

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	
<b>Total Revenue Generated =</b>		<b>2,999,997,000.00</b>	<b>\$</b>

**Supplementary Materials S3. Deuterium Mining**

Table S3. Deuterium mining cost and plan

DEUTERIUM COSTS						Mass Ratio, from Mars=	4.463
Cost on E =	10000	\$/kg	Power generated (per year) =	452	GW	Mass Ratio, from Earth =	29
Mass exported from M =	43994.66667	kg	D required (per day) =	400	g for 1500 MW	Total Payload (2 years) =	87989.33333 kg
			D required (per day) (for 1 MW) =	0.2666666667	g	Dry Mass =	8798.933333 kg
Transportation costs =	133318094.3	\$				Tank Mass =	234624.4372 kg
			D required for power generation (per year) =	97.33333333	g for 1 MW	Propellant Mass =	335177.7675 kg
Cost of same amount on E =	439946666.7	\$				Total Mass =	666590.4714 kg
				43994.66667	kg for 452 GW		
No. of trips =	1	in	2	years			
Total mass exported =	87989.33333	kg					
Total cost of D on E =	879893333.3	\$					
TOTAL REVENUE(every 2 years) =	746575239.1	\$					

**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		

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Number of Molecules required =	1.8491E+27		7.39642E+27		1.8491E+27		3.69821E+27
Kg of each molecule required =	135136.3447	kg	24759.70502	kg	49252.14653	kg	110634.8143
		per day		per day		per day	per day
	49324765.81	kg	9037292.334	kg	17977033.48	kg	40381707.2
		per year		per year		per year	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					

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**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	
Pre - Initiative Phase	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				
	2088	Spacecraft manufacturing	\$ 1,500,000,000.00				
		Manned Missions	\$ 19,275,000,000.00				
		Cargo Missions					
				\$ 196,460,000,000.00	\$ 206,283,000,000.00		\$ 817,499,674,387.26

		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		
	2090	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						
		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	
		2092	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							
	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

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	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

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	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

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	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

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	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

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	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

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	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 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	\$					



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 kg	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>		

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**Informed Consent Statement:** Not applicable.

**Conflicts of Interest:** The authors declare no conflict of interest.