The Socio-Economic Value of Satellite Communications

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Valdani Vicari & Associati

LS telcom

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Executive Summary

The number of satellite broadband users is set **to double to at least 500 million people by 2030**.

Communications services provided by satellites (satcoms) are set to deliver the following social and economic benefits:

- **Broadband delivery to households**: US$52 billion in 2030 (up from US$26 billion in 2022), as 81 million students benefit from satcom tele-education and 74 million people from satcom tele-medicine by 2030
- **Media broadcasting**: US$86 billion by 2030
- **Broadband on the move**: US$121 billion in 2030 (up from US$15 billion in 2022), as innovative new services are deployed.

Cellular backhaul via satellites - a crucial technology to bring connectivity where terrestrial infrastructure cannot reach - will generate market revenues of almost **US$30 billion by 2030.**

The **Internet of Things** will use satcoms to connect medical wearable devices and other sensors and monitors.

New satellite applications, such as inter-satellite links and direct-to-cell phone connectivity, will take off in the coming years.

Introduction

The purpose of this study, conducted for the Global Satellite Operators Association (GSOA), is to assess the socio-economic benefits of satellite communications (satcoms) in different use cases across the globe. Satcoms provides meaningful connectivity that complements terrestrial networks and contributes to the delivery of universal service and coverage. Terrestrial infrastructure can be severely limited by economic and physical constraints, such as the cost of deploying extensive networks, engineering to reach remote areas and unsustainable energy consumption. Satellites offer a cost-effective means to cover large swaths of the earth surface, reaching people where terrestrial networks are unavailable, generating substantial direct and indirect social and economic benefits.

As of September 2022, 2.7 billion people worldwide were not online.[1] Satellite connectivity can significantly help reduce this digital divide and bring broadband to many more people. However, a predictable regulatory and spectrum environment is critical to achieve this goal.

1 Key use cases

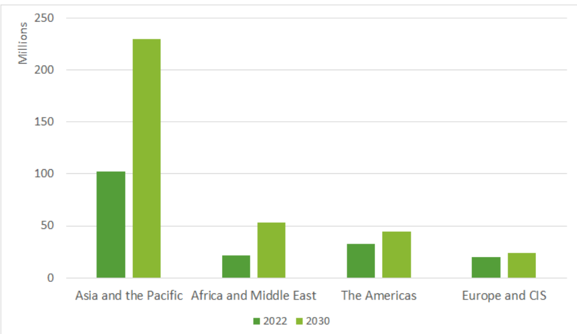
With the deployment of new high-capacity satellite constellations and recent technology advances, satcoms is a vibrant and competitive market. This paper analyses the socio-economic impact of the following three main use cases for satcoms:

1. Broadband for households, education, healthcare, emergency, and critical services
2. Media broadcasting
3. Broadband on the move

1.1 Broadband for households, education, healthcare, emergency and critical services

New generations of satellite antennas of various sizes, combined with digital and software-defined spacecraft, have significantly improved the bandwidth and radio spectrum usage of satellite transmissions. Unlike rolling out fibre or other ground infrastructure, satellite broadband deployment can be straightforward and cost-effective. It can also be tailored to a variety of users' needs. This means that even a rural village, an isolated hospital or an entire network of schools can be served in an economically efficient manner.

Figure 1: Satcom broadband users, in 2022 and 2030, by region



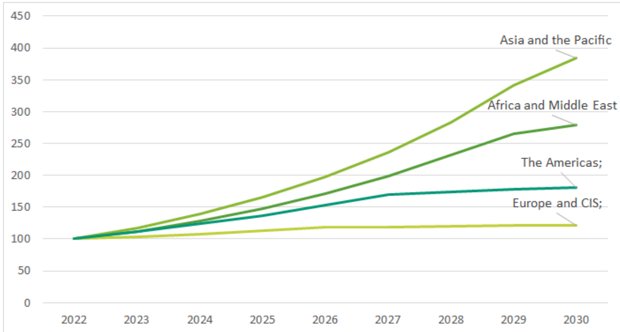
Each region of the world [2] [3] [4] will experience an increase in the number of satellite internet users between 2022 and 2030, as shown in Figure 1. Sub-Saharan Africa and Asia-Pacific will see the largest relative growth. In Africa and the Middle East, the number of users will grow from 20 million to 50 million, and in Asia-Pacific from 100 million to 230 million, by 2030.

140% growth of satcom broadband users in Africa and Middle East by 2030	120% growth of satcom broadband users in Asia-Pacific by 2030

1.1.1 Broadband delivery to households

Satellite internet technology can deliver high speed broadband to households in unserved or underserved areas.

Figure 2: Index of socio-economic benefits of satellite broadband for households



The global socio-economic benefits of satellite broadband for households are estimated to be approximately:

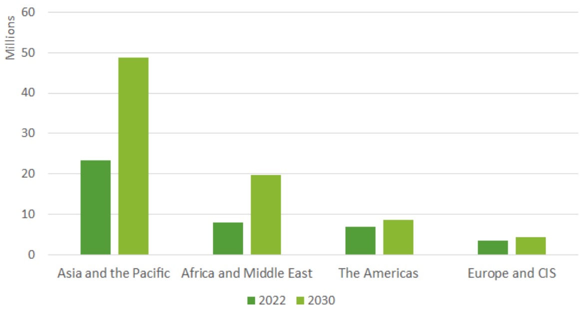
- US$26 billion in 2022
- US$52 billion in 2030

Figure 2 shows the annual socio-economic benefits of household broadband in each region indexed to the benefits of the baseline year (2022). Although in absolute values, the economic benefits are higher in the Americas and Europe and CIS, due to the greater digitalization of their economies, in relative terms Asia- Pacific, together with Africa and the Middle East, are set to see the biggest growth in benefits by 2030. However, it is crucial to foster satellite broadband for households in every region of the world in order to address the digital divide. Broadband provides access to information, online transactions,[5] telework, communications, and entertainment, among other things, bringing essential services to everyone in the world, regardless of their related economic contribution.

1.1.2 Broadband for tele-education and tele-medicine

Satellites can deliver high speed broadband to students, schools, doctors, and hospitals in underserved areas.

Figure 3: Population addressable by satcom tele-education in 2022 and 2030, by region

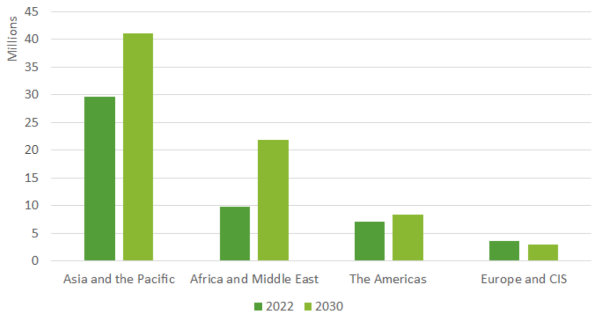


Broadband is crucial to provide online educational material to students, and to allow them to catch up on missed classes when sick or they are unable to be in the classroom (e.g., because of travelling time). As shown in Figure 3, the regions that will see the largest benefits from satellite broadband for education are Africa and the Middle East, and Asia-Pacific.[6]

Indeed, the population of these regions is young and set to grow fast during the decade. Moreover, in Sub-Saharan Africa, 60% of the population is still not online (compared to 10% in Europe).[7] Considering the vast landmass of the African continent and the thousands of islands in Asia-Pacific, satellite is indispensable to bridge this connectivity gap.

147% growth of satcom tele-education users in Africa and the Middle East by 2030	109% growth of satcom tele-education users in Asia-Pacific by 2030

Figure 4: Population addressable by satcom tele-medicine in 2022 and 2030, by region



Satellite tele-medicine can help to provide adequate access to healthcare to people living in hard to reach and unserved areas. General practitioners in remote locations could consult specialist doctors from any other area of the world, to ensure that their patients receive the best treatments. At the same time, tele-medicine allows patients to save time and costs by receiving the medical consultation at home instead of going to the doctor's premises. In the case of contagious diseases, tele-medicine can help reduce the spread of the infection. As shown in Figure 4, Asia-Pacific and Africa and the Middle East are set to experience the biggest increase in the user base of satellite tele-medicine.[8] In these regions, a substantial share of people lack adequate access to tele-medicine via terrestrial networks.

1.1.3 Broadband for emergency and critical services

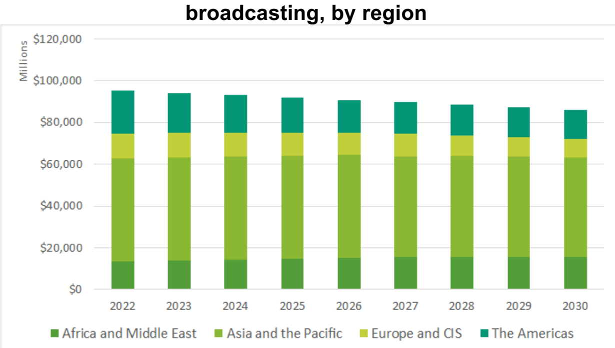
If cell towers and fibre cables are wiped out by extreme weather events or other disasters, cable or cellular connections will not be available until the ground infrastructure is rebuilt. This is where satcoms excel: with little physical infrastructure needed, satellite services can be deployed in a very short time span. Satellites are the only means to guarantee communications in every place of the world during times of emergency. Satcoms have played a pivotal role in the response to the earthquake in Turkey and Syria in February 2023.[9] Moreover, for time-critical services, such as online banking transactions, satellites can ensure redundancy for business continuity in case of a terrestrial infrastructure failure.

1.2 Satellite media broadcasting

Access to live information and cultural diversity is a fundamental human right.[10] Satellite TV and radio have fostered this right for decades in an efficient and effective manner. Satellite TV is now directly benefiting from software-defined and coding/modulation innovations that improve the efficiency of spectrum usage and bandwidth flexibility. Satellite television and radio are a primary source of information and entertainment for nearly 500 million people worldwide. At major sporting events, such as the FIFA World Cup or the Olympic Games, that attract vast audiences, satellite TV and radio do not experience traffic congestion issues. Moreover, satellite broadcasting plays a crucial role in remote areas where other broadcasting technologies provide a sub-optimal user experience.[11 12 13]

Although satellite media broadcasting (like traditional broadcasting) is facing mounting competition from video-on-demand services, it will still be generating more than US$80 billion of socio-economic benefits in 2030 (see Figure 5). In some regions, such as Africa and the Middle East, the satellite media broadcasting market continues to grow.

Figure 5: socio-economic benefits of satellite media broadcasting, by region



1.3 Broadband on the move

Broadband connectivity on an airplane, train, ship or car is no longer a luxury, but a requirement. Passengers and crew members expect and need broadband while travelling to communicate with colleagues, family and friends, use social media, telework, and be entertained, especially during lengthy flights and voyages. Satellites are the most suitable and cost-effective solution to provide connectivity on the move since the strength of their internet signal does not depend on geographical locations or altitude.[14]

Figure 6: socio-economic benefits of aviation broadband connectivity, by segment

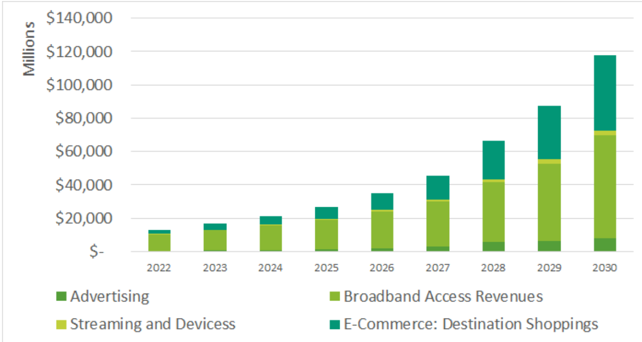


Figure 7: socio-economic benefits of maritime broadband connectivity, by segment

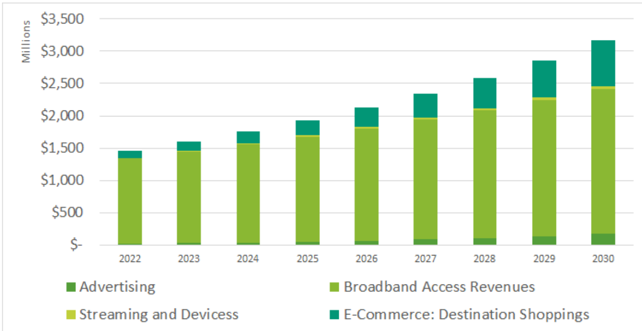
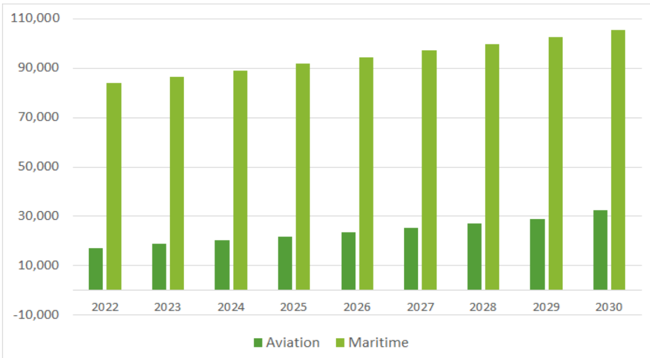


Figure 8: The number of connected airplanes and ships, by year



The global socio-economic benefits of satellite broadband on the move are set to jump from US$15 billion in 2022 to US$121 billion in 2030 (see Figures 6 and 7).[15]

$15 billion global socio-economic benefits of satcoms broadband on the move in 2022	$121 billion global socio-economic benefits of satcoms broadband on the move in 2030

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2 Additional use cases

Employing satellite connections to backhaul cellular traffic provides large amounts of capacity to connect individual households and businesses across the world, especially in sparsely populated regions, islands, and other remote areas. Mobile network operators would not be able to serve these communities without satcoms: academic research suggests that using 4G with a wireless backhaul is the most cost-effective way to serve those areas.[16] Satellite cellular backhaul market revenues are set to be approximately US$10 billion in 2022 and reach almost US$30 billion in 2030,[17] when satellite backhaul will serve at least 200 million users by 2030.[18]

Several new satellite applications are set to take off in the coming years. For example, inter-satellite links will enable the exchange of real time data between spacecraft and ground stations.[19] Moreover, several smartphone makers have recently launched phone models capable of directly connecting to satellites (direct-to-cell satellite connectivity) for emergency messaging services. Other capabilities are likely to materialize in the coming years.[20] Satcoms will also support the growing Internet of Things market, connecting everything from households' appliances to tracking and remote sensing devices.[21]

Sources and formulas

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[6] The following formula is used to calculate the number of yearly tele-education users: Users of satcom for tele-education for a country (year n) = schooling age population (year n) * uptake of satcom (year n); additional information on the computation methodology can be found in D1 (sources of the data of the formula: a), b), and c) Statista (2023), *Ibid*).

[7] ITU (2022); *Ibid.*

[8] The following formula is used to calculate the number of yearly tele-medicine users: Users of satcom for tele-medicine for a country (year n) = share of population with inadequate access to healthcare (year n) * population (year n) * uptake of satcom (year n); additional information on the computation methodology can be found in D1 (sources of the data of the formula: a), b), c) and d) World Health Organization (2022); THE GLOBAL HEALTH OBSERVATORY; Who.int; retrieved January 2023 from https://www.who.int/data/gho/data/indicators/indicator-details/GHO/uhc-index-of-service-coverage).

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[15] The following formula is used to calculate socio-economic benefits: Benefits of satellite broadband on the move for aviation/maritime (year n) = satellite broadband revenues by market segment for aviation/maritime (year x) / (number of operational airplanes/ships in year x * share of connected airplanes/ships in year x) * number of connected airplanes/ships in year n (sources of the data of the formula: c), e) London School of Economics (2018); Chapter One: Quantifying the commercial opportunities of passenger connectivity for the global airline industry; retrieved from https://www.lse.ac.uk/business/consulting/reports/sky-high-economics , f) Equasis (2021); The 2021 World Merchant Fleet Statistics from Equasis; equasis.org; retrieved from https://www.equasis.org/Fichiers/Statistique/MOA/Documents%20availables%20on%20statistics%20of%20Equasis/Equasis%20Statistics%20-%20The%20world%20fleet%202021.pdf and g) 21. Digital Journal (2023), *Ibid*).

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