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Economic Analysis of Indian Space Policy 2023

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From the launch of its first artificial satellite, i.e. Aryabhatta in 1975, to the launch of Chandrayaan-3 in 2023, India has seen its space sector grow to amazing and unprecedented rights. In this contextual background, another equally important breakthrough came in the Indian space sector this year, with the approval of the Indian Space Policy 2023 by the Indian Government. The policy has been described as a visionary that has the potential to pave the way for India to become a global player in space law. The policy predominantly lays down the agendas of the Indian Space Research Organisation, to focus primarily on research on space technologies and the development of applications that can increase human knowledge of space and the legal framework surrounding it. The policy is a significant milestone for India, as it gains India substantial momentum toward harnessing the power of space for economic growth and technological advancement. The economic analysis of the Indian Space Policy will have multifaceted benefits that range from gaining insights about the projected financial investments and returns on the same to analysing the big picture as to how the space sector can drive the economic development of India.

Keywords: *isro, space policy 2023, chandrayaan-3.*

RESEARCH OBJECTIVES

- To assess the key features and components of the Indian Space Policy 2023, focusing on its objectives, priorities, and strategic goals.

- To investigate the economic implications of the Indian Space Policy 2023, including its impact on the domestic space industry, technology development and innovation.
- To examine the historical evolution of India's space program and policies and analyse how the Indian Space Policy 2023 aligns with or diverges from previous policies.
- To assess the role of international collaboration and partnerships in India's space policy and its impact on economic development, technological advancement and diplomatic relations.

RESEARCH QUESTIONS

- To what extent does the 2023 space policy promote the commercialization of space activities, and how do these initiatives contribute to India's economy?
- What is the economic impact of India's space missions and programs in 2023, including international collaborations and commercial ventures?
- What are the economic challenges and opportunities associated with India's efforts to attract foreign investment and collaboration in the space sector under the new policy?
- What are the regional and global economic implications of India's space activities in terms of competitiveness, market access, and technological advancements?
- What lessons can be learned from the economic analysis of India's space policy in 2023 that may inform future space policies and economic strategies in the country?

RESEARCH METHODOLOGY

The article adopts a mixed form of research methodology in terms of data collection, combining both qualitative and quantitative techniques to provide a comprehensive economic analysis of the Indian Space Policy 2023.

Quantitative Data: Quantitative data will be collected through surveys questionnaires and interviews with chief stakeholders in the Indian space industry, government officials, and

lawmakers. The surveys will focus on economic indicators, budget allocation, and industry performance metrics. Moreover, government reports and publications from space research organizations will be used to gather quantitative data on the economic facets of the policy.

Qualitative Data: In-depth interviews with experts, policymakers, and industry professionals will be conducted to gather qualitative insights into the implementation and impact of the Indian Space Policy 2023. Qualitative data sources such as reports, academic articles and relevant documents will be reviewed to gain a deeper understanding of the context and background of the policy.

As for the data sources, the research paper will collect data from both primary sources as well as secondary sources to provide a comprehensive economic analysis of the Indian Space Policy 2023.

Primary Data: Primary data will be collected through interviews, surveys, or observations, from relevant stakeholders including policymakers, space agencies and industry experts. It can offer valuable insights into the formulation, evolution and implementation of the Indian Space Policy 2023.

Secondary Data: Data will also be collected from existing sources such as government reports, academic publications, and economic databases on the subject matter. It can offer historical context, policy evolution and key milestones. It can also help validate and cross-verify data obtained from primary sources.

LITERATURE REVIEW

Rajeswari Pillai Rajagopalan (2023): What do we know about India's new Space Policy? This research article provides a comprehensive account of the Indian Space Policy, 2023, and its economic and legal aspects. It emphasizes how the new space policy outlines the roles and responsibilities of the different research organisations in the Indian space sector. The article summarizes almost all the extensive facets that have been laid down in the new space policy.

Ms. Rajagopalan also provides her analysis as well as suggestions for prospects that India can incorporate in its future projects.

Rakesh Sood (2023): A ground view of the Indian Space Policy 2023: This research article talks about how the policy is different from previous policies. It insists on the need for suitable legislation, backed by clear rules and regulations, to govern the Indian space sector. It gives insights into how India can capitalize on the momentum that it has gained in the space sector in recent years, with the most recent example being the launch of Chandrayaan3, to help itself tap the vast potential it possesses in the 'Second Space Age'.

INTRODUCTION

Background and Context: The Indian Space Policy of 2023[1] was launched earlier this year when the Cabinet Committee on Security gave its approval regarding the same on 06 April 2023. The policy has twin goals that it seeks to achieve, one for the government sector, i.e., it lays down the role of key Indian space institutions such as the Indian Space Research Organisation (hereinafter referred to as 'ISRO'), New Space India Limited[2] (hereinafter referred to as 'NSIL') etc. to focus on the advancement of space technology research and development; and one for the private sector i.e. to actively become involved in and contribute to the growth of Indian space sector and commercialization of space.

India has already achieved great progress in the space sector, and the government is now concentrating on further advancement and growth in this area. All in all, the predominant objective and intention of India behind bringing this policy is to leverage India's unique expertise and technical know-how in this domain. To have a better understanding of the context, let us take a quick look at some statistics. Currently, the global space economy is valued at USD

[1] Indian Space Policy 2023

[2] T E Narasimhan, 'Isro's new commercial arm NewSpace India officially inaugurated' *Smart Investor* (Chennai, 24 May 2019) <https://web.archive.org/web/20190827142458/https:/smartinvestor.business-standard.com/market/Marketnews-584409-storydet Isros_new_commercial_arm_NewSpace_India_officially_inaugurated.htm> accessed 07 November 2023

400 billion. However, India contributes only 2% to the global space industry. This accounts for approximately 10 billion USD.

Indian scientists recognised the potential as well as the need for the establishment of rocket technology long back. In fact, after taking into consideration how demographically tremendous nation India was, the work towards the establishment of a space research and development organisation began as soon as India gained independence. Many great historical figures are owed major credit. Indian space industry would not have reached the lengths that it has had Vikram Sarabhai not been there. He was the founding father of the Indian space program and a scientific visionary. Homi Bhabha, who is considered the father of India's atomic program, was the director of the Department of Atomic Energy. A ground-breaking milestone came in the year 1969 when the Indian Space Research Organisation (ISRO) was created from the INCOSPAR program. Dr. Sarabhai was made its first chairman.

As years passed by, the USSR and USA emerged as global space giants, and the famous 'Space Race' started between these two nations. Against this backdrop, India began developing satellite technology keeping in mind the need of the remote sensing and communication needs of the future. In 1975, India launched the Aryabhata, its first satellite. Just a few years later in 1980, India launched Rohini-1, its first indigenous satellite.

In 1992, India successfully launched its first ASLV, named ASLV-D3, which was its third attempt and in 1994, India successfully launched its first PSLV. In 2001, India successfully launched its first GSLV, which is currently the most powerful Indian launch vehicle in operation. The most crucial mission that ISRO has undertaken is its ongoing Lunar Exploration Space Programme. From Chandrayaan-1, which was the mission's first flight, launched in 2008 to Chandrayaan-3, which was launched as recently as 14 July 2023. Currently, ISRO is developing the spacecraft Aditya-L1 to investigate the solar atmosphere. It will study the solar atmosphere and how it affects Earth while in orbit at the L1 Lagrange point between the Sun and Earth.

SIGNIFICANCE OF THE STUDY

The Indian Space Policy 2023 is highly significant and much needed for the development of the space industry, as it has the potential to pave the way for the promotion of space activities that are necessary for enhancing the human understanding of space. The reason behind this is the increment of ISRO's involvement in researching more about the nuances that are involved in the space sector's exploration. What will follow is the development of new space technologies and their applications to improve space infrastructure and capacity building.

Moreover, the policy is all the more important because it lays heavy emphasis on encouraging the commercial presence of India in space. In addition, India can become a leading power in combining space-tech and economy and this can have major implications in international relations too, in favour of India. The policy also pushes for increasing private participation in the space sector. It holds significance because of the many international precedents that private companies have set in the space sector. For example, Space X's Falcon 9, which is a reusable rocket, was launched in 2020[3] and it is a remarkable milestone because it was the first time a private crewed mission was sent to the International Space Station (hereinafter referred to as 'ISS'). Private organisations can aid India in staying competitive in the space industry, which is a 'sunrise' sector. Moreover, private participation becomes all the more important because private organisations are more flexible in their operations and workings as compared to government organisations, as they are not bound by any external control and they respond better and quickly to technological advancements and changing consumer preferences.

This policy would provide much-needed clarity for space reforms, paving the road for the nation to take advantage of the space economy. Overall, the 2023 policy is a highly important document that will not only govern but also influence India's space sector in the coming years.

[3] 'Falcon 9 – First orbital class Rocket capable of Reflight' (*SPACEX*) <https://www.spacex.com/vehicles/falcon-9/> accessed 07 November 2023

INDIAN SPACE POLICY 2023

Key Provisions and Objectives: The policy has many facets to it. The policy lays heavy emphasis on the roles of certain space entities that will enable the participation and active contribution of the private sector. These are the Indian National Space Promotion and Authorisation Centre[4] (hereinafter referred to as 'InSpace'), Department of Space[5] (hereinafter referred to as 'DOS') and NSIL. This is unprecedented because now, as per the role division provided in the policy, these entities will engage in space activities that were previously under the sole domain of ISRO.

InSpace, as the primary authority for space launches, will assist with launch pad testing, satellite operations, the transmission of data on high-resolution imagery and remote sensing technologies, and other tasks. In addition to evaluating how to maximize India's space resources and expand space-based operations, the institute will serve as a liaison between ISRO and commercial businesses.

NSIL, on the other hand, will be in charge of manufacturing, assembling and integrating the launch vehicle. With the assistance of the private sector, it will seek to transfer small satellite technology to the space industry, produce SSLVs, produce PSLVs and produce and market space-based goods and services, including their launch and use.

DOS will be responsible for the administration of the Indian space program. It will oversee the agencies and institutes such as ISRO, NSIL, InSpace, etc. that are related to space exploration and space technologies. It will provide overall policy guidelines and be the nodal department for implementing space technologies and coordinating international cooperation and coordination in the area of global space governance and programs.

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[4] 'In-Space to be new space industry regulator, says ISRO chief Sivan' *The Hindu* (Bengaluru, 06 June 2020) <https://www.thehindu.com/sci-tech/science/new-space-industry-body-inspace-to-be-in-place-in-3-6-months-ksivan/article31911841.ece#:~:text=IN%2DSPACe%2C%20or%20Indian%20Space,Sivan%20said.> accessed 07 November 2023

[5] 'DOS Structure' (*ISRO*) <https://web.archive.org/web/20140927110830/http:/dos.gov.in/structure.aspx> accessed 07 November 2023

OVERVIEW OF THE SPACE POLICY

The space sector has been recognized as a domain for building cost-effective satellites and this year; all eyes are on India and its space industry. Against this backdrop, the 2023 policy has been introduced as the perfect blend of a public-private partnership. It recognizes the need and potential for private participation in the space sector. Let us understand how the provisions of the policy can help develop space industry standards. The predominant reason is the policy identifies space activities, such as exploration of lunar orbital caps and investigation of the solar atmosphere, and works to promote these crucial operations. It also provides for collaborating with academia to enable industry-academia linkages. On the other hand, ISRO, which is the 6th largest space agency in the world, has been allotted the task of developing space technology by the method of research and application of the research findings.

COMPARATIVE ANALYSIS WITH PREVIOUS POLICIES

Before understanding how the 2023 policy is different from previous space policies of India, it is imperative to gather knowledge about what the previous policies were and what they talked about. The Satellite Communication Policy 1997 was concerned with how the usage of satellite communication in India was governed.[6] The Remote Sensing Data Policy 2001 focussed on how remote sensing data technology could be expanded in India.[7] Then, the National Geospatial Policy, 2016 talked about specific aspects of technologies relating to GDPSS.[8]

As we can witness, all the previous policies were comparatively narrower in what they wanted to achieve and focus on. Whereas, the 2023 policy talks about the larger picture. It brings into light the private companies and places a stronger emphasis on encouraging their participation in India's space activities. It provides more detailed strategies to incentivize and facilitate space operations.

[6] The Satellite Communication Policy 1997
[7] The Remote Sensing Data Policy 2001
[8] The National Geospatial Policy 2016

Additionally, the 2023 policy emphasizes India's goal to increase the scope of its international partnerships in technological development, research, and space exploration. Participation in international lunar and solar missions is another area of emphasis. The previous policies, however, were overly limited and national; they acknowledged the necessity of international collaboration but did not offer specific plans for bringing it about. A more all-encompassing approach to national security in space is outlined in the 2023 policy, which also includes tactics to safeguard India's space assets and defense-related satellite applications. An equally comprehensive foundation for space-based defense applications was not offered by earlier policies.

ECONOMIC IMPACT OF SPACE ACTIVITIES

Economic Contributions of India's Space Program: Antrix Corporation, which is ISRO's commercial arm, provides satellite launch services to international customers and this has become a significant revenue-generating activity. Moreover, ISRO's broadcasting assets, such as the GSAT series of communication satellites, have played a significant role in expanding the reach of communication services in India. This has boosted the telecommunications sectors, contributing to economic growth. Furthermore, the NavIC system, which is India's regional satellite navigation system, has applications in agriculture, transportation, and disaster management, and it has contributed to substantial cost savings in these sectors. An important initiative undertaken by ISRO is that its activities have spurred growth in space-related research and education. The Indian Institutes of Space Science and Technology is one of the most reputed universities that offers courses in space technology and science. As far as employment is concerned, 120,000 people in the OECD countries[9] and 250000 people in Russia are employed in the space sector.[10] In the case of India, the space industry employs more than 45,000 people.[11]

[9] The Space Economy at a Glance 2007

[10] Andre Ionin, 'Russia's Space Program in 2006: Some Progress but No Clear Direction' (*Moscow Defense Brief*, 27 August 2007) <https://web.archive.org/web/20070827204307/http:/mdb.cast.ru/mdb/2-2007/item1/item3/> accessed 07 November 2023

[11] Peerzada Abrar et al., 'India's aerospace start-ups eye rocket launches and planetary missions' *Business Standard* (Bengaluru/Chennai, 26 June 2020) <https://www.business-standard.com/article/companies/india-s-aerospace-start-ups-eye-rocket-launches-and-planetary-missions-120062601687_1.html> accessed 07 November 2023

The growth of India's space program has resulted in the creation of jobs, both directly within ISRO and indirectly in industries related to space technology, manufacturing and research.

INFRASTRUCTURE DEVELOPMENT AND TECHNOLOGICAL ADVANCEMENTS

ISRO's satellite communication capabilities have facilitated direct-to-home (DTH) broadcasting, enabling access to a wide range of television channels across the country. Through initiatives like the Village Resource Centres and Common Service Centres, rural areas have gained access to internet connectivity and agricultural information. In addition, the use of remote sensing technology in urban planning, forestry, and water resource management has improved decision-making and resource allocation. Geographic Information Systems technology, combined with satellite data, is used for urban planning and infrastructure development.

India's successful missions to the moon, i.e. Chandrayaan, Mars (Mangalyaan) and the Sun i.e. Aditya-L1 have highlighted unprecedented technological prowess. Research and development in fields including electronics, materials science and propulsion technologies have been influenced by the space industry. The space industry has promoted the growth of a workforce with specialized skills and academic establishments devoted to space science and technology. This generates a pool of highly skilled engineers and scientists which in turn encourages technological breakthroughs in other fields.

OPPORTUNITIES AND CHALLENGES

Economic Challenges faced by India's Space Program: The space industry demands substantial financial investments, making it challenging for private enterprises and start-ups to cover the high costs. Consequently, the government must take a central role in fostering its growth. Space technology relies on highly specialized knowledge and state-of-the-art advancements. However, India's limited expenditure on research and development poses potential obstacles to sector development. Space-related subjects are only sparsely integrated into the curricula of universities and prestigious colleges. Consequently, there is a scarcity of well-trained professionals entering the field. The space sector not only provides employment

opportunities but also has strategic importance for any nation. Therefore, the government needs to address these challenges that hinder the sector's progress.

MARKET OPPORTUNITIES AND POTENTIAL GROWTH AREAS

India's space sector presents a multitude of opportunities for growth and innovation. With a strong record of accomplishment in launching satellites for various countries, there is a growing demand for cost-effective satellite launch services. This not only offers revenue-generating prospects but also the chance to expand India's presence in the global commercial launch industry. Additionally, the utilization of satellite imagery and data for applications ranging from agriculture and forestry to disaster management and urban planning is on the rise. This trend has created a burgeoning market for remote sensing services and geospatial information, both in the public and private sectors.

The emergence of space-focused start-ups in India further adds to the potential for innovation and entrepreneurship. These start-ups are exploring various areas, including satellite technology, data analytics and space-based applications, contributing to the overall dynamism of the space sector. Lastly, as space tourism gains momentum on a global scale, India has an opportunity to explore this emerging sector, potentially through collaborations with international space tourism companies. These developments collectively highlight the diverse avenues for growth and engagement within India's space sector.

CONCLUSION

The Article provides the background and context for the Indian Space Policy of 2023. It highlighted the policy's twin goals for government and the private sector, emphasizing India's desire to leverage its unique expertise in space technology. The chapter also provided a historical overview of India's Space program development, acknowledging key figures like Vikram Sarabhai and Homi Bhabha and important milestones.

It further discussed the significance of the Indian Space Policy of 2023, focusing on its potential to promote space activities and enhance human understanding of space. The chapter pertained

to explaining the role of private participation and its implications for India's international standing. The article also underscored the importance of private companies in staying competitive and agile within the evolving space industry.

In addition, The Article delved into the economic impact of India's space activities. It mentioned Antrix Corporation's role in providing satellite launch services, ISRO's contributions to broadcasting and navigation, and the space industry's job creation. The chapter underlined the role of space technology in fostering research, education and technological advancements.

Lastly, the Article outlined the economic challenges faced by India's space program, including the high cost of investment, limited research and development funding, and a shortage of skilled professionals. It also explored market opportunities and potential growth areas in the space sector, such as cost-effective satellite launches, remote sensing services, space-focused start-ups and the emerging field of space tourism.