

## Article

# The Brahmavarta Initiative: A Roadmap for the First Self-Sustaining City-State on Mars: Supplementary Material

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This article provides the supplementary files for the article “The Brahmavarta Initiative: A Roadmap for the First Self-Sustaining City-State on Mars”.

## Supplementary Materials S1. Broadcasting

Table S1. Revenue generated from broadcasting

Broadcasting		
Revenue Generated	\$ 183,333,333.00	/Event
Number of Launch Events On Earth	6	/Year
Number of Sporting Events on Mars	156	/Year
Total Revenue Generated in the Pre-Initiative Phase	\$ 1,099,999,998.00	/Year
Total Revenue Generated in the Self-Sustaining Phase	\$ 29,699,999,946.00	/Year

## Supplementary Materials S2. Martian Soil

Table S2. Revenue generated from Mars Soil

Selling Martian Soil for Research			
1gram of Lunar dust =		200,000.00	\$
1 Kg of Lunar Dust =		200,000,000.00	\$
Cost for Transporting 1 kg =		200.00	\$
Organizations	Number of Kg each year	Cost	
ESA Gets 1KG	1	200,000,000.00	\$
NASA Gets 1KG	1	200,000,000.00	\$
JAXA Gets 1KG	1	200,000,000.00	\$
ISRO Gets 1KG	1	200,000,000.00	\$
ROSCOSMOS Gets 1KG	1	200,000,000.00	\$
SPACEX Gets 1KG	1	200,000,000.00	\$
CNSA Gets 1KG	1	200,000,000.00	\$
CSA Gets 1KG	1	200,000,000.00	\$
ASA Gets 1KG	1	200,000,000.00	\$
Misc Gets 5KG	5	1,000,000,000.00	\$
Universities Get 1KG	1	200,000,000.00	\$
Total Sold =	15	3,000,000,000.00	
Total Cost of Transporting =		3,000.00	
Total Revenue Generated =		2,999,997,000.00	\$



**Supplementary Materials S4. BEA Analysis**

Table S4. Break even analysis economic plan of the initiative

	Expenditure	Income	Balance	Settlement profits	Settlement balance
2025	0		0	0	0
2026	800000000		9920000000	-800000000	-800000000
2027	800000000		9840000000	-800000000	-1600000000
2028	800000000		9760000000	-800000000	-2400000000
2029	800000000		9680000000	-800000000	-3200000000
2030	800000000		9600000000	-800000000	-4000000000
2031	800000000		9520000000	-800000000	-4800000000
2032	800000000		9440000000	-800000000	-5600000000
2033	800000000		9360000000	-800000000	-6400000000
2034	9200000000	746575239.1	85146575239	-8453424761	-14853424761
2035	9000000000	746575239.1	76893150478	-8253424761	-23106849522
2036	9200000000	746575239.1	68439725717	-8453424761	-31560274283
2037	9000000000	746575239.1	60186300956	-8253424761	-39813699044
2038	9200000000	746575239.1	51732876195	-8453424761	-48267123805
2039	9000000000	746575239.1	43479451434	-8253424761	-56520548566
2040	9200000000	746575239.1	35026026673	-8453424761	-64973973327
2041	9000000000	746575239.1	26772601912	-8253424761	-73227398088
2042	14200000000	13244764391	25817366304	-955235608.9	-74182633696
2043	9000000000	746575239.1	17563941543	-8253424761	-82436058457
2044	9000000000	15536431058	24100372600	6536431058	-75899627400
2045	9000000000	746575239.1	15846947839	-8253424761	-84153052161
2046	9000000000	15536431058	22383378897	6536431058	-77616621103
2047	9000000000	746575239.1	14129954136	-8253424761	-85870045864
2048	9000000000	21,344,439,747.73	26,474,393,883.92	12,344,439,747.73	-73,525,606,116.08

Supplementary Materials S5. Colony Fuel Usage  
Table S5. Calculations for Colony Fuel Usage.

COLONY FUEL USAGE									
Fuel Needed for Tourism and Research	4946110.405								
=									
Fuel Needed for Deuterium =	335177.7675								
Fuel Needed for asteroid Mining =	2762500								
Fuel Needed to send Platinum =	72852862.5								
Total Fuel Used Every year =	80896650.67	kg							
Total Fuel Needs to be produced every day =	221634.6594								
Total Methane required =	49252.14653								
Total Oxygen Required =	172382.5128								
Water Consumption needed by a person =	8	kg	per day						
With Margin	9.6	kg	per day						
For 13000 people	1248000	kg	per day						
Mol Mass of CO2	44.01								
Mol Mass of H2	2.01588								
Mol Mass of CH4	16.04								
Mol Mass of H2O	18.01528								
Reaction =	CO2	+	4 H2	=	CH4	+	2H2O		
Number of Molecules	1	+		4	=	1	+		2
Number of Molecules of Methane in 4083	1.8491E+27								

Number of Molecules required =	1.8491E+27		7.39642E+27		1.8491E+27		3.69821E+27	
Kg of each molecule required =	135136.3447	kg per day	24759.70502	kg per day	49252.14653	kg per day	110634.8143	kg per day
	49324765.81	kg per year	9037292.334	kg per year	17977033.48	kg per year	40381707.2	kg per year
Methane is required everyday =	49252.14653	kg						
Water produced everyday =	110634.8143	kg						
One machine can dig up to =	68.2	kg/hr						
One machine can dig up in one day =	1691.36	kg						
Water required for h2 =	222837.3452	kg						
Number of Machines required =	131.7503933							
Round of Machine =	132							
Oxygen produced from electrolysis =	198077.6402	kg						
Oxygen produced for fuel =	172382.5128	kg						
Oxygen for life support =	25695.12734	kg						
Prop Produced per year =	221634.6594	kg						
Prop Produced every year =	80896650.67	kg						

**Supplementary Materials S6. Detailed Cost Budget**

Table S6. Detailed cost budget of the initiative.

Colonization Status	Year	Details	Outflow Cost estimation	Total Outflow	Outflow 5% margin	Inflow cost estimation	Total Inflow
<b>Pre - Initiative Phase</b>	2024	MADE member's investments		\$ 48,232,500,000.00	\$ 50,644,125,000.00	\$ 8,000,000,000.00	\$ 55,490,230,670.00
		MADE infrastructure	\$ 1,860,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		MADE operating cost	\$ 3,200,000,000.00				
	2026	MADE member's investments				\$ 8,000,000,000.00	
		MADE infrastructure	\$ 1,860,000,000.00				
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
	2028	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Training program at MADE	\$ 120,000,000.00			\$ 318,733,220.00	
		Spacecraft manufacturing	\$ 1,500,000,000.00				
	2030	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Training program at MADE	\$ 600,000,000.00			\$ 1,593,666,100.00	
		Spacecraft manufacturing	\$ 1,500,000,000.00				
	2032	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Training program at MADE	\$ 900,000,000.00			\$ 2,390,499,150.00	
		Cargo Missions	\$ 5,140,000,000.00				
		Manned Missions	\$ 1,285,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
	2034	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				

		Cargo Missions	\$ 5,782,500,000.00				
		Manned Missions	\$ 1,285,000,000.00				
		Training program at MADE	\$ 1,200,000,000.00			\$ 3,187,332,200.00	
		Spacecraft manufacturing	\$ 1,500,000,000.00				
<b>Start of the Settlement Phase</b>							
<b>Settlement Phase</b>	2036	MADE member's investments		\$ 1,037,291,500,000.00	\$ 1,089,156,075,000.00	\$ 8,000,000,000.00	\$ 1,790,037,128,851.92
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 1,285,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 7,710,000,000.00				
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,152,000,000.00			\$ 43,072,000,000.00	
	2038	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 1,285,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 2,570,000,000.00				
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,152,000,000.00			\$ 43,072,000,000.00	
	2040	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 2,570,000,000.00				



		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,152,000,000.00			\$ 43,072,000,000.00	
	2042	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 5,140,000,000.00				
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,152,000,000.00			\$ 43,072,000,000.00	
	2044	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 5,782,500,000.00				
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,152,000,000.00			\$ 43,072,000,000.00	
	2046	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 7,710,000,000.00				
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,302,000,000.00			\$ 43,472,000,000.00	
	2048	MADE member's investments				\$ 8,000,000,000.00	

		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 2,570,000,000.00				
		Deterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,452,000,000.00			\$ 43,872,000,000.00	
	2050	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 2,570,000,000.00				
		Deterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,452,000,000.00			\$ 43,872,000,000.00	
	2052	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 5,140,000,000.00				
		Deterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,452,000,000.00			\$ 43,872,000,000.00	
	2054	MADE member's investments				\$ 8,000,000,000.00	

		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 5,782,500,000.00				
		Deterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,452,000,000.00			\$ 43,872,000,000.00	
	2056	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 7,710,000,000.00				
		Deterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,452,000,000.00			\$ 43,872,000,000.00	
	2058	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 2,570,000,000.00				
		Deterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,608,000,000.00			\$ 44,288,000,000.00	
	2060	MADE member's investments				\$ 8,000,000,000.00	

		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 2,570,000,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,608,000,000.00			\$ 44,288,000,000.00	
	2062	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 5,140,000,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,608,000,000.00			\$ 44,288,000,000.00	
	2064	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 5,782,500,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,608,000,000.00			\$ 44,288,000,000.00	
	2066	MADE member's investments				\$ 8,000,000,000.00	

		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 7,710,000,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,608,000,000.00			\$ 44,288,000,000.00	
	2068	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00			\$ 1,099,999,998.00	
		Cargo Missions	\$ 2,570,000,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 16,608,000,000.00			\$ 44,288,000,000.00	
	2070	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 2,570,000,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 20,874,000,000.00			\$ 55,664,000,000.00	
	2072	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				

		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 12,850,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 5,140,000,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 25,140,000,000.00			\$ 67,040,000,000.00	
	2074	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 16,062,500,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 5,782,500,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 25,140,000,000.00			\$ 67,040,000,000.00	
	2076	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 19,275,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 7,710,000,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 25,140,000,000.00			\$ 67,040,000,000.00	
	2078	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				

		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 19,275,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 2,570,000,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 25,140,000,000.00			\$ 67,040,000,000.00	
	2080	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 19,275,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 2,570,000,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 25,140,000,000.00			\$ 67,040,000,000.00	
	2082	MADE member's investments				\$ 8,000,000,000.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 19,275,000,000.00				
		Broadcasting				\$ 1,099,999,998.00	
		Cargo Missions	\$ 2,570,000,000.00				
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Training program at MADE	\$ 25,140,000,000.00			\$ 67,040,000,000.00	
	2084	Broadcasting				\$ 29,699,999,946.00	
		MADE member's investments				\$ 8,000,000,000.00	

		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 19,275,000,000.00				
		Cargo Missions					
		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Tourism				\$ 62,360,023,071.75	
		Research Visit				\$ 1,782,826,340.00	
		Asteroid Mining				\$ 36,745,500,000.00	
		Training program at MADE	\$ 25,140,000,000.00			\$ 67,040,000,000.00	
<b>PayBack Time</b>							
		Broadcasting				\$ 29,699,999,946.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 19,275,000,000.00				
		Cargo Missions					
	2086	Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Tourism				\$ 62,360,023,071.75	
		Research Visit				\$ 1,782,826,340.00	
		Asteroid Mining				\$ 36,745,500,000.00	
		Training program at MADE	\$ 25,140,000,000.00			\$ 67,040,000,000.00	
		Broadcasting				\$ 29,699,999,946.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 19,275,000,000.00				
		Cargo Missions					
	2088						



		Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Tourism				\$ 62,360,023,071.75	
		Research Visit				\$ 1,782,826,340.00	
		Asteroid Mining				\$ 36,745,500,000.00	
		Training program at MADE	\$ 25,140,000,000.00			\$ 67,040,000,000.00	
		Broadcasting				\$ 29,699,999,946.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 19,275,000,000.00				
		Cargo Missions					
	2090	Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Tourism				\$ 62,360,023,071.75	
		Research Visit				\$ 1,782,826,340.00	
		Asteroid Mining				\$ 36,745,500,000.00	
		Training program at MADE	\$ 25,140,000,000.00			\$ 67,040,000,000.00	
		Broadcasting				\$ 29,699,999,946.00	
		MADE operating cost	\$ 3,200,000,000.00				
		Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 19,275,000,000.00				
		Cargo Missions					
	2092	Deuterium Mining				\$ 746,575,239.06	
		Martian Soil				\$ 5,999,994,000.00	
		Tourism				\$ 62,360,023,071.75	
		Research Visit				\$ 1,782,826,340.00	
		Asteroid Mining				\$ 36,745,500,000.00	

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		Training program at MADE	\$ 25,140,000,000.00			\$ 67,040,000,000.00	
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**Supplementary Materi S7. Cargo Missions**

Table S7. The details of the Cargo missions to the colony.

CARGO MISSIONS								
Colonization Status	Year	No. of Missions		Payload per Mission	Payload Each Year	Cumulative Payload	Cumulative Missions	
		Cargo	Manned				Cargo	Manned
	2032	4	1	100	400	400	4	1
	2033	4	1	100	400	800	8	2
	2034	5	1	100	500	1300	13	3
	2035	4	1	100	400	1700	17	4
	2036	6	1	100	600	2300	23	5
	2037	6	1	100	600	2900	29	6
	2038	2	1	100	200	3100	31	7
	2039	2	1	100	200	3300	33	8
	2040	2	10	106	212	3512	35	18
	2041	2	10	106	212	3724	37	28
	2042	4	10	106	424	4148	41	38
	2043	4	10	106	424	4572	45	48
	2044	5	10	106	530	5102	50	58
	2045	4	10	106	424	5526	54	68
	2046	6	10	106	636	6162	60	78
	2047	6	10	106	636	6798	66	88
	2048	2	10	106	212	7010	68	98
	2049	2	10	106	212	7222	70	108
	2050	2	10	106	212	7434	72	118
	2051	2	10	108	216	7650	74	128
	2052	4	10	108	432	8082	78	138
	2053	4	10	108	432	8514	82	148

	2054	5	10	108	540	9054	87	158
	2055	4	10	108	432	9486	91	168
	2056	6	10	108	648	10134	97	178
	2057	6	10	108	648	10782	103	188
	2058	2	10	108	216	10998	105	198
	2059	2	10	108	216	11214	107	208
	2060	2	10	108	216	11430	109	218
	2061	2	10	108	216	11646	111	228
	2062	4	10	109	436	12082	115	238
	2063	4	10	109	436	12518	119	248
	2064	5	10	109	545	13063	124	258
	2065	4	10	109	436	13499	128	268
	2066	6	10	109	654	14153	134	278
	2067	6	10	109	654	14807	140	288
	2068	2	10	109	218	15025	142	298
	2069	2	10	109	218	15243	144	308
	2070	2	10	109	218	15461	146	318
	2071	2	10	109	218	15679	148	328
	2072	4	10	109	436	16115	152	338
	2073	4	10	109	436	16551	156	348
	2074	5	10	109	545	17096	161	358
	2075	4	15	110	440	17536	165	373
	2076	6	15	110	660	18196	171	388
	2077	6	15	110	660	18856	177	403
	2078	2	15	110	220	19076	179	418
	2079	2	15	110	220	19296	181	433
	2080	2	15	110	220	19516	183	448

	2081	2	15	110	220	19736	185	463
	2082	4	15	110	440	20176	189	478
	2083		15	110				493
	2084		15	110				508
	2085		15	110				523
	2086		15	110				538
	2087		15	110				553
	2088		15	110				568
	2089		15	110				583
	2090		15	110				598
	2091		15	110				613
	2092		15	110				628
	2093		15	110				643
	2094		15	110				658
	2095		15	110				673
	2096		15	110				688
	2097		15	110				703
	2098		15	110				718
	2099		15	110				733
	2100		15	110				748
	2101		15	110				763
	2102		15	110				778
	2103		15	110				793
	2104		15	110				808
	2105		15	110				823
	2106		15	110				838
	2107		15	110				853

	2108		15	110			868
	2109		15	110			883
	2110		15	110			898
	2111		15	110			913
	2112		15	110			928
	2113		15	110			943
	2114		15	110			958
	2115		15	110			973
	2116		15	110			988
	2117		15	110			1003
	2118		15	110			1018
	2119		15	110			1033
	2120		15	110			1048
	2121		15	110			1063
	2122		15	110			1078
	2123		15	110			1093
	2124		15	110			1108
	2125		15	120			1123
	2126		15	120			1138
	2127		15	120			1153
	2128		15	120			1168
	2129		15	120			1183
	2130		15	120			1198
	2131		15	120			1213
	2132		15	120			1228
	2133		15	120			1243
	2134		15	120			1258

	2135		15	120			1273
	2136		15	120			1288
	2137		15	120			1303
	2138		15	120			1318
	2139		15	120			1333
	2140		15	120			1348
	2141		15	120			1363
	2142		15	120			1378
	2143		15	120			1393
	2144		15	120			1408
	2145		15	120			1423
	2146		15	120			1438
	2147		15	120			1453
	2148		15	120			1468
	2149		15	120			1483
	2150		15	120			1498
	2151		15	120			1513
	2152		15	120			1528
	2153		15	120			1543
	2154		15	120			1558
	2155		15	120			1573
	2156		15	120			1588
	2157		15	120			1603
	2158		15	120			1618
	2159		15	120			1633
	2160		15	120			1648
	2161		15	120			1663

	2162		15	120			1678
	2163		15	120			1693
	2164		15	120			1708
	2165		15	120			1723
	2166		15	120			1738
	2167		15	120			1753
	2168		15	120			1768
	2169		15	120			1783
	2170		15	120			1798
	2171		15	120			1813
	2172		15	120			1828
	2173		20	130			1848
	2174		20	130			1868
	2175		20	130			1888
	2176		20	130			1908
	2177		20	130			1928
	2178		20	130			1948
	2179		20	130			1968
	2180		20	130			1988
	2181		20	130			2008
	2182		20	130			2028
	2183		20	130			2048
	2184		20	130			2068
	2185		20	130			2088
	2186		20	130			2108
	2187		20	130			2128
	2188		20	130			2148



	2189		20	130			2168
	2190		20	130			2188
	2191		20	130			2208
	2192		20	130			2228
	2193		20	130			2248
	2194		20	130			2268
	2195		20	130			2288
	2196		20	130			2308
	2197		20	130			2328
	2198		20	130			2348
	2199		20	130			2368
	2200		20	130			2388
	2201		20	130			2408
	2202		20	130			2428
	2203		20	130			2448
	2204		20	130			2468
	2205		20	130			2488
	2206		20	130			2508
	2207		20	130			2528
	2208		20	130			2548
	2209		20	130			2568
	2210		20	130			2588
	2211		20	130			2608
	2212		20	130			2628
	2213		20	130			2648
	2214		20	130			2668
	2215		20	130			2688

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	2216		20	130				2708
	2217		20	130				2728
	2218		20	130				2748

**Supplementary Materi S8. Asteroid Mining**

Table S8. The details of the Asteroid Mining missions to the colony.

Mass Ratio, from Mars=	4.463						
Frequency =	2.75						
Payload To Asteroid Belt =	3750000	kg	=	3750	tonnes		
Total Dry Mass =	750000	kg	=	750	tonnes		
Total propellant to and from the asteroid =	26491950	kg	=	26491.95	tonnes		
Tankage weight =	18544365	kg	=	18544.365	tonnes		
Total Mass one way (with asteroid propellant) =	49536315	kg	=	49536.315	tonnes		
<b>for CERES taken as a ref</b>							
Mass Ratio Required =	1.35						
del v Required	2.7	kg/s2					
Payload from 16 pshye	7500000	kg					
Total Dry Mass	1500000	kg	=	1500	tonnes		
Propellant Mass	3150000	kg	=	3150	tonnes		
Total Payload brought =	20625000	kg	=	20625	tonnes		
At 75% Efficiently Processing =	15468750	kg	=	15468.75	tonnes		
At 25% Platinum =	3867187.5	kg	=	3867.1875	tonnes		
Remaining Pay load =	38671875	kg	=	38671.875	tonnes		
Number of Transits =	4.25			per year			
Kg that can be trasported per trip =	150000	kg			=	150	tonnes
Kg that can be trasported per year =	637500	kg			=	637.5	tonnes
Dry Mass =	85000	kg		Assumption: 2 cargo ships every 2 year	=	85	tonnes
Propellant Mass =	650000	kg		Assumption: 85000kg can be transported	=	650	tonnes

					=		
Total Mass of the S/c =	885000	kg			=	885	tonnes
Cost of Platinum on Earth =	30,000.00	\$					
Cost of Transport Per ship =	177000000	\$					
Cost of Transport Per Year =	752250000	\$					
Estimated Cost of our payload =	19,125,000,000.00	\$					
Remaining Platinum=	42,187.50	kg	=				
<b>Revenue generated in one year =</b>	<b>18,372,750,000.00</b>	<b>\$</b>					

### Supplementary Materi S9. Tourism

Table S9. The details of the tourism missions to the colony.

TOURISM COST SCHEME							
				No. of tourists (per trip)=	127	people	
Mass Ratio, from Mars=	4.463			Number of days travel =	206.7		
				Payload per person=	785.45	kg	
Total dry mass =		85000	kg	Total payload weight =	99752.15	kg	
Propellant, from Mars=		639796.6955	kg				
Propellant, from Earth		1100000	kg	Frequency =	3	in	1 years
Total Weight S/C from Earth=		1284752.15	kg				
Total Weight S/C from Mars=		824548.8455	kg				
Rate of exports from E =		500	\$/kg				
Rate of exports from M =		200	\$/kg		Number of people a year		1095

Cost from Earh =		642,376,075.00	\$				31180011536	
Cost from Mars =		164909769.1	\$					
Total Cost (per trip) =		807,285,844.09	\$					
Cost per tourist (per trip) =		6,356,581.45	\$					
SP per tourist (per trip) =		15,000,000	\$					
Revenue generated per tourist =		8,643,419	\$					
Total revenue (per trip) =		1097714156	\$					
<b>TOTAL REVENUE =</b>		3293142468	\$					
<b>Tourist Cost Scheme -B</b>								
				No. of tourists (per trip)=	85	people		
Mass Ratio, from Mars=	4.463			Number of days travel =	320.7272727			
				Payload per person=	1184.545455	kg		
Total dry mass =		85000	kg	Total payload weight =	100686.3636	kg		
Propellant, from Mars=		643031.8773	kg					
Propellant, from Earth		1100000	kg	Frequency =	3	in	1	years
Total Weight S/C from Earth=		1285686.364	kg					
Total Weight S/C from Mars=		828718.2409	kg					
Rate of exports from E =		500	\$/kg					
Rate of exports from M =		200	\$/kg					
Cost from Earh =		642843181.8	\$					

Cost from Mars =		165743648.2	\$					
Total Cost (per trip) =		808586830	\$					
Cost per tourist (per trip) =		9512786.235	\$					
SP per tourist (per trip) =		18000000	\$					
Revenue generated per tourist =		8487213.765	\$					
Total revenue (per trip) =		721413170	\$					
<b>TOTAL REVENUE =</b>		2164239510	\$					
				No. of tourists (per trip)=	126	people		
Mass Ratio, from Mars=	4.463			Number of days travel =	209.2307692			
				Payload per person=	794.3076923	kg		
Total dry mass =		85000	kg	Total payload weight =	100082.7692	kg		
Propellant, from Mars=		640941.6298	kg					
Propellant, from Earth		1100000	kg	Frequency =	3	in	1	years
Total Weight S/C from Earth=		1285082.769	kg					
Total Weight S/C from Mars=		826024.3991	kg					
Rate of exports from E =		500	\$/kg					
Rate of exports from M =		200	\$/kg					
Cost from Earh =		642541384.6	\$					
Cost from Mars =		165204879.8	\$					
Total Cost (per trip) =		807746264.4	\$					

Cost per tourist (per trip) =		6410684.638	\$					
SP per tourist (per trip) =		21000000	\$					
Revenue generated per tourist =		14589315.36	\$					
Total revenue (per trip) =		1838253736	\$					
<b>TOTAL REVENUE =</b>		5514761207	\$					
<b>TOURISM COST SCHEME D - 450 days</b>								
				No. of tourists (per trip)=	80	people		
Mass Ratio, from Mars=	4.463			Number of days travel =	339.6923077			
				Payload per person=	1250.923077	kg		
Total dry mass =		85000	kg	Total payload weight =	100073.8462	kg		
Propellant, from Mars=		640910.7292	kg					
Propellant, from Earth		1100000	kg	Frequency =	3	in	1	years
Total Weight S/C from Earth=		1285073.846	kg					
Total Weight S/C from Mars=		825984.5754	kg					
Rate of exports from E =		500	\$/kg					
Rate of exports from M =		200	\$/kg					
Cost from Earh =		642536923.1	\$					
Cost from Mars =		165196915.1	\$					
Total Cost (per trip) =		807733838.2	\$					
Cost per tourist (per trip) =		10096672.98	\$					
SP per tourist (per trip) =		24000000	\$					
Revenue generated per tourist =		13903327.02	\$					

Total revenue (per trip) =		1112266162	\$					
<b>TOTAL REVENUE =</b>		3336798486	\$					
<b>TOURISM COST SCHEME D - 450 days</b>								
				No. of tourists (per trip)=	117	people		
Mass Ratio, from Mars=	4.463			Number of days travel =	227			
				Payload per person=	856.5	kg		
Total dry mass =		85000	kg	Total payload weight =	100210.5	kg		
Propellant, from Mars=		641383.9615	kg					
Propellant, from Earth		1100000	kg	Frequency =	3	in	1	years
Total Weight S/C from Earth=		1285210.5	kg					
Total Weight S/C from Mars=		826594.4615	kg					
Rate of exports from E =		500	\$/kg					
Rate of exports from M =		200	\$/kg					
Cost from Earh =		642605250	\$					
Cost from Mars =		165318892.3	\$					
Total Cost (per trip) =		807924142.3	\$					
Cost per tourist (per trip) =		6905334.55	\$					
SP per tourist (per trip) =		27000000	\$					
Revenue generated per tourist =		20094665.45	\$					
Total revenue (per trip) =		2351075858	\$					
<b>TOTAL REVENUE =</b>		7053227573	\$					



TOURISM COST SCHEME D - 450 days							
				No. of tourists (per trip)=	136	people	
Mass Ratio, from Mars=	4.463			Number of days travel =	192		
				Payload per person=	734	kg	
Total dry mass =		85000	kg	Total payload weight =	99824	kg	
Propellant, from Mars=		640045.512	kg				
Propellant, from Earth		1100000	kg	Frequency =	3	in	1 years
Total Weight S/C from Earth=		1284824	kg				
Total Weight S/C from Mars=		824869.512	kg				
Rate of exports from E =		500	\$/kg				
Rate of exports from M =		200	\$/kg				
Cost from Earh =		642412000	\$				
Cost from Mars =		164973902.4	\$				
Total Cost (per trip) =		807385902.4	\$				
Cost per tourist (per trip) =		5,936,661.05	\$				
SP per tourist (per trip) =		30000000	\$				
Revenue generated per tourist =		24,063,338.95	\$				
Total revenue (per trip) =		3272614098	\$				
<b>TOTAL REVENUE =</b>		9817842293	\$				

## Supplementary Materi S10. Research Visit

Table S10. The details of the research visit mission to the colony.

Research Visit				
		No. of tourists (per trip)=	85	people
Mass Ratio, from Mars=	4.463	Number of days travel =	320.7272727	
		Payload per person=	1184.545455	kg
Total dry mass =	85000	Total payload weight =	100686.3636	kg
The propellant, from Mars=	643031.8773			kg
The propellant, from Earth	1100000			kg
Total Weight S/C from Earth=	1285686.364			kg
Total Weight S/C from Mars=	828718.2409			kg
Rate of exports from E =	500			\$/kg
Rate of exports from M =	200			\$/kg
Cost from Earh =	642843181.8			\$
Cost from Mars =	165743648.2			\$
Total Cost (per trip) =	808586830			\$
Cost per Researcher (per trip) =	9512786.235			\$
SP per Researcher (per trip) =	20000000			\$
Revenue generated per Researcher =	10487213.76			\$
Total revenue (per trip) =	891413170			\$
<b>TOTAL REVENUE =</b>	<b>891413170</b>			<b>\$</b>

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