**Space Technologies and SDGs**

**To utilise space-based technolo-gies to their maximum potential, Pakistan needs to overcome several challenges.**

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In December 2023, Pakistan un­veiled its first-ever National Space Policy, highlighting its pro­found determination to strengthen the space industry and build domestic capabilities in space-based technologies. The policy underlines so­cio-economic develop­ment and national se­curity as key focus areas which largely align with the UN’s 2030 Agenda for sustain­able development. The 2030 Agenda comprises a set of 17 interconnect­ed objectives for sustainable devel­opment. Pakistan has adopted these SDGs as a part of its national devel­opment plan and formulated task forces to monitor the progress.

Under its national SDG framework, Pakistan aims to alleviate pover­ty, mitigate water scarcity, and com­bat environmental degradation, all while promoting climate resilience, ensuring food security, and building sustainable communities. However, due to its socio-economic and politi­cal conditions, Pakistan is lagging in achieving these objectives. The inte­gration between national space pro­gramme and SDG Agenda presents a wide range of opportunities for sci­entific advancements and socio-eco­nomic development. Leveraging space-based technologies effectively can propel Pakistan towards attaining a substantial portion of all 17 SDGs by 2030. Pakistan’s indigenous satellites, PRSS-1 and PakTES-1A, have signifi­cant applications in areas like disas­ter management, agriculture, water resource management, oceanic sur­veillance, geological prospection, and environmental monitoring.

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In the agricultural sector, Pakistan is using space-based technologies to gather data on soil mapping, estimate crop areas, monitor crop growth, iden­tify pests and diseases, monitor salin­ity conditions, and determine risks of natural disasters. For example, under the AgriPak project, SUPARCO uses remote-sensing technology to identify and determine most accurate and re­liable areas for wheat production an­nually. However, the results are imple­mented at a limited scale as majority of farmers still rely on traditional tools and methods. A comparative analy­sis between SDGs and applications of space-based technologies shows that in the agricultural sector alone, space-based technologies can help Pakistan achieve SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-being), SDG 8 (Decent Work and Economic Growth), and SDG 12 (Responsible Consump­tion and Production). The applica­tion of space-based technologies also extends to natural disasters manage­ment and suitable climate action. Cli­mate change has badly disrupted the natural cycle of glacier melts and monsoon rains in Pakistan. Under the National Disaster & Risk Management Fund, Pakistan is developing a Natu­ral Catastrophe Model (NatCat) for the timely prediction and assessment of natural disasters, vulnerability, and probable financial damage. A spatial database would enhance the national climate resilience by efficiently man­aging floods, droughts, and other nat­ural disasters.

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Moreover, space-based technolo­gies can be utilised for water resource management. According to Paki­stan’s Council of Research in Water Resources, water scarcity is likely to reach a high-risk level by 2025, lead­ing Pakistan to become the most wa­ter-stressed country in South Asia by 2040. Remote sensing satellites can play an advantageous role in provid­ing real-time information on the rate of glacier melts, the capacity of water bodies, and other such indicators nec­essary to build adequate water capac­ity. In the natural disaster and water resource management sectors, space-based technologies can contribute to­wards SDG 6 (Clean Water and Sani­tation), SDG 7 (Affordable and Clean Energy), SDG 13 (Climate Action), SDG 14 (Life below Water), and SDG 15 (Life on Land). Furthermore, the increasing population and rural to ur­ban migration have created signifi­cant challenges for cities already suf­fering from poor urban services, like clean water supply, sewerage and waste management system, and pub­lic transport. Space-based technolo­gies have instrumental applications in smart urban planning as they can help analyse urban growth patterns and design sustainable cities. They can help fulfill SDG 11 (Sustainable Cities and Communities) and pave way for SDG 1 (No Poverty), SDG 10 (Reduced Inequalities), and ultimately, SDG 17 (Partnerships for the Goals) on both national and international levels.

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However, to utilise space-based technologies to their maximum poten­tial, Pakistan needs to overcome sev­eral challenges. Firstly, Pakistan faces economic constraints, political insta­bility, organisational bottlenecks, and international sanctions. These factors largely hinder the use of space tech­nologies for socio-economic develop­ment. Pakistan needs to work towards focused diplomacy to get SUPARCO out of the US Entity List to eliminate tech­nology export restrictions and sanc­tions. Pakistan must also establish a highly integrated “technology-strate­gy” think tank consisting of strategists, technology experts, military planners, and private sector. This way, Pakistan can generate massive returns through its limited resources and moderate in­vestment from the private sector. Sec­ondly, the National Space Policy does not provide structure of the space pro­gramme or any regulatory framework for its effective governance. The gov­ernment should work towards for­mulating a comprehensive regulatory framework as it would build trust be­tween government and private sector for cooperation in space programme. It would also encourage domestic stakeholders to invest in space tech­nology and enhance attractiveness for foreign investments. Thirdly, Pakistan lacks international partnerships in the area of space cooperation. The coun­try should work towards expanding its external outreach in space, espe­cially with China to harness advanced space capabilities for swift progress.

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There is a huge potential in Pakistan to utilise space technologies for its so­cio-economic development. Through focused diplomacy, regulatory frame­work, and stronger international co­operation, the National Space Policy can act as an effective tool to steer the country towards achieving sustain­able development and keeping pace with global space ventures.

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