**Satellite internet**

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Globalization has benefited developed and developing nations by providing them access to unexplored markets and cultures around the world through various innovative technologies and communication channels. To reap its maximum benefits, the significance of sustainable global connectivity cannot be overstated.

The ability to communicate and transact with anyone and everyone from anywhere in the world is an obvious benefit of global connectivity. In contemporary times, global connectivity relies mainly on the internet. According to some estimates, there were approximately 4.95 billion active internet users around the globe in January 2022 – 62.5 percent of the world’s population.

Satellite internet has been gaining prominence in the realm of global connectivity. Because of its easy availability, global coverage, and independence of terrestrial infrastructure, satellite internet is supposed to replace traditional cable internet anytime soon. ‘Satellite internet is the process of accessing the internet with the help of communication satellites, usually geostationary satellites’ (now low-Earth satellites also). Unlike cable internet, which operates through intercontinental submarine cables and optic fiber, satellite internet operates through three basic interconnected components that form a network: network operation centers (NOCs), communication satellites, and dish antenna connected with a modem at the user-end.

In the said network, data travels from Internet Service Providers (ISPs) to NOCs via cables. NOCs, which act as ground stations, transmit data in the form of radio waves to satellites which then further transmit the same data to users around the globe. The dish antennas installed at the user-end receive the data from the satellite and the connected modem translates it to make it usable for PCs and other devices. The same channel is followed to transmit (upload) data from the user-end to the NOCs, and finally, to the Internet to complete the data cycle.

The penetration of satellite internet in the global internet market has been growing at a rapid pace since the introduction of private companies in commercial space-related activities. During the Covid-19 pandemic, the adoption of satellite internet marked significant growth because of its availability in far-flung areas.

Allied Market Research estimates that the value of the global satellite internet market was around $2.93 billion in 2020, and the way it is progressing, it is predicted to reach $18.59 billion by 2030, with a Composite Annual Growth Rate (CAGR) of 20.4 percent. HughesNet, Viasat, and Starlink are the top three satellite internet providers so far in 2022. The services provided by HughesNet and Viasat are largely dependent on geostationary satellites orbiting 22,236 miles away from Earth which is quite a long distance. Moreover, these companies are offering their services in the US only.

A renowned spaceflight company SpaceX has started its satellite internet venture Starlink, which is set to provide its services around the globe through a mega constellation of thousands of Low-Earth Orbit (LEO) satellites. Starlink has already been granted permission to launch 12,000 satellites by the US Federal Communications Commission (FCC) and it is looking for permission to launch 30,000 more in the near future. This has raised a lot of apprehensions regarding space pollution by various national space agencies as well as environmentalists. Even NASA has written a letter to the FCC, highlighting concerns about the risks of satellite collision in orbit because of the Starlink satellites.

In late January, several news items regarding Starlink being barred from offering its services in Pakistan were circulating in national media. On January 19, 2022, the Pakistan Telecommunication Authority (PTA) clarified that “… satellite broadband provider Starlink has neither applied for nor obtained any licence from PTA to operate and provide internet services in Pakistan”. Unfortunately, there is no national legal framework regarding regulating space-related activities as well as services in Pakistan. The Ministry of IT and Telecom has been involved in talks with the Starlink officials regarding the policy and operation vis-a-vis satellite internet access in Pakistan, but there has been no substantial outcome.

Despite the technical and environmental concerns, satellite internet is a technology being rapidly adopted by people around the globe. It is going to alter the way homes, small and medium businesses, and community internet services will operate in the near future. It will also help reduce the digital divide between the developed and developing world by providing equal opportunities to interact and do business. However, the internet services provided by the constellations of satellites need to be stringently regulated at the global and national levels.

International regulating agencies need to ensure that the satellites launched by private companies do not add to space junk/debris or disrupt the vital space services provided by other satellites. Similarly, at the national level, the government of Pakistan needs to formulate regulatory guidelines regarding the operations, registration, licensing, and taxation of space-related technology services in the country for their smooth adoption.

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