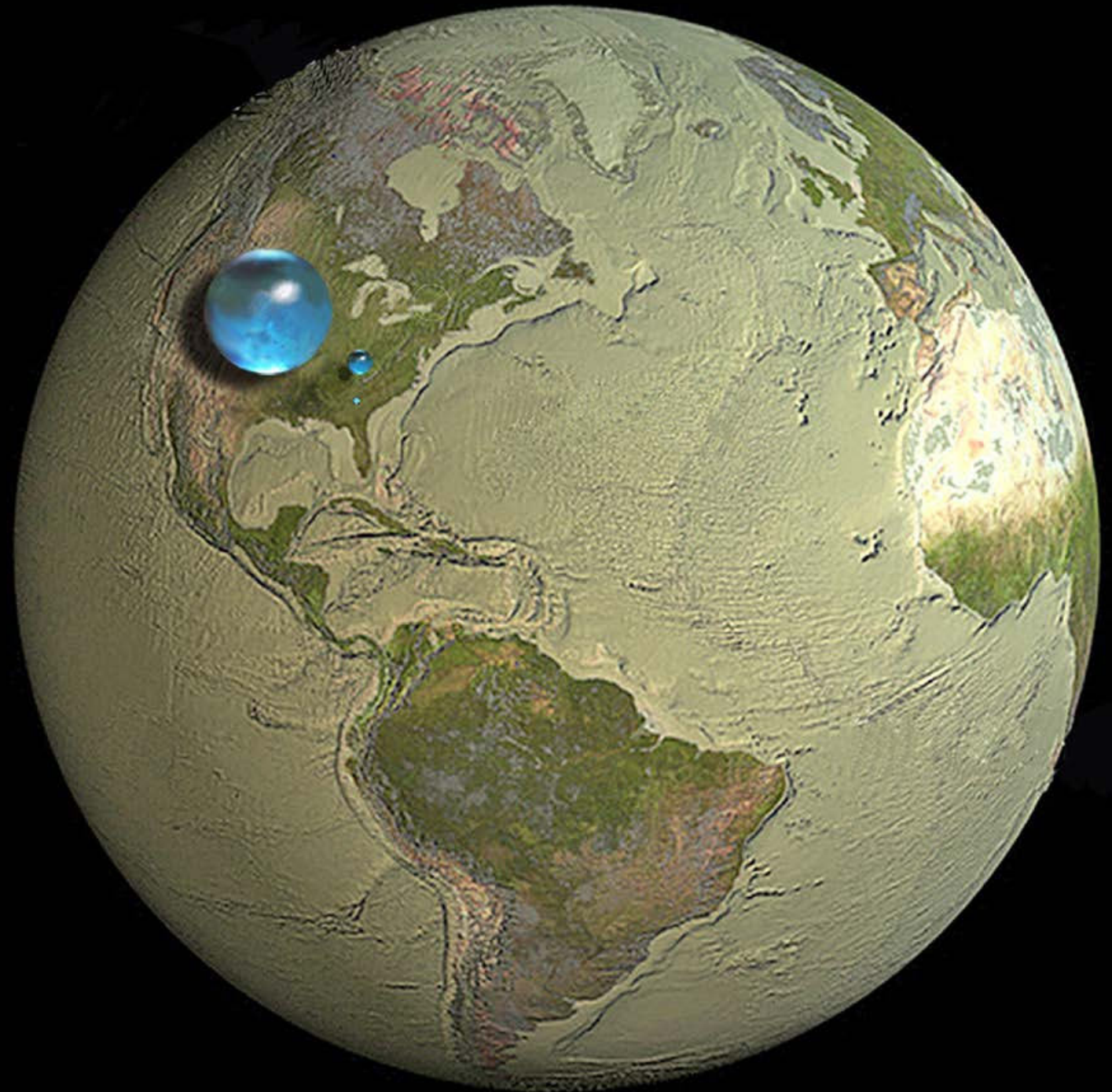
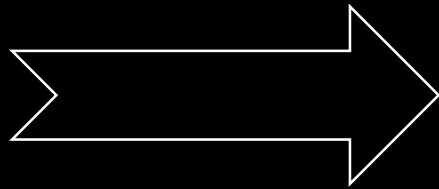
1. **SUPPORT SYSTEM FOR ASTRONAUTS**- Since the main constituents of water are hydrogen and oxygen, it is a source of oxygen for life support.
2. **PROTECTION FROM RADIATION**- Water absorbs and blocks infrared radiation, which means that by storing heat it helps to maintain temperature.
3. **ROCKET FUEL**- Rocket propellant is hydrogen and oxygen based, with a large percentage of the weight of a spacecraft taken up by fuel.
4. **SPACE EXPLORATION- A GAS STATION IN SPACE**
 - Today billions of dollars are spent in rocket fuel to sustain space explorations.
 - IF, water is taken from asteroids and broken down into fuel, rockets will become lighter and missions cheaper.
 - Asteroids will serve as **ORBITAL REFUELLING DEPOTS** which will allow us to make journeys that have always been out of our reach.

THE RELATIONSHIP SUMMARISED:



Earth vs. Space- Accessible Water

- The Volume of the Earth's accessible water compared to the volume of the world



Water as the future of Space Exploration

Source: Planetary Resources, "The Trillion Dollar Market, Fuel in Space from Asteroids".





ON-SITE: a robot prospector drills out precious materials to be launched back to Earth in capsules

HOW COULD IT BE DONE?

NASA and space advocates have studied various plans to extract space resources since the 1970s.

BAG IT: a proposed retrieval mission would enclose an asteroid up to 23 feet in diameter (7 meters) for transport to the moon's orbit

TOW TRUCK: an asteroid is hauled into Earth orbit by rocket power

CREDIT: TOP, NASA/AMES (DENISE WATT); MIDDLE: DSI (BRYAN VERSTEEG); BOTTOM, NASA/KECK (RICHARD STERNBACH)




HOW ASTEROID MINING CAN BE DONE

EXISTING INTERNATIONAL & DOMESTIC LEGISLATION

INTERNATIONAL:

1. *The Outer Space Treaty-1967*
2. *The Moon Treaty-1969*

NATIONAL/DOMESTIC LEGISLATION

1. *Russia- The Law of Russian Federation on Space Activities (1979)* 
2. *USA – Space Act 2015* 
3. *Luxembourg- Space Resources Law (Pending-2017)* 

Major Private Companies engaged in Asteroid Mining:

USD 1 Billion-
Cost of bringing
2oz of an
Asteroid, the
weight of a
tennis ball back
to earth



Planetary Resources



Deep Space Industries



Shackleton Energy Company



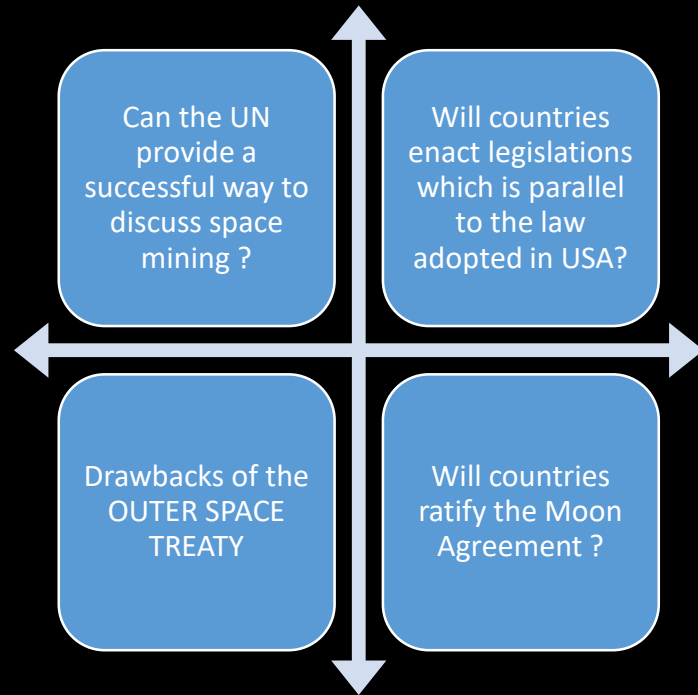
Moon Express



THE NEED FOR A NEW LEGAL REGIME

- The Outer Space Treaty (1967) lays down the principles that apply to all activities carried out in space.
- **Province of Mankind Principle**--Article 1 states that the exploration of celestial bodies shall be for the benefit of all countries.
- **Non-Appropriation Principle**- Article 2 states that celestial bodies shall not be subject to national appropriation by occupation or any other means.

QUESTIONS WE FACE TODAY



REASONS FOR ESTABLISHMENT FOR A NEW LEGAL FRAMEWORK

- **States No Longer Sole Participants In Space Activities**--Earlier, most space activities were undertaken by State governments. This is not the case anymore.
- **Regulation Of Private Parties** --With rapid technological progress and the entrance of private companies who wish to exploit the resources found on asteroids, there is a need to regulate their activities in an orderly manner to prevent conflict.
- **Regulation Of Joint Ventures** For establishment of the framework for joint ventures between Governments and private entities
- **Dispute Resolution**- For settlement of disputes between States and Private entities and between private entities inter se.

THE FOLLOWING QUESTIONS CAN ONLY BE ANSWERED THROUGH PLANNING AND REGULATION:

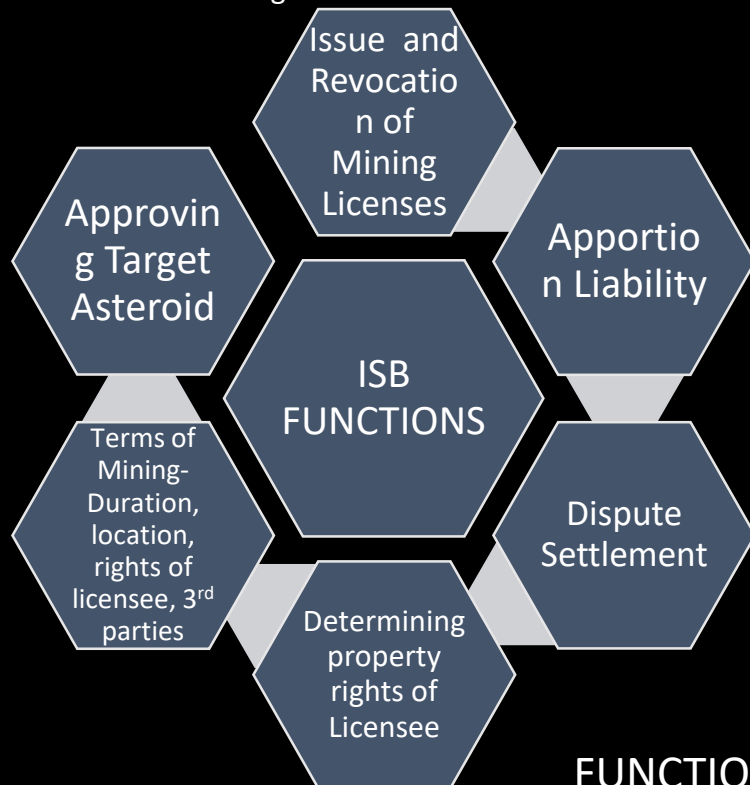
1. What will the **sale price of mined resources** be? What is the *extent to which profits will be permitted*?
2. The **effect of asteroid mining** on the respective State and world economy
3. The **aim of the Government** in engaging in asteroid mining--- For PROFIT or for STATE WELFARE?

THE INTERNATIONAL SPACE BODY ('ISB')

STEP 1- INTERNATIONAL COURT OF JUSTICE-- First, the ICJ must be asked to determine what legal framework, IF ANY, will apply to SPACE RESOURCE UTILIZATION

STEP 2- Proposal- Formation of a new international body, ('ISB') which will have a status of a specialized Agency under the United Nations. The ISB will consist of a Panel of Experts appointed by All Member States.

Objective- Formulation of rules by the Panel of Experts that apply to the entire range of Asteroid Mining activities.



FUNCTIONS OF THE ISB

PROCESS FOR GRANTING A TENDER FOR MINING

STEP 1- APPLICATION STAGE

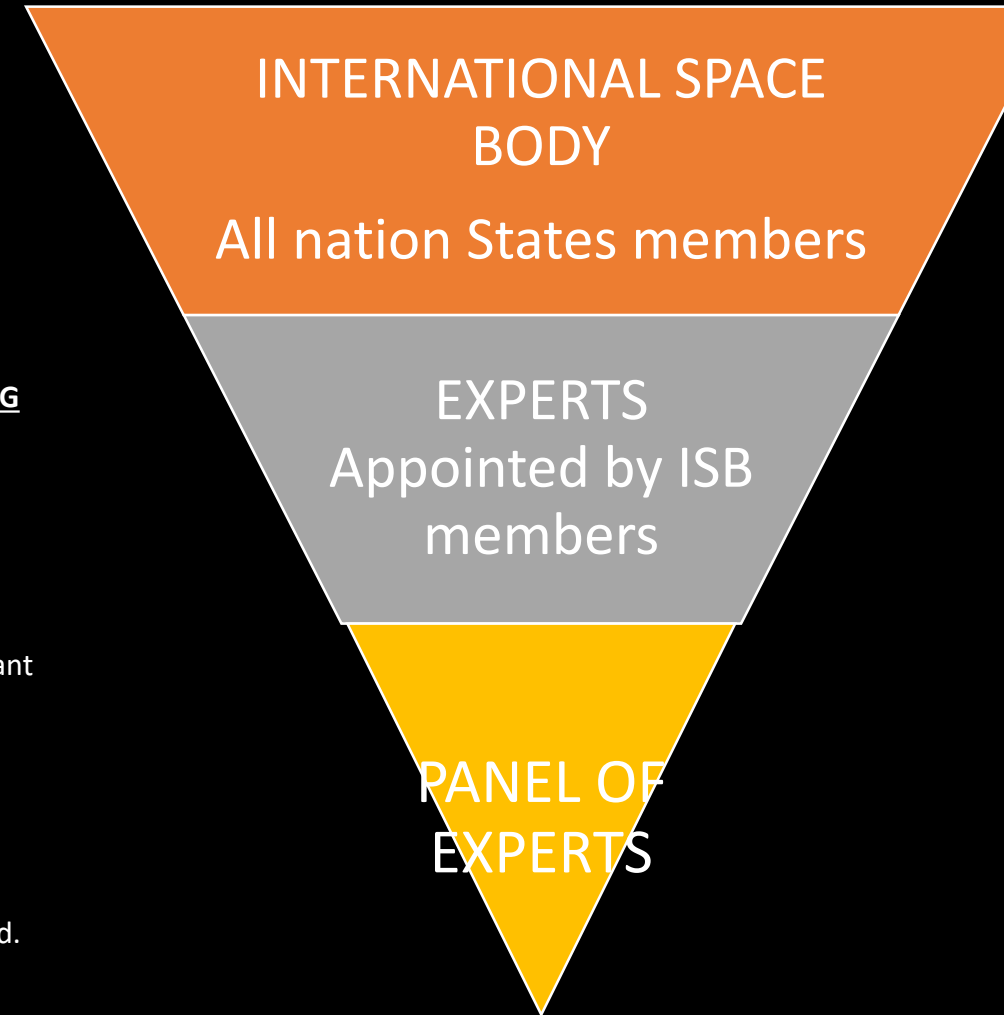
State Governments and Private Parties, either in partnership or separately apply via tenders

STEP 2- GRANT OF LICENSES

After due consideration, the Expert Panel will grant a mining license to the most capable enterprise

STEP 3- FACTORS TO BE CONSIDERED BY PANEL

The Expert Panel is duty-bound to consider the strength of the tender based on the applicant's mining plan, financial resources and track record.



STRUCTURE OF THE ISB

DISPUTE SETTLEMENT

STEP 1- Dispute Resolution by the ISB

Expert Panel that constitutes ISB decides disputes between parties.

The ISB DECISION IS BINDING.

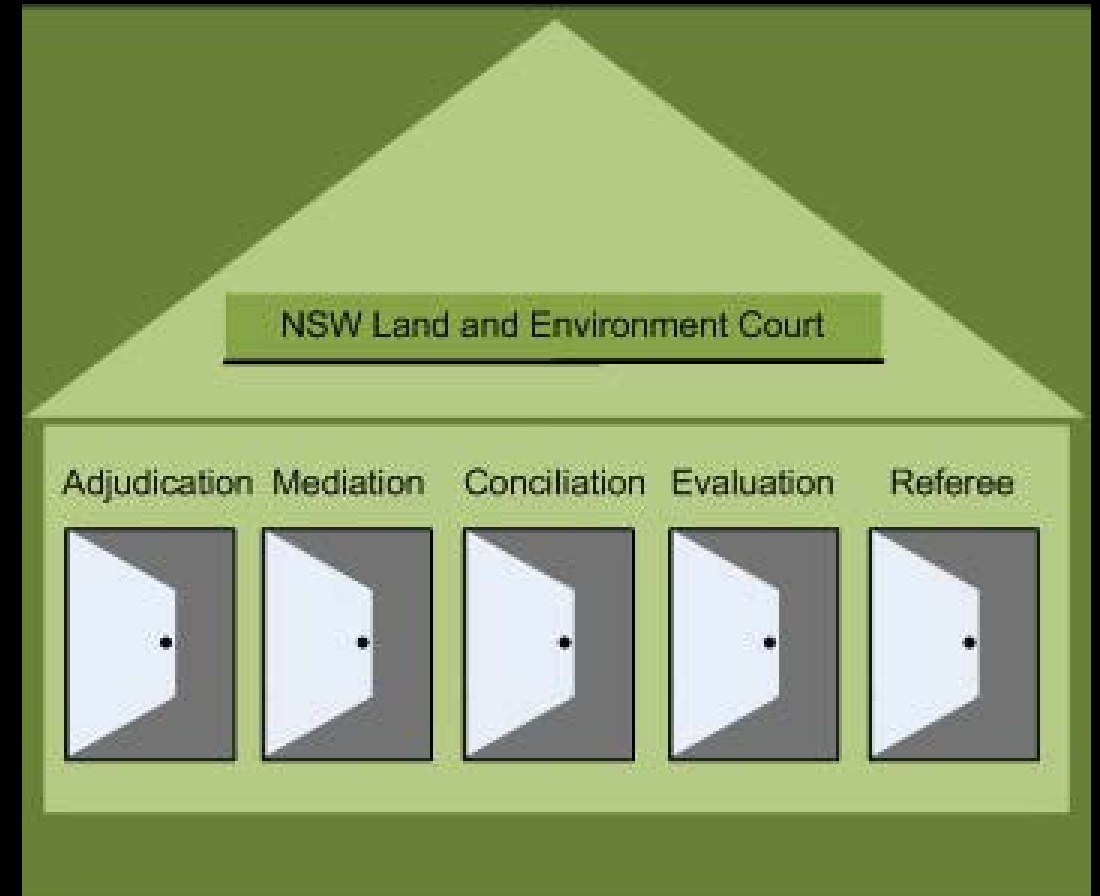
STEP 2- The Multi-Door Courthouse

However, in the interests of justice and fair play, an appeal to a duly authorized adjudicatory body will be permitted.

Departing from the traditional system, this appeal will lie to a MULTI-DOOR COURTHOUSE.

WHAT A MULTI DOOR COURTHOUSE IS:

- A courthouse where various dispute resolution options exist
- The dispute resolution options include mediation, arbitration, conciliation, case evaluation and finally adjudication
- Parties are referred to different dispute resolution options to select an option that suits them best.
- GOAL OF THE SYSTEM- Streamlining the dispute resolution process and resolving disputes beyond the standard option of litigation



An Illustration of a Working Multi-Door Courthouse