

## Space Finance - An Investment Opportunity for Green and Sustainable Future

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### Abstract

For quite a long time, government alone financing, launching, working, and returning space items and people. Scientific exploration of space propulsion, route, correspondence, and life security progresses brought about financially feasible innovations and business strategies. Scientific research and mission objectives relied upon government space mission needs and spending plan assignment processes. Government funding of investigation actually prevails, outspending private area investment. Business satellites are funded in light of their terrestrial incomes and the endangers of send off and in-service life. Simultaneously, developing nations are sending off satellites and missions, broadening space business. Space finance is an innate boundary or right. Space finance is a quiet innovation empowering influence or mission progression risk. Space investigation is an exceptional setting to rethink better space and earthbound finance option. Finance is crucial for advance serene disclosures and utilization of space resources. On the off chance that investigating space is to be really open to all mankind, choices for supporting and safeguarding space explorers and missions should extend appropriately and comprehensively, beyond governments and high net worth entrepreneurs. This research paper attempts to cover the three main objectives -need for space finance, investment opportunity in space finance and country wise investment in Space finance tech sector.

**Keywords:** Space Finance, Space resources, Innovation, Global Space Finance

### Introduction:

Space investigation is entering into new phase of market extension. Driving this extension are billionaire explorers drawing in start-up up business people and mission groups they collect from industry veterans and new ability, meeting up to disturb previous generations of space industry organizations. The new company founders have the capital and try to develop the market for commercial exercises in space. Government space organizations are taking benefit of the new organizations' cash-flow to reduce public subsidizing of business missions, while privatizing large portions of mission prototyping hazard and investment return. Privately coordinated and market-funded space exploration is huge. Notwithstanding, gaps and dangers in space exploration arise due to the actual energy of tying private space missions to the excitement and limit of space pioneers to finance them

These days, unprecedented inventions and an unused innovative soul are rapidly framing the new space economy. The space area is seeing the ascent of unused confidential performing specialists who see fantastic business open doors in space exploration and double-dealing through cutting edge innovation and the information upheaval. Historically, Europe has been at the very front of room investigation, focusing profoundly on space infrastructure. The EU can in any case flaunt scholarly and scientific accomplishments yet chances losing them in the following flood of space innovation in the event that it doesn't make a move to sustain more endeavors inside the modern space sector. There is an overall conviction that space ought to be utilized to support all Humanity, yet just a few nations have the necessary mechanical base for admittance to space. Space innovations with their effect on science, the economy and the prosperity of residents are, for the most part picked by developing nations as one of the priority area of technological development. Be that as it may, the Global Space Industry as of now has an excess of limit, and there are questions about the requirement for extra limit in developing nations.

Space was open to just a small bunch of the most well off states who were willing and ready to distribute billions of dollars to huge scope, decade(s) long research and investigation drives. Albeit frequently covered in political and philosophical talk, the cold War Space Race opened another boondocks for human investigation and pioneered research and technology which actually benefit the space sciences today.

Since Apollo program has been retired and US spending on space has significantly declined, modern space entertainers — from business visionaries to enthusiasts — have never been more dynamic. In 2008, Elon Musk's SpaceX and Orbital Sciences Organization got \$3.5 billion in agreements to carry US payloads to the Global Space Station (ISS), and in 2014, Boeing and SpaceX got \$6.8 billion in agreements to taxi American space explorers to the ISS. A rising number of room the travel industry tasks, for example, Virgin Cosmic and XCOR Aerospace, have drawn in sufficient funding with the commitment of orbital and suborbital flight at a fraction of present rates. This study is a stage toward an overall discussion of need and potential investment and possibilities for space development that could guarantee space funding. So it is important at state level to initiate the steps for space finance.

### Review of Literature:

(James Guild 2020) explained in his article 'The Political and institutional constraints on green finance in Indonesia that there is need for There is solid interest for capital business sectors for green bonds backing clean energy projects. In any case, the sustainable power area's institutional plan has made a skewed motivator structure for Indonesia's political class. For foundation likewise experience the ill effects of feeble establishments and immature monetary business sectors, low degrees of human resources, and an absence of green projects.

(Kim Schumacher et.al 2020) authors reveled in their study hoe financial sector of Japan can reduce climate risk and supports Japan's transition to zero carbon and to align itself with sustainable goal . Study again explain how Japan financial sector requires decisive action to expand sustainable finance.

(Aaron Maltais & Björn Nykvist 2019) explained in the study the bottom up development of the green security market is due to the solid coordinating of motivators between guarantors and financial backers.Green bonds apparent to give motivations to guarantors to raise the 'green aspirations' of explicit projects and their organizations.

(Tolliver,c et.al 2020) studies that how much green development and money in Asia has expanded to meet the developing interest for manageable monetary advancement, contamination reduction and environmental problems.This is all determined by government approaches for manageable monetary advancement.

(Wang, K., Tsai, et.al 2019) found in their study Societal development accompanies stressed access and utilization of resources as well as negative natural suggestions, prompting constraints and clashes.Study also recommended Government must strive to foster low carbon economies by making an empowering climate for green money banks and makers to guarantee reasonable financial improvement and change.

(Dikau, S., & Volz, U 2019) explained in their article that Ecological dangers can substantially affect monetary and macroeconomic steadiness.Subsequently, it is the government's obligation to actually make monetary frameworks in managing environmental change issues furthermore, banks to turn into public organizations that will help the public authority in creating feasible green money.

(Clap,C.N. 2019) Studied in their article Investing in a green future' in the recent times there is positive green premium bond. Climate change has the tendency to destroy the capital of form. The study also recommend that investors need to turn to the green premium to respond the effects of climate change.

To some degree, such researchers as E. Marpreanu focused on the examination of policy management in the space circle in the 2019 logical archive "Space research - measurements and realities"; I. Andrushko in his 2006 work "Space Regulation: Idea and Content"; O. Beglii in his 2002 work "Lawful guideline of the world market of space service and technology"; A. Huron in his 2019 work "Legitimate assurance of close Earth space from clogging"; S. Negoda in crafted by 2000 "Legitimate guideline of worldwide business space projects".

### Objectives of the Study:

1. To identify the need for Space Finance.
2. To analysis the current state of growth of investment in Space Finance.
3. To identify the country wise investment in Space finance tech sector.

**Research Methodology:**

The study is based on secondary data and descriptive in nature. The source of data both qualitative and quantitative is being collected from case studies, research articles, research papers, public reports and different websites of space finance.

**Need for Space Finance :**

The climate change and the results from air and ocean pollution, loss of biodiversity and deforestation are making major areas of strength for an on enterprises embrace reasonable development strategies and cultivate a green recovery. Human action has warmed the planet by around 1°C since pre-industrial times Without horrifying act, we are setting out toward a 3°C to 4°C temperature increment before this century's over assuming temperatures climb above 1.5°C, many pieces of the planet will become dreadful. Also, we could lose all warm-water corals and experience unmanageable changes. The planet has lost 60% of its biodiversity over the most recent 40 years

The financial sector, as a significant worldwide player, has been committed as of late to assuming an decisive part in the change towards a sustainable economy. Sustainable finance, through the coordination of ESG (Ecological, Social and Governance) factors in speculation and dynamic cycles, has made significant progresses in recent years. The application of ESG arrangements as of recent years has headed down the path of filling this gape, to make the environmental protection sector more transparent. By and large, the principal source of ESG information have been voluntary exposures by the company itself through Corporate Social Obligation (CSR) reports. This training has demonstrated inadequate in light of multiple factors: organizations have frequently demonstrated that they are dependent upon positive predisposition, with a propensity to overlook negative subtleties (for example fines got) in the event that not obliged by guidelines; the procedures utilized by organizations are unique, causing trouble in looking at information between different companies and sectors. ESA has been working for a really long time to help EU guidelines. Satellite checking can give regular information on the natural and climatic execution of organizations' resources, subjective information got from remote detecting, high comparability among resources and organizations on account of the use of worldwide principles, and consistency across different scales. As of now as of now, this kind of innovation is bringing exceptionally encouraging outcomes.

**Use of Satellite Technology:**

Satellite technology can uphold the framework to check the responsibility of companies, which over and over again figure out how to participate in shifty ways of behaving of their ecological responsibilities. Artificial intelligence and machine learning algorithm support the need of a lot of information coming from satellites. Data from the Copernicus group of stars can be utilized to follow the outflows of companies, deforestation (a major issue in poor nations, where woodlands are cleared to account for soy and palm oil developments) and loss of biodiversity, for natural heritage protection, blue economy. The take-up of a Green and Sustainable Finance is supposed to hold the growth to strong regulatory support.

Selected Business Policy at International level

G20 Sustainable finance Study Group (2016)	To identify barrier and gaps in mobilizing Sustainable Finance
OECD Center for Green Finance and Investment (2015)	To contribute in the effective policies, institutions and instruments for investment in green finance
G7 and UNEP financial center for sustainability (FC4S) Network (2017)	Enabling financial centers to exchange experience, drive convergence, and take action on shared priorities for accelerate the sustainable finance
European Green Deal (2019) and Sustainable European Investment Plan	To maintain a framework for private and public sector investor to facilitate sustainable investment.

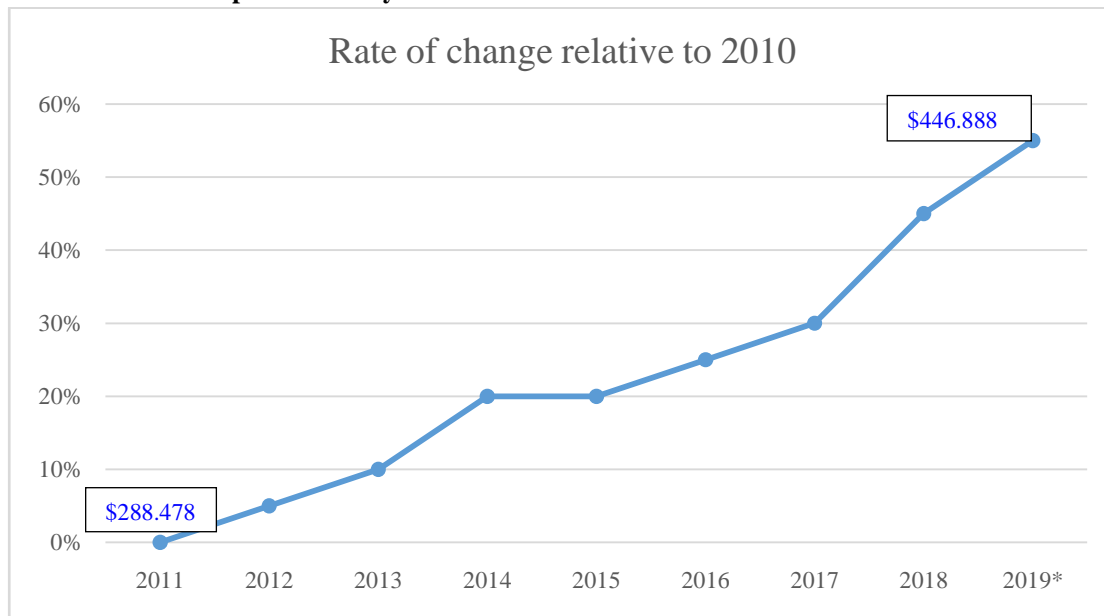
Above table shows the selected business policy need to be implemented. In order to effective implementation of these policies there is need of data and data monitoring of corporate efforts. Accuracy and availability of data has become a basic requirement in present situation. A amount of space finance need to be invested to have a sustainable future. Demand of data ha been increasing day to day.

**Data related Opportunities and Challenges:**

Demand for environmental, social and governance (ESG) data is increasing (tripling of market since 2015)	Demand for environmental, social and governance (ESG) data is increasing (tripling of market since 2015)
Digital technologies (AI, data processing) open up new opportunities	- Accessibility of reliable data in usable formats
Standardization and consolidation of reporting frameworks	Coverage and comparability of data
Increasing availability of data	User capabilities and skills to process and analyse data

Source: FC4S (2021), Sustainable Finance Market Update Series

**Growth of Global Space Economy:**



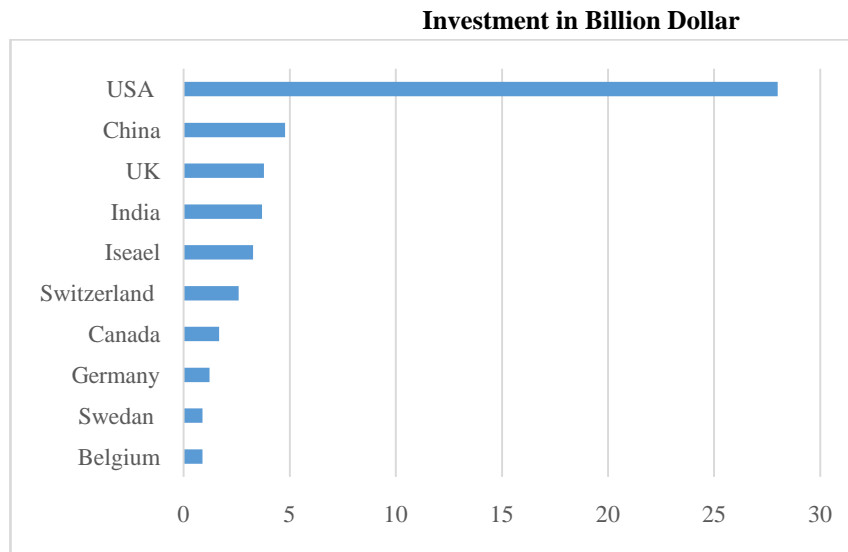
Source - Space Foundation Database

Recently space industry is not only growing at an exponential rate. The value of the Global Space economy has increased to \$ 447B in 2020- 55% higher than a decade ago, since last five years it's being increasing at fast rate. Global Government has spent \$90.2B on space activities in 2020 and US has share 58% of that total investment. According to space report 2021Q2 edition China and European Space Agency (ESA) are on top three position for investment in global space economy. Japan has increased its space by 3% in 2020 and France made it more than 40% of its budget.

**The Global space Economy is booming-**

Around the world there has been increase in the space backed investment in the space projects. According to space foundation report there was 19% jump in overall government spending on military and civilian space programme last year. Most of the countries has raised spending on space projects such as India raised by 36%, China 23% more and US has pumped more 18% in to space ventures. According to Space Foundation report 2022 that space economy was worth \$469 billion in 2021 a 9% increase from the earlier year investment. Not only space sector is growing itself- it also proving a key enabler of growth and efficiency of other sectors also. According of European Space Agency (ESA) the development of space infrastructure has made possible of growth of other sectors such as meteorology, energy, telecommunication, aviation and urban development.

**Top-10 Countries in Space Tech Sector in 2021**



Source- SpaceTech Analytic 2021

With a total of investment \$28B in 3,086 companies by US alone is global leader in terms of SpaceTech investment. China- the second largest country in terms of SpaceTech investment (\$4.786B invested in 122) companies. Third country United Kingdom (UK) where funding is mostly raised from public sources and IPOs, and not by the way of private funding. Recently huge amount of finance is invested by private investors. Many companies are raising finance for space investment. According to CEO of Planet Labs, will Marshal explained to the World Economic Forum's Annual Meeting of Davos in May that rocket price has dropped down fourfold as compare to past decade price. Now companies has to less amount to put a satellite into space which they had to pay hundreds of thousand dollar earlier. He also told that now companies are producing 10 times more earth imagery by the area as compared five year ago and 10 times the bandwidth of communication is now being transmitted at vary fast speed around the world.

He further explained that satellite imagery can also help farmers to monitor crops, to track environmental changes for businesses, security and governance for social and government to monitor pollution such as CO2 emissions etc. These are some examples why different countries are taking more interest to invest in space finance.

**Conclusion:**

The present world is confronting difficulties that will reshape our lifestyle: environmental change, the Coronavirus pandemic and digitization. Just organizations that will actually want to make the most of the new open doors and utilize the new innovations will have a future. Massive infrastructure investments required towards 2030 to arrive at SDG goals Private investors and commitments will be key piece of reaction, with various initiative has been launched at the public and global level starting around 2015. Space-based perceptions play a part to play in checking natural execution, yet there are different provisos such as Reasonableness and accessibility of sufficient information, Ground adjustments are required for information quality and dependability.

ESA and global space agency has been working for a really long time to help to follow space guidelines. Satellite observing can give regular information on the ecological and climatic performance of organizations' resources, subjective information got from remote detecting, high likeness among resources and organizations because of the use of worldwide guidelines, and consistency across numerous scales. As of now as of now, this sort of innovation is bringing exceptionally encouraging outcomes. In this sense, ESA and global space agency will continue to support governments, academia and companies with scientific and commercial activities, development funds and a constant flow of data from the Copernicus satellite constellation to foster a green and sustainable growth for our planet..

**References:**

1. Guild, J. (2020). The political and institutional constraints on green finance in Indonesia. *Journal of Sustainable Finance & Investment*, 10(2), 157-170.

2. Schumacher, K., Chenet, H., & Volz, U. (2020). Sustainable finance in Japan. *Journal of Sustainable Finance & Investment*, 10(2), 213-246. Tolliver, C., Fujii, H., Keeley, A., & Managi, S. (2020). Green innovation and finance in Asia. *Asian Economic Policy Review*, e12320.
3. Clapp, C. (2018). Investing in a green future. *Nature Climate Change*, 8((2)), 96-97
4. Al Breiki, M., & Nobanee, H. (2019). The role of financial management in promoting sustainable business practices and development
5. Dikau, S., & Volz, U. (2018). Central banking, climate change and green finance. Tokyo: Asian Development Bank Institute, 867.
6. Tolliver, C., Keeley, A. R., & Managi, S. (2020). Drivers of green bond market growth: The importance of Nationally Determined Contributions to the Paris Agreement and implications for sustainability. *Journal of Cleaner Production*, 244.
7. Wang, Y., & Zhi, Q. (2016). The role of green finance in environmental protection: Two aspects of market mechanism and policies. *Energy Procedia*, 311-316.
8. David L. (2015, March 19). Bigelow Aerospace's Inflatable Habitat Ready for Space Station Trip. Retrieved September 17, 2015, from [www.space.com/28855-inflatable-space-station-habitat-bigelow.html](http://www.space.com/28855-inflatable-space-station-habitat-bigelow.html)
9. Berger, Eric. (2017). In-depth study: Commercial cargo program a bargain for NASA. *Arstechnica*.<https://arstechnica.com/science/2017/11/in-depth-study-commercialcargo-program-a-bargain-for-nasa/>
10. Berger, Eric. (2017). Trump to sign executive order creating a national space council. *Arstechnica*.<https://arstechnica.com/science/2017/06/trump-to-sign-executive-ordercreating-a-national-space-council/>
11. Foust, Jeff. (2014). Exploration and the private sector. *The Space Review*.<http://www.thespacereview.com/article/2567/1>
12. [https://www.spacefordevelopment.org/wp-content/uploads/2020/01/118601\\_UKSA\\_Finance-Report-2019\\_EL\\_v9.pdf](https://www.spacefordevelopment.org/wp-content/uploads/2020/01/118601_UKSA_Finance-Report-2019_EL_v9.pdf)
13. [https://commercialisation.esa.int/wp-content/uploads/2021/05/Space-for-finance\\_Le-Drian.pdf](https://commercialisation.esa.int/wp-content/uploads/2021/05/Space-for-finance_Le-Drian.pdf)
14. <https://commercialisation.esa.int/2021/05/space-for-finance-workshop/>
15. <https://commercialisation.esa.int/2021/04/how-space-supports-the-financial-sector-to-foster-the-transition-towards-a-green-and-sustainable-future/>