



White Paper

# The value of telling with a **supply** chain

flexible to withstand  
the **fiber** growth that it  
experiences  
Latin America

The value of having a flexible supply chain for to support the growth of fiber that Latin America is experiencing



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This study was commissioned by FYCO Telecommunications and carried out between June and October 2022.

#SurfTheLatamDigitalPolicyScene

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# Executive Summary

Fiber optics has undergone a strong evolution over the last few decades, positioning itself as a technology that has been able to respond to the growing demand for greater bandwidth and low latency, whether provided by fixed or mobile means.

**Sustained growth in fiber deployments for FTTH technology.** By the end of 2021, the Latin American region had 103 million homes passed with FTTH/B networks (23 million more than the previous year)<sup>1</sup>, which is equivalent to 60% of homes in the region. It is estimated that there will be 158 million homes with FTTH in Latin America by 2026, representing 91% coverage and an increase of 54 million homes in 5 years (an annual growth rate of 9%). As for FTTH subscribers, there were 46 million in 2021, and an annual growth rate of 15% is expected over 5 years, reaching 94 million.

**5G technology as another driver of fiber growth.** Fiber plays a fundamental role in connectivity, both for homes and mobile devices. The evolution from 4G to 5G mobile technology will require significant deployments of antennas and microcells to guarantee the high bandwidth and low latency that new 5G solutions demand. 5G adoption in Latin America began in 2022, and it is estimated that 5G subscriptions will reach 240 million connections by 2027.

reaching 35% of mobile subscriptions.

**The challenge of fiber deployments in Latin America.** Timely and efficient deployment of fiber optics in Latin America will be necessary to achieve the goals regarding the adoption of FTTH/B and 5G. Achieving such deployments is no trivial task, as it requires considering a series of adverse factors that operators and governments must contend with. This involves managing a complex supply chain subject to various variables (both exogenous and endogenous) that can lead to inefficiencies and, ultimately, delays in fiber deployments. The fiber optic supply chain comprises nine links. Of these nine, the links of production, international logistics and transport, customs, and local warehousing, distribution, and delivery to the customer are the ones that have a significant impact on fiber deployment delays, and these are the links on which this study focuses.

**Inefficiencies in fiber supply and the required specialization.** Each link in the chain presents its own complexities and bottlenecks, which can result in delays.

There are many risks and variables associated with fiber optic procurement that make this task very complex, especially for telecommunications operators, whose main activity is not deploying fiber optics or connectivity infrastructure in general. These risks can include inventory shortages, longer production, transportation, or import lead times, errors in product specifications or delivery, among others.

**Inefficiencies in the supply chain will result in operators having less capacity to acquire new customers and a degradation of service quality, leading to a loss of market share and revenue.** An operator experiencing inefficiencies in its fiber deployments could lose more than 5 percentage points of market share in the next 5 years, thus losing approximately 15% of its revenue during that period.

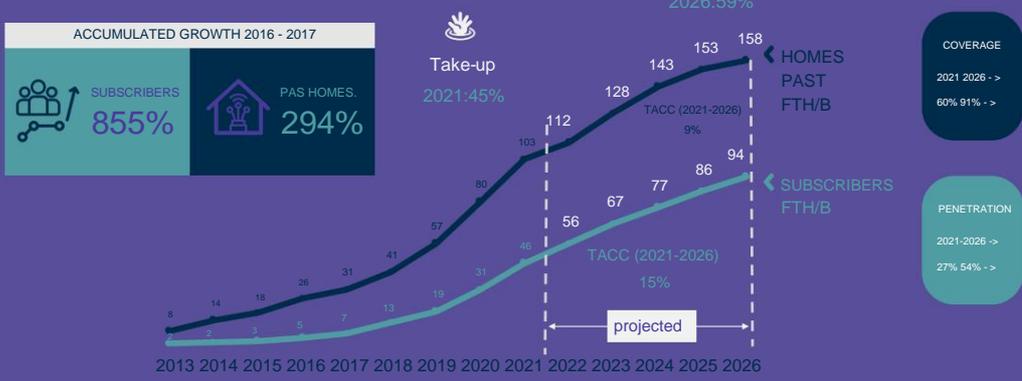
**Delays in fiber optic deployments could hinder connectivity projects and the closing of the digital divide in Latin America.** Over the next five years, the region faces a demand for fiber equivalent to 7.5 million kilometers, and given supply inefficiencies, deployments could be delayed by up to 19 months, with the resulting impact of reduced broadband and 5G penetration on society and the economy.

**It is vitally important that telecommunications operators do not experience delays in fiber deployments.** The telecommunications industry is trending towards specialization and offshoring non-core activities, reducing infrastructure investments and moving towards contracting processes as a service. Specialization in fiber deployments requires a broad portfolio of suppliers, detailed knowledge of all processes, financing schemes tailored to business needs, and a collaborative approach.

with dynamic inventories close to deployments and, finally, training of technical teams.

1. FBA Latam Chapter.  
2. SmC+

Evolution of subscribers and homes passed by FTTH/B networks in Latin America



The telecommunications industry is trending towards specialization

- Focus on the core business and outsourcing of support activities
- Reduction of CAPEX and migration towards OPEX
- Migration towards processes as a service (X-as-a-Service)

The fiber supply chain and its related stages



An inefficient operator loses potential to increase your base...

...Losing 5.4 percentage points of market share in 5 years...

... Which results in a loss \$14 million



Delays in fiber deployments would hinder connectivity projects and the closing of the digital divide in Latin America

Specialization in fiber deployments requires having:



- A broad portfolio of suppliers
- A detailed knowledge of all the processes
- Financing schemes that are adapt to the needs of the business
- Working with dynamic inventories and close to the deployments
- Training of technical teams

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The value of having a flexible supply chain to support the fiber growth that Latin America is experiencing

# Introduction

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Fiber optics has undergone a strong evolution over the last few decades, positioning itself as a technology that has been able to respond to the growing demand for greater bandwidth and low latency, whether provided by fixed or mobile means.

Other regions in the world, such as Asia and Europe, have adopted fiber optics as their primary fixed-bandwidth technology. Latin America has been adopting it slowly, in a market that has been heavily dominated by other fixed technologies such as cable and copper. Therefore, the region currently presents many opportunities for growth in fiber deployments given the persistent digital divide, not only in terms of access, but now also in terms of higher bandwidth in areas where connectivity was already available.

The growing deployment of fiber optics generally observed requires a highly dynamic supply chain to meet changing demand and provide connectivity services as quickly as possible. In this regard, the various operators, stakeholders, and governments in the region must be involved and understand the importance of having a

a supply chain that is flexible enough to reduce potential bottlenecks and deployment delays.

This study aims to shed light on the realities affecting the supply of optical fiber in Latin America. The report begins with a description of the exponential growth in fiber optic demand that the region will experience in the coming years. The second chapter details the different links in the optical fiber supply chain for stakeholders in Latin America and identifies the main bottlenecks that operators in the region must address.

Subsequently, an analysis is presented of the impact that inefficiencies in this supply chain could have from a commercial and business point of view for an operator.

This analysis is then complemented by an examination of the implications for governments and society as a whole. Finally, conclusions and recommendations are provided to stakeholders involved in fiber optic deployment in Latin America, aiming to adopt a deployment model that remains flexible in the face of challenges affecting fiber supply.

# Latin America expects exponential growth in fiber optics

Although internet access in Latin America has been gradually increasing over the years, the region still lags behind others in the world.

Especially when observing the deployments and access to high-speed fixed networks available in isolated areas, where it is more expensive to provide this type of service.

## Limited internet access in America

In Latin America and the Caribbean, 26% of the population still lacks internet access. This value is lower than the world average of 40% but presents a significant gap when compared with OECD countries, Europe or the United States, where 86%, 84% and 91% of the population have access to the internet<sup>3</sup>.

Efforts to provide connectivity in the region have focused on urban areas, which is why America has comparable urban coverage.

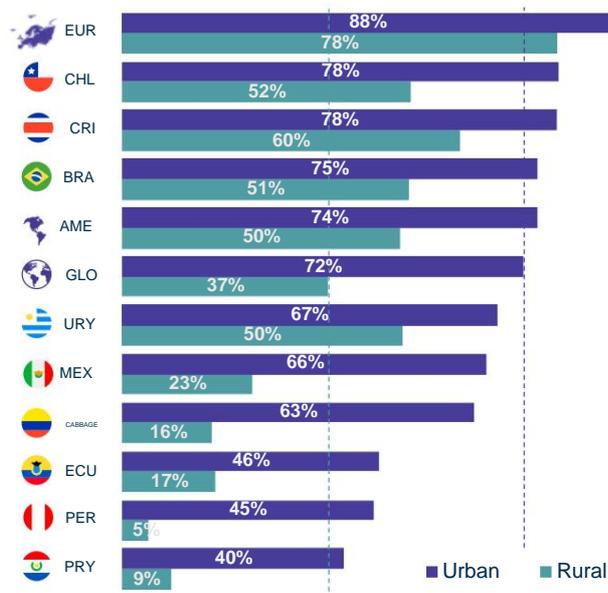
with other regions. In fact, by 2019, the Americas had 74% of households with internet access in urban areas, compared to 88% in Europe and 72% globally. However, the picture is different when looking at the percentage of households with internet access in rural areas, where there is a drastic reduction compared to urban areas (reaching 50%, significantly lower than the 78% in Europe)<sup>4</sup>.

3. World Bank. [People who use the internet \(% of the population\)](#).

4. SmC+ analysis based on ITU data.

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ILLUSTRATION 1  
**Households with access to urban-rural internet (2019)**



Note: Argentina is not included because there is no data for the rural area and the data for the urban area is from 2016 and 2017.

Source: SmC+ analysis based on ITU data

While the world's urban population has virtually universal mobile network coverage, a significant gap remains in rural areas. Therefore, it is crucial to have coverage expansion plans that include new infrastructure in these isolated regions. The situation in the Americas is similar regarding mobile network coverage, with a substantial gap.

between urban and rural areas (in the case of 4G, urban coverage reaches 98% and rural coverage 54%). Additionally, having mobile coverage does not necessarily mean that households have internet access.

Additionally, it should be noted that, in addition to the limitation of internet access due to a lack of infrastructure deployments, there is also the limitation of access to devices, digital capabilities and quality internet (considering speed and latency).

This delay in connectivity and digitization in Latin American and Caribbean countries has drastically accentuated the economic and social consequences of COVID-19.

The COVID-19 pandemic increased the demand for digital tools to enable the remote continuation of economic, educational, and social activities. Indeed, the pandemic demonstrated that without adequate digital infrastructure, it is impossible to manage the activities of a society that has become dependent on internet access and its reliable operation.

Digital infrastructure contributes not only to maintaining daily activities, but also to the socio-economic recovery of the region, through digital tools and services that serve to meet new demands such as distance education and teleworking, among others.

To achieve these objectives, coverage and quality of access are required.

## Fiber plays a fundamental role in connectivity, both for homes and mobile devices.

Fiber optics is the medium for providing robust connections, and it has the particularity of being a scalable technology due to the high bandwidth levels it can handle, as well as the low latency levels. In this sense, fiber optics is used to support the main infrastructures that provide connectivity, such as submarine cables.

high capacity, backbone networks, home networks (pure or hybrid) and mobile connectivity technologies.

Regarding backbone networks, fiber has been adopted by governments as the means to bridge the digital divide, due to its ability to transport data from

High-speed interregional connections. Backbone networks offer greater opportunities for telecommunications operators to improve coverage in isolated areas that lack internet access due to adverse geographical conditions where deploying networks is economically unfeasible.

Among the different backbone network initiatives deployed by governments, countries such as Argentina with REFEFO, Colombia with PNFO, Uruguay with the national network of ANTEL, Paraguay with the networks of COPACO and ANDE, Bolivia with the PRONTIS network, Peru with RDNFO, Chile with FON, among others, stand out.

Universal Service Funds (USFs) are promoted by governments with the comprehensive goal of reducing the digital divide. These initiatives generally seek to subsidize deployments in rural areas and encourage investment in telecommunications infrastructure.

Regarding last-mile connectivity, pay attention to the number of devices per

Due to the bandwidth and latency requirements of home networks, legacy deployments are being replaced by fiber to the home (FTTH) deployments.

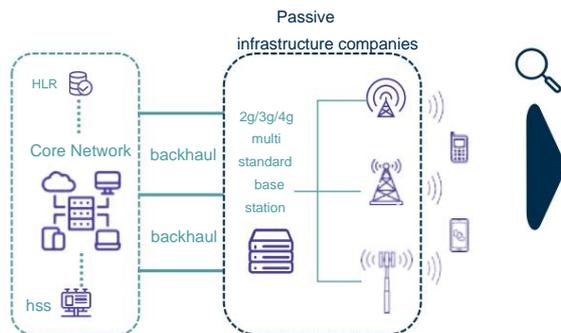
With regard to mobile device connectivity, it relies heavily on high-capacity fixed networks that can provide large bandwidths to existing mobile repeater points.

The evolution of new technologies, such as 5G, is forcing operators to migrate to new technologies with greater transmission capacity, such as fiber optics, and to densify antennas and cells in order to guarantee bandwidth, reduce latency, and ensure service stability. For example, as is the case with 5G, and given its uses and low latency requirements, deployments of macrocells as well as microcells with significant urban coverage will be necessary, requiring connectivity via fiber optics.

ILLUSTRATION 2

## General scheme of a mobile telephone network

General scheme of a mobile telephone network

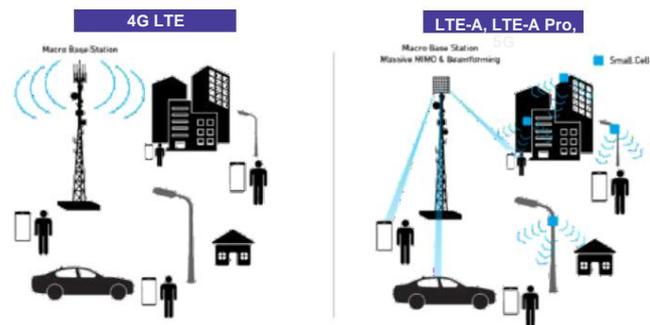


Source: SmC+ analysis

For the deployment of new technologies, there will be new models where fiber and 5G will be associated<sup>5</sup>, such as:

- **Private networks:** consist of autonomous networks whose components reside in a single facility made up of micro towers that connect to an organization's local area network (LAN) and its business applications.
- **Neutral host:** These types of networks provide value-added services to help mobile operators improve delivery

The evolution towards a heterogeneous network with massive antennas MIMO and small cells. All connected with fiber...



indoor and outdoor connectivity for its subscribers.

• **New Smart cell models:** in this

With 5G networks, each company will have its own deployment environment and its own challenges for the best installation and management of connectivity with small cells.

There is a general consensus that broadband penetration results in growth in gross domestic product,

5. SmC+ analysis based on data from the Small Cell Forum's "Neutral hosts requirements".

The value of having a flexible supply chain to support the fiber growth that Latin America is experiencing

This will have a direct economic impact on job creation related to network infrastructure and an indirect impact on productivity improvement as a result of adopting more efficient processes. It is also proposed that it will have induced effects on new economic activities that will boost the economy and allow for GDP growth.<sup>6</sup> The ITU maintains that a 10% increase in broadband penetration in Latin America could be reflected in a 1.7% increase in GDP for mobile broadband and a 1.6% increase for fixed broadband.<sup>7</sup>

logistics, distribution, foreign trade, real-time supply and better customer knowledge amount to about 31 billion dollars.



**Manufacturing:** This sector is estimated to be worth \$34 billion with the deployment of smart manufacturing or Industry 4.0.



**Financial services:** \$16 billion represents the value of this sector caused by access to digital services for a larger portion of the population, thus achieving greater banking penetration.

According to Katz-Cabello<sup>8</sup>, mobile expansion, supported by fiber optics as a fixed transmission technology, will boost different value chains in the region<sup>9</sup>, with the impact on them estimated at around 200 billion dollars by 2030.



**Public sector:** This segment is estimated to be worth 55 billion dollars, associated with improvements in public sector productivity, open government strategies, cooperation and coordination between government entities and public services such as health, education, security and smart cities.



**Agriculture and food:** \$18 billion is estimated to be the value related to increased productivity due to the use of sensors, management systems, monitoring, and optimization based on Big Data.



**Commerce:** The impact on the entire e-commerce value chain, including the processes of



**Professional services:** \$41 billion in value is unlocked in professional services due to the reduction of the digital divide between urban and rural centers and due to the provision of services remotely.

## Sustained growth in fiber deployments

The development of fiber optic and 5G technologies is vital in the region, as they will support new economic and social dynamics. In this regard, there has been a continuous increase in fiber deployments, as well as in the adoption of this technology by end users within the region.

Latin America (18 countries under study) had 103 million homes passed with FTTH/B networks, representing 60% of homes in the region. Comparing this result with those from December 2020, this translates to 23 million homes added to the network in less than 12 months and an increase in FTTH/B coverage of more than 13 percentage points. Similarly, the FBA Latam Chapter estimates that 158 million homes in Latin America will be reached with this technology.

According to FBA Latam Chapter 10, by the end of 2021 the Americas region

6. CAF "Expansion of the BA".

7. ITU Digital Trends 2020.

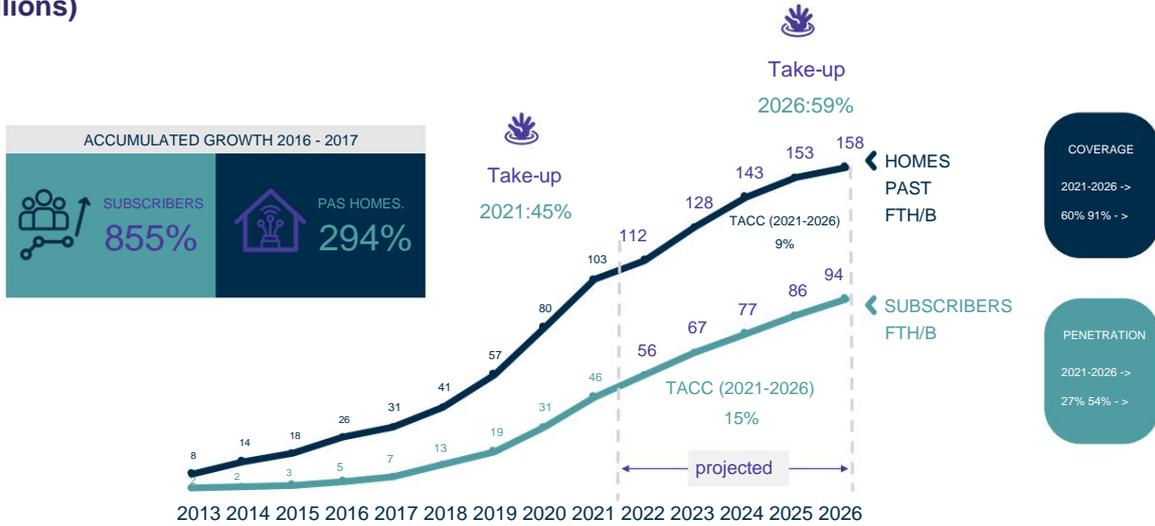
8. The Value of Digital Transformation through Mobile Expansion in Latin America. Katz, Cabello. 2019

9. Taking into consideration the following countries: Argentina, Brazil, Chile, Colombia, Mexico and Peru.

10. FTTH/B Panorama 2021 LATAM. FBA Latam Chapter.

ILLUSTRATION 3

**Evolution of subscribers and homes passed by FTTH/B networks in Latin America (millions)**



Source: FTTH/B Panorama 2021 LATAM. FBA Latam Chapter, SmC+ analysis

By 2026, this represents 91% coverage and an increase of 54 million users in just five years. This certainly speaks to the rapid expansion of fiber optic networks in major Latin American countries and demonstrates that the region's strategy is solidifying towards adopting fiber as the primary data transmission medium.

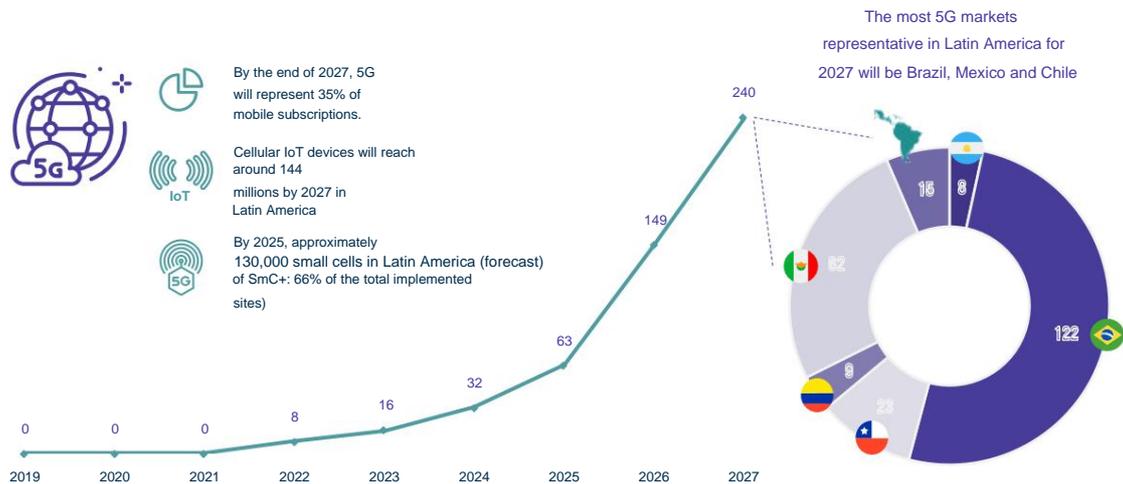
reaching 94 million FTTH/B subscribers, which represents a fiber adoption rate of 54% of households.

Regarding 5G technology, as can be seen in the following illustration, its adoption in Latin America began in 2022 after experiencing delays in the various auctions for the radio spectrum required for its development. The path forward is beginning to take shape around this technology, and it is estimated that 5G subscriptions will reach 240 million connections by 2027, representing 35% of total mobile subscriptions.

FBA LATAM reports 46 million FTTH/B network subscribers by the end of 2021, an increase of 15 million subscribers compared to 2020. It is estimated that the region will grow at a rate of 15% annually until 2026.

ILLUSTRATION 4

**The adoption of 5G to support backhaul (millions of 5G connections)**



Source: FTTH/B Panorama 2021 LATAM. FBA Latam Chapter, SmC+ analysis

11. Analysis and estimates of SmC+ based on public information and information from Ericsson and GSMA.

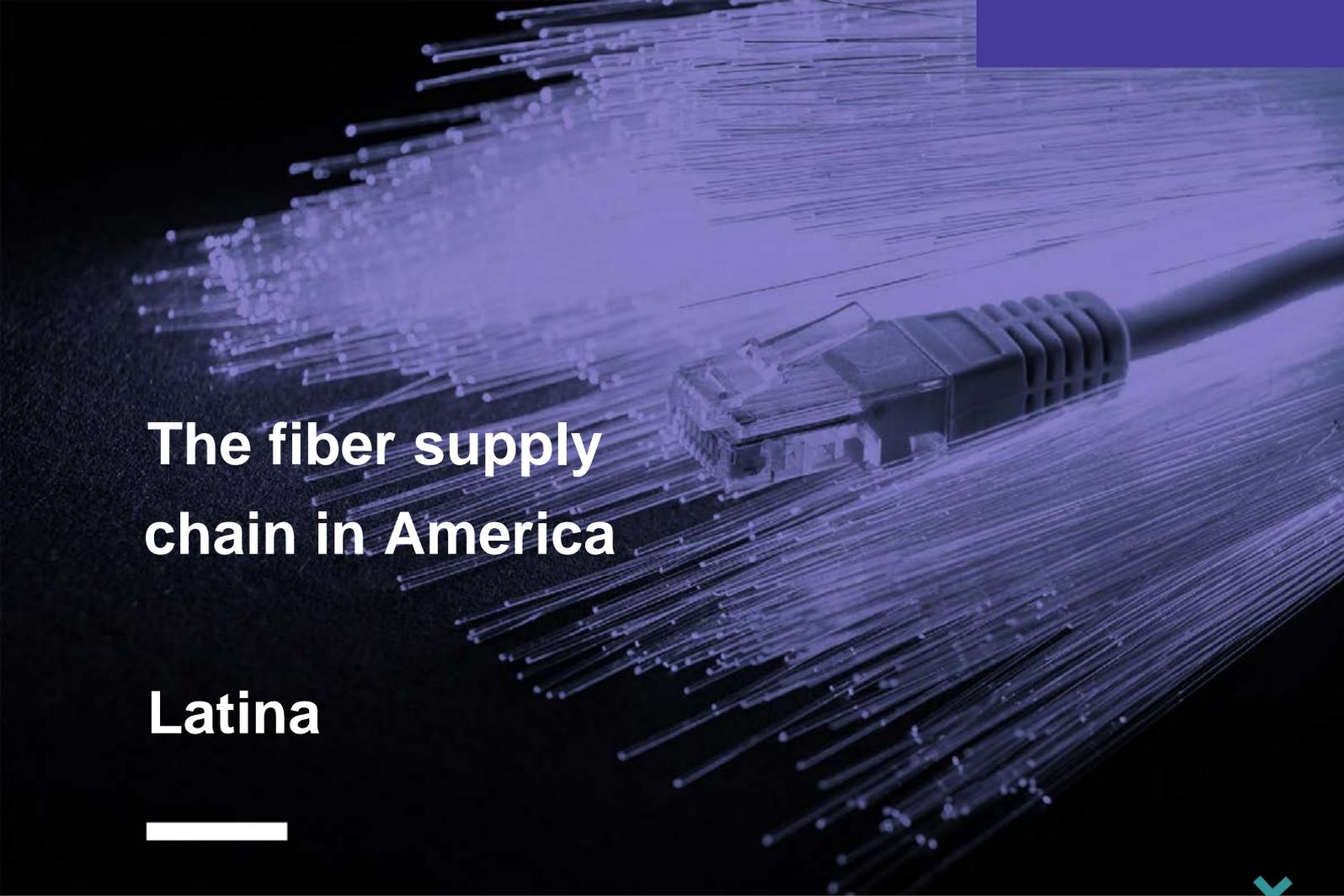
## Machine Translated by Google

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As can be seen in the previous illustrations, it is expected that the number of 5G subscribers in Latin America will surpass FTTH/B subscribers by 2026, given the exponential growth expected for 5G resulting from spectrum auctions and the required infrastructure deployments. 5G presents a

The annual growth rate is significantly higher because, unlike FTTH/B, where each subscriber mostly corresponds to a household, subscriptions are at the individual level, and this is further boosted by connected devices from the massification of the Internet of Things (IoT).





# The fiber supply chain in America

## Latina

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Timely and efficient deployment of fiber optics in Latin America will be necessary to achieve the goals regarding the adoption of FTTH/B and 5G.

Achieving such deployments is not a trivial activity, as a number of adverse factors must be taken into account.

which operators and governments have to deal with, since it involves managing a complex supply chain subject to different variables (exogenous and endogenous) that can result in inefficiencies and, ultimately, delays in fiber deployments.

## Factors adverse to fiber deployment

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Currently, supply chains face three factors that require special attention to ensure their continued sustainability over time.<sup>12</sup>

✘ **Scarcity:** Since the pandemic, many industries have experienced resource shortages. In this context, organizations must create a supply chain that allows them to synchronize the different links to cope with short-term resource changes and manage crises effectively.

✘ **Volatility:** There are significant fluctuations in the current fiber supply chain, primarily due to the health crisis, container shortages, and recent conflicts. This situation is forcing a rapid response from both operators and input suppliers.

✘ **Agility:** the traditional supply chain is becoming more inflexible and, therefore, it is necessary to adapt quickly to new processes.

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12. Arthur D. Little (2022). "The sustainable and highly productive supply chain".

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It is important to note that Latin America is heavily dependent on components produced in Asian countries, primarily China. While there is fiber component production in Latin America and North America,

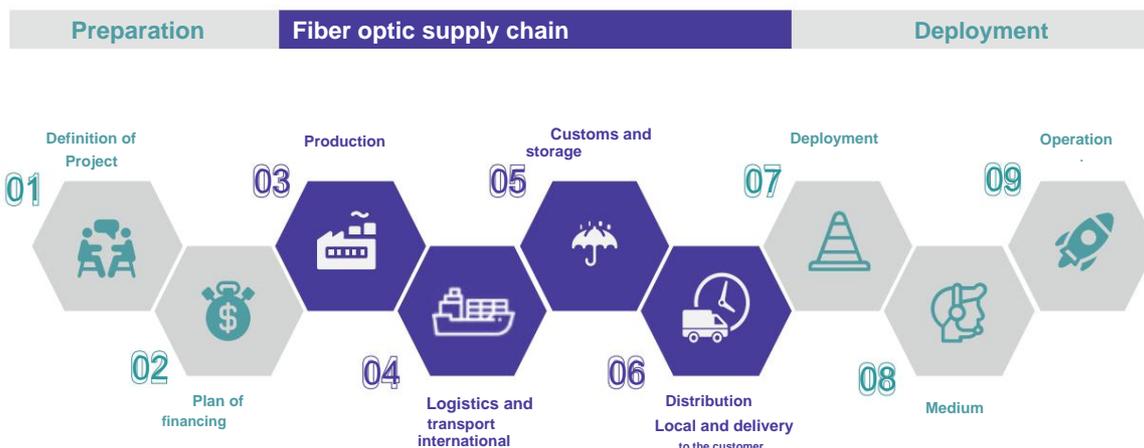
Unfortunately, operators in the region must contend with higher costs, despite the much shorter distance. Therefore, relying on such distant production exacerbates the three adverse factors mentioned previously.

## The different stages of the fiber supply chain

The fiber optic supply chain consists of nine links, ranging from project definition to the operation of a fiber optic network.

Along the different links, there are different considerations to take into account by each operator if they wish to deploy fiber optics.

ILLUSTRATION 5  
The fiber optic supply chain



Source: SmC+

It should be noted that, specifically regarding supply logistics, 4 of the 9 links are present, while 2 refer to previous stages and 3 to subsequent stages, leading up to network operation. Each of the 9 links is briefly described below.

**1. Project definition:** activities for network sizing and defining the specifications and materials to be acquired to deploy the optical fiber.

**2. Financing plan:** an evaluation is made of the cost involved, return on investment, who the possible suppliers are, what the sources of financing would be and what payment facilities can be obtained with the suppliers.

**3. Production:** This refers to the phase where large quantities of optical fiber components are manufactured. This link works in conjunction with the supply of necessary raw materials.<sup>13</sup>

13. This report will not analyze the details of the supply of raw materials for the production of optical fiber, but it is considered as part of this link in the supply chain.

**4. International logistics and**

**transport:** includes consolidation, inspection, transport and intercontinental delivery.

**5. Customs and warehousing:** This includes all physical, administrative, legal, and procedural steps to be followed once the goods arrive in the region. It also includes defining where the goods will be stored.

**6. Local distribution and delivery to the customer:** This represents the final, purely logistical stage of the fiber supply chain. It refers to the distribution, within Latin America, to the end customer who will be deploying the fiber.

**7. Deployment:** refers to the synchronization of activities and different validations that must be done between operator, contractor and supplier to deploy the fiber.

**8. Support:** This phase includes all the technical and logistical support that is necessary during deployment and support in case of irregularities in the supplies.

**9. Operation:** The final link is responsible for monitoring the network and its various components once the fiber optic network is operational. This link takes into account

the response to component failures.

This study focuses primarily on the four links associated with the supply of fiber for the deployments.

In this sense, the links of production, logistics and international transport, customs and storage and local distribution and delivery to the customer are those that have a significant impact on fiber deployment delays or that involve significant financial risks.

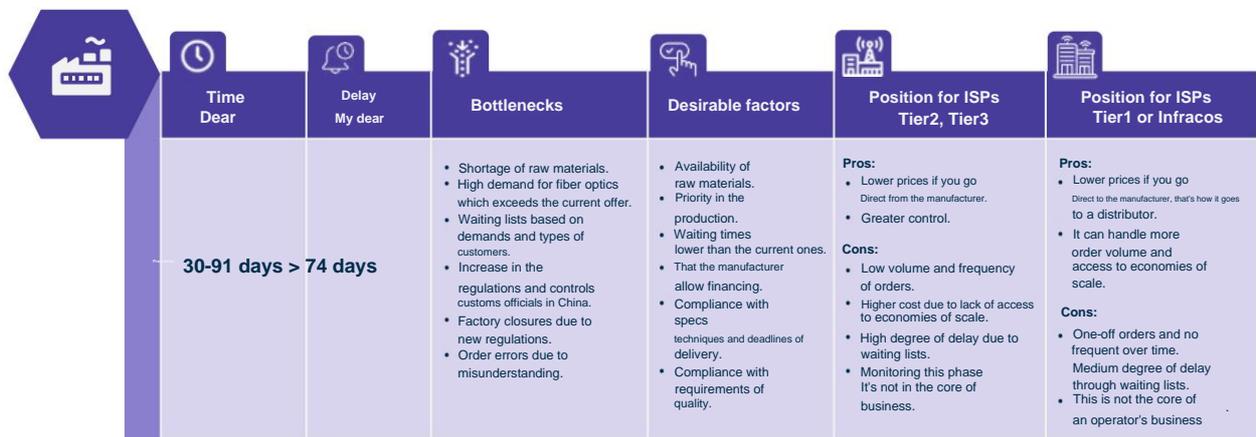
In the analysis of each of the links, according to their size, financial capacity and negotiation capacity, four types of possible telecommunications operators are considered: tier 1 (regional scope), tier 2 (national scope) and tier 3 (local scope), as well as companies that provide connectivity infrastructure (which, for the purposes of this study, behave similarly to tier 1, assuming that their ability to consolidate the needs of several operators gives them a comparable scale).

3.

**Production**

Of the four links under analysis, the production link is the one that demands the most time and presents the greatest possibilities of deviation in the times of the fiber chain.

ILLUSTRATION 6  
**Fiber optic supply chain: production**



Source: SmC+

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At this stage of fiber optic provision, bottlenecks are mainly linked to the scarcity of raw materials, high demand and asymmetric priority of merchandise delivery, reduced supply and human errors resulting from misunderstandings and cultural differences.

The delay affecting the supply is due to different situations and especially because the components are mainly imported from Asia.

**Raw materials:** Currently, raw material suppliers are experiencing high demand and low supply for the production of fiber-related components. Raw materials such as PVC, stainless steel, aramid yarn, and neon are becoming increasingly difficult to obtain, delaying manufacturing times.<sup>14</sup> Similarly, there are delays in the production of semiconductor chips,<sup>15</sup> and while plastic and glass are not currently in short supply, resources, especially white sand, are limited because extraction costs are expected to increase in the coming years. Regarding this last point, it is estimated that white sand reserves are limited to 20 years at current usage rates (such as glass production, computer chip manufacturing, and oil extraction via fracking).<sup>16</sup> In addition to the raw material shortage, there is a production limitation at factories that are operating at full capacity due to high demand.

**Increased restrictions in Asia:** There are currently more government controls on imports from China. Furthermore, government actions in China have impacted factory closures in that country, as well as the operation of logistics providers for deliveries, which has created a capacity gap for global operators.

limited for planning<sup>17</sup>. Faced with this situation, other producing countries have emerged. It is being observed that operators are buying in other Asian countries such as Vietnam, Singapore, Taiwan, Japan, South Korea and Malaysia<sup>18</sup>.

Similarly, large manufacturers have developed production capabilities in other regions, such as Corning, which has started production in Poland to partially meet demand in Europe, and in Mexico to meet demand in the United States.<sup>19</sup>

**Other factors impacting production:** the armed conflict in Ukraine is affecting the supply of neon gas used to manufacture fiber optic lasers. There is also an increase in oil prices, which raises transportation costs, and global port congestion is affecting the delivery of raw materials to factories.<sup>20</sup>

An important factor to consider when obtaining fiber optic cable from Asia to Latin America is the difference in culture, language, and time zones. While it may seem insignificant or of minor importance, it can lead to delivery delays, errors in specifications, and other potential misunderstandings.

## 4.

### Logistics and transport international

This link has the second longest delay time in the fiber optic supply chain.

In this case, the bottlenecks are mainly linked to the recent increase in international transport prices, the low frequency of the Asia-Latin America route, the lack of containers, port congestion, and regulatory changes.

14. Kosu.org (2021). "The USDA Is Helping Expand Rural Broadband, But Providers Face Equipment Shortages."

15. Fierce Telecom (2021). "[Corning GM says fiber lead times are 'much longer' than a month.](#)"

16. Dutch Design Week Symposium (2017). "[Sand becomes 'increasingly scarce and expensive', threatening glassmaking and construction.](#)"

17. EIU (2022). "[What does zero-covid mean for foreign investment in China?](#)"

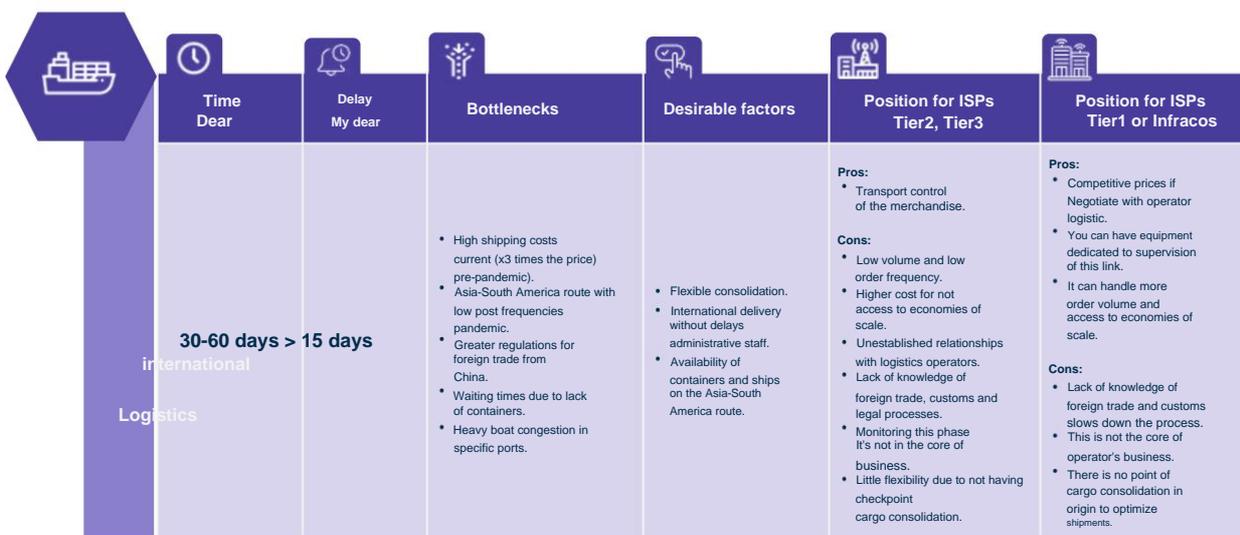
18. EIU (2022). "[What does zero-covid mean for foreign investment in China?](#)"

19. Cailabs (2022). "[Upgrading your network infrastructure in the middle of a fiber shortage.](#)"

20. NY Times (2022). "[Russian invasion of Ukraine worsens global supply chain crisis.](#)"

ILLUSTRATION 7

## Fiber optic supply chain: logistics and international transport to Latin America



Source: SmC+

The delays are mainly linked to increased costs and a global shortage of containers.<sup>21</sup> When discussing high logistics costs, it has been observed that the route between China and South America has become more expensive for supplying fiber optics to Latin America.<sup>22</sup> This is mainly due to the long distance and, additionally, to the fact that regions such as Latin America and Africa have a negative foreign trade balance, making it costly for a logistics operator to return containers with sub-optimal use to Asia.<sup>23</sup>

a large amount of time that a container will be blocked and cannot be used for shorter routes where greater profit can be made.

This logistical crisis has led to an increase in inflation worldwide in 2022. In fact, the International Monetary Fund states that shipping costs play a fundamental role in inflation and established that doubling logistics costs impacts an increase of 0.7% in annual inflation.<sup>25</sup>

On the other hand, the container crisis and ship congestion are affecting logistics.<sup>24</sup> Following the pandemic, product demand exceeded shipping capacity, and this was compounded by the poor global distribution of containers, which were left empty and stranded in different parts of the world. In addition, container shipments from Asia to South America represent a significant impact, as they involve

### 5. Customs and warehouse

The supply of fiber optics depends on this link, as it includes nationalization and regional warehousing to ensure high local availability of inventories and guarantee that deployments are carried out on schedule.

21. UNCTAD (2021). "Shipping during COVID-19: Why container freight rates have emerged."

22. Freightos Baltic Index (2022). "FBX Index".

23. UNCTAD (2022). "Freight rates, maritime transport, costs and their impact on prices".

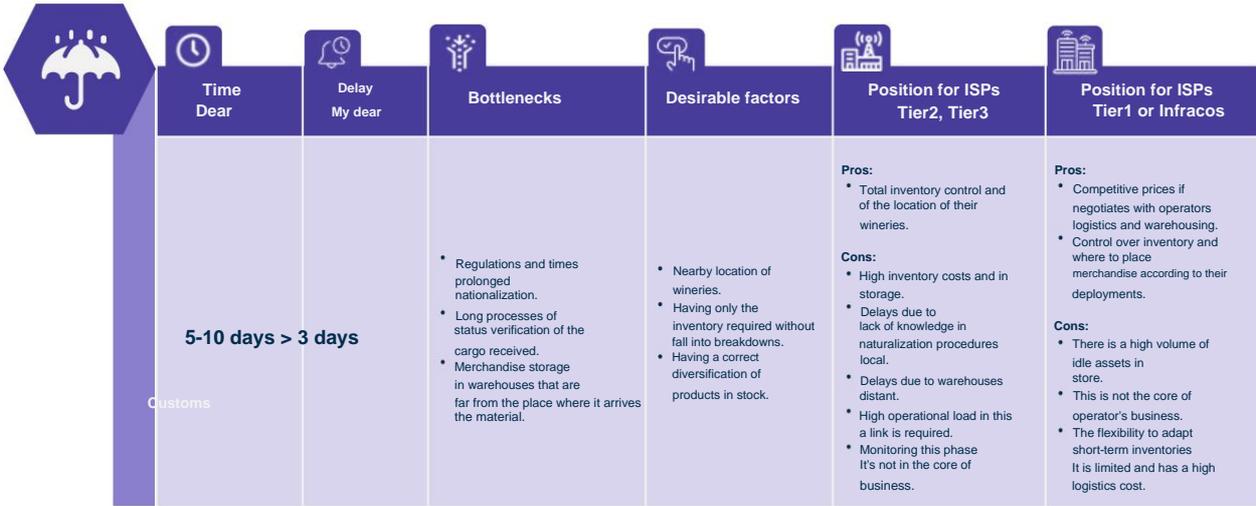
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The value of having a flexible supply chain to support the fiber growth that Latin America is experiencing

ILLUSTRATION 8

Fiber optic supply chain: customs and warehousing in Latin America



Source: SmC+

The bottlenecks in this link of the chain are related to the long, and in some cases unpredictable, processes of importing products into Latin America<sup>26</sup> and to the possibility of having storage capacity efficiently distributed according to the regions of final use of the imported products.

Regarding customs clearance processes, the World Bank states that, on average, this process takes eight days in Latin America. However, each country in the region has its own processes and requirements, resulting in varying processing times for importing goods (ranging from seven days in Mexico to sixteen in Brazil). Therefore, expertise in handling customs procedures is essential to avoid delays.

On the other hand, inventory management is evolving towards new, more efficient, on-demand models due to rising warehousing and local transportation costs. For example, 2022 saw record highs in the

Logistics costs in the United States that include transportation, warehousing and inventory<sup>27</sup>.

This is why telecommunications operators are increasingly pursuing just-in-time (JIT) operations as the most effective way to ensure delivery of materials at the right place and time.<sup>28</sup>

Similarly, operators in Latin America are increasingly implementing vendor-managed inventory (VMI), which allows them to delegate inventory, and its management, to a supplier who assumes the risk and guarantees that supplies will be available and close to the end customer when needed<sup>29</sup>.

6.

Local distribution and delivery to the customer

Even though this link does not present as many delays as the first two, it is still a very sensitive link because it requires a high level of synchronization with the end customer.

26. See, for example, the case of Argentina where fiber, in October 2022, became part of the list of non-automatic licenses, and therefore requires government authorization to enter the country.

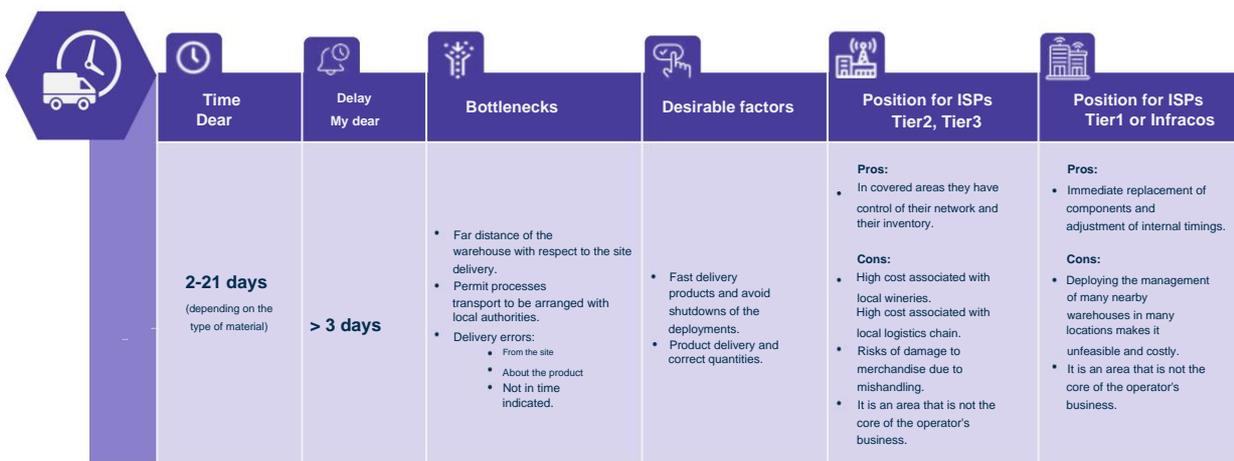
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ILLUSTRATION 9

## Fiber optic supply chain: distribution and delivery to the customer in America Latina



Source: SmC+

In this last link, the bottlenecks are linked to the distance from the warehouses to the place where the fiber optic cable is finally required, to obtaining land transport permits and, lastly, to errors in the delivery on the ground, which, in many cases, are due to deficiencies in training and/or the lack of trained personnel.

The areas most affected by fiber deployment failures are the least covered, namely rural areas. This is because smaller operators lack the ease, volume, and frequency of material delivery that larger operators have, and therefore must wait for the latter to be served first.

Delays already caused by previous links in the chain will directly impact this link, and therefore, deployments in the region are being affected, as operators are already reporting. For example, in the United States, the National Rural Broadband Association estimates that suppliers already have a 40% shortage of required materials and lead times exceeding

18 months delay, compared to the average of three months that was previously expected<sup>30</sup>.

Deployment delays are also linked to a lack of qualified personnel to implement deployments correctly and optimally. In the United States, the Wireless Internet Service Provider Association reports significant delays due to a shortage of trained deployment personnel.<sup>31</sup> The Center for Growth and Opportunity at the University of Utah reports that approximately one new technician is needed for every 1,500 to 2,000 new fiber subscribers, a requirement that is not currently being met.

Therefore, it is necessary to train skilled technicians to accelerate fiber deployments once the materials are supplied.

Several initiatives have been adopted, among which, at the regional level, the alliance between Fiber Broadband Association LATAM Chapter and FYCO stands out, who created The FBA Academy with the objectives of implementing training in the region to provide knowledge and skills for the design, assembly, installation, operation and activation of FTTx networks.

30. National Rural Broadband Association (2021). ["Severe fiber shortage delays half a million AT&T internet installations."](#)

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The value of having a flexible supply chain to support the fiber growth that Latin America is experiencing

## Supplier profiles for fiber procurement

In the region there are different actors operating along the different links in the chain. fiber optic supply.

ILLUSTRATION 10  
**Key players involved in the fiber optic supply chain in Latin America**



Source: SmC+ based on publicly available company information

Although they have different profiles, there are practically no players in Latin America that offer a solution encompassing all links in the fiber optic supply chain. It's worth noting that having suppliers that provide solutions across the entire chain has its advantages, but it's also important to address the risks and weaknesses that arise from dependence on components from a single brand.

Finally, it should be highlighted that few companies specialize in the customs, warehousing, distribution, and delivery stages to the end customer.

It's important to mention that the region's supply comes primarily from Asia. However, there are local production initiatives. This has reduced manufacturing lead times for components, with delivery times starting at eight weeks or more.

However, the production price in the region is, on average, 20% higher than that of Asian products, which is very relevant in a market whose decision criteria are based more on price than on quality and local expertise for fiber deployment.

ILLUSTRATION 11

**Optical fiber component production capacity in Latin America**

Manufacturer	Origin	Products	Factories in LATAM	Countries with factories in Latin America
<b>Furukawa</b>	Japan	Cables fiber components	4	
<b>Prysmian</b>	Italy	Cables fiber components	16	
<b>Sumitomo Electric Industries (SEI)</b>	Japan	Cables fiber components	2	
<b>SterliteConduspar</b>	India / Brazil	Fiber optic cables	1	
<b>LatamFiber Home</b>	China/ Ecuador	Cables fiber components	1	
<b>KOC Latin America</b>	Swiss	Fiber components	1	
<b>Corning</b>	USA	Cables fiber components	1	

Source: SmC+ based on publicly available company information

From what has been explained so far, it is clear that fiber supply in Latin America involves various complexities that require specific knowledge and capabilities to overcome. Few companies in Latin America are dedicated to and possess the specific expertise to manage the fiber supply chain.

An operator can choose to handle each of these steps, but as previously mentioned, this presents a complex scenario that could cause the operator to neglect its core business, which is providing quality service to its end customers. In this regard, there are four fiber optic supply models.

## Fiber component supply schemes in Latin America

Telecommunications operators will need to have varying degrees of involvement in the supply chain.

supply based on the supply scheme that is decided upon.

The value of having a flexible supply chain to support the fiber growth that Latin America is experiencing

ILLUSTRATION 12

## Fiber optic component supply schemes in Latin America



Source: SmC+ based on publicly available company information

### Manufacturers

This alternative means that the telecommunications operator will contact a manufacturer directly to carry out the fiber supply work itself.

This alternative is the most complex for operators since it involves a series of tasks to be carried out to guarantee a correct supply of fiber components.

Among the tasks, the following stand out:

- Research suppliers.
- Select based on quality and technical specifications.
- Negotiate commercial terms and payment facilities.
- Negotiate delivery and production times.
- Negotiate with logistics operators.
- Manage trading activities abroad.
- Manage customs and warehousing logistics.
- Perform local distribution and control inventory.
- Manage support.
- Handle warranties and returns.

This supply model gives the operator greater control over the supply chain. However, it involves a heavy workload in processes that divert them from

Its main focus is providing connectivity services. It also requires negotiating and dealing with more than one manufacturer to reduce the risks of dependence on a single manufacturer.

### Turnkey

This alternative involves supplying the fiber through a third party that has turnkey solutions and manages the entire fiber supply chain.

This supply scheme requires the operator to perform the following tasks:

- Research actors that provide turnkey solutions.
- Negotiate commercial terms and payment facilities.
- Define the scope of the project.

By choosing this scheme, the telecommunications operator has the advantage of completely delegating the supply and implementation of the fiber to a third party.

However, it implies a dependence on a single provider, resulting in greater exposure to the risk of unwanted events.

### Supply providers

The telecommunications operator contacts a fiber supply services specialist and another contracting company to handle the deployment of the fiber optic cable once the components are supplied.

This supply route allows the operator to focus on the following tasks:

- Research companies specializing in supply services.
- Research contracting companies that carry out the deployment.
- Define the scope of the project.
- Negotiate commercial terms and payment facilities that can be obtained with the supply provider and the contractor in the deployment.

This option has the advantage that the telecommunications operator delegates only part of the operation, but still has control over the products and companies involved.

However, it assumes that the operator must be the interface that coordinates between several actors and, consequently, that there may be communication errors between the parties that lead to delays due to misunderstandings or greater difficulty in identifying responsibilities in the face of supply problems.

### Contractors

This option involves the telecommunications operator delegating the implementation to a company specializing in deployment, not only to carry it out, but also to handle the entire process of supplying the fiber optic cable.

This alternative requires the telecommunications operator to perform the following tasks:

- Investigate those contractors who carry out deployments and also guarantee supply.
- Define the scope of the project.
- Negotiate commercial terms and payment facilities with contractors.
- Negotiate with the contractor how warranties and support will be handled.

Adopting this alternative will certainly allow the operator to delegate procurement and deployment and maintain control over products and technical specifications. However, similar to the turnkey option, high dependence on a single company brings with it several risks.



The value of having a flexible supply chain to support the fiber growth that Latin America is experiencing that Latin America is experiencing

# Impact of inefficiency in fiber supply

Understanding the entire fiber supply chain helps to have a clearer understanding of the different parts that constitute the deployment of this technology for an operator and, consequently, all the particularities and challenges that it represents.

The various risks and delays that this supply chain may present have been identified. Based on this, the aim is to determine the potential impact and delays on fiber optic deployments in Latin America over the next five years due to supply chain inefficiencies.

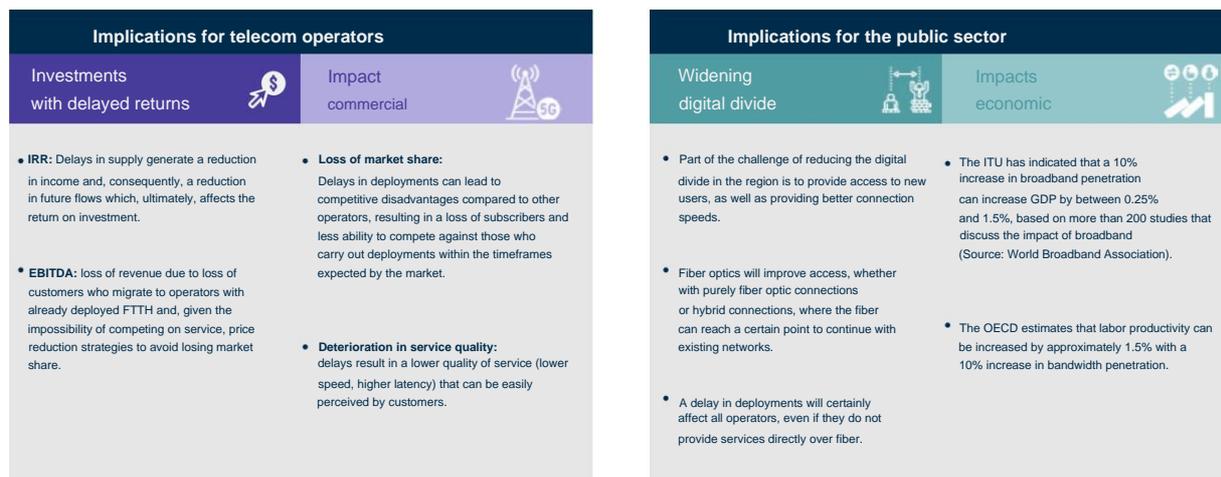
## Inefficiencies in the fiber supply chain can result in deployment delays.

To gain a more general understanding of the potential impact of fiber optic supply in the Latin American region, two impact analyses have been conducted: (i) for a telecommunications operator, in order to understand the economic impact of the loss of market share from

(ii) for the public sector, how to understand the additional time that the fiber optic network coverage goals in the region would be delayed and its implications for reducing digital divides.

## ILLUSTRATION 13

## Implications of delays in fiber optic deployments for telecommunications operators and the public sector



Source: SmC+

Based on the supply chain description, the impact model seeks to estimate the additional time to which fiber deployments are subject.

Given the current estimated times for the 4 main supply links of

The optical fiber under study, and its weighted delays, it is estimated that, due to supply inefficiencies, a delay of 29% of the initial scheduled time under efficient conditions can be obtained.

## Impact of a delay in fiber optic deployments for an operator

Inefficiencies in the supply chain will result in operators having less capacity to acquire new customers and a decline in service quality, leading to a loss of market share and revenue. Operators must develop a strategy that allows them to source supplies dynamically and nimbly in response to global supply realities.

A model was designed to quantify the economic loss that a given operator in Latin America would incur due to inefficiencies in the supply of fiber optic infrastructure for its projects. The model assumes an operator that provides FTTH services.

which has a third of the FTTH subscribers in a Latin American city of 300,000 homes and where ARPU<sup>32</sup> is around USD 43/month for a 100 megabytes FTTH service.

It is assumed that this operator does not choose to adopt a dynamic and alternative supply model, while the rest of the operators in the market do.

Thus, this operator suffers delays in its fiber optic deployments, while its competitors, with 2/3 of the market, are not affected by this inefficiency.

Under this approach, it is estimated that the operator would lose 5.4 market share points in the next five years, passing its

32. Average revenue per subscriber (ARPU).

The value of having a flexible supply chain to support the fiber growth that Latin America is experiencing

market share fell from 33.3% to 27.9%. This market loss resulted in a loss of \$13.8 million over five years, representing 14% of its net income over the same period.

It is important to mention that this model does not take into account other variables that may impact commercial competition; these are isolated and are not considered.

ILLUSTRATION 14

**Impact of inefficiencies in the fiber supply chain for a telecommunications operator**



Source: SmC+

# Impact of a delay in fiber optic deployments for the public sector and industry

Based on the FTTH/B and 5G demand projections mentioned in previous chapters, it is estimated that 7.5 million kilometers of fiber optic cable will be required in the region over the next 5 years in order to advance the deployment of FTTH/B home networks, 5G infrastructure and backbone deployments in each country.

A potential delay of almost 30% of the time can be observed, which will postpone the estimated times for reducing gaps.

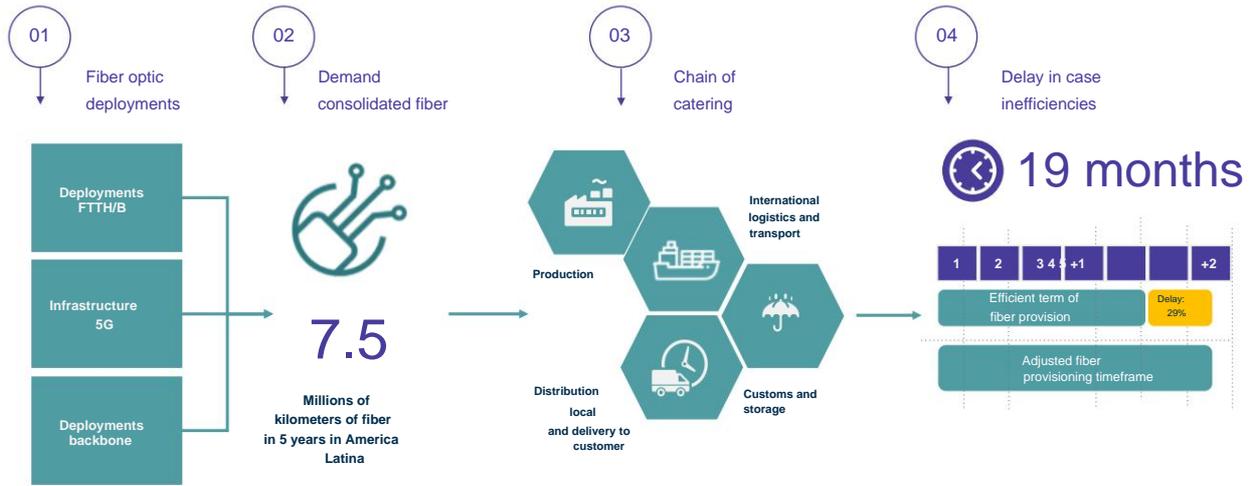
digital in the region in 19 months.

Delays in fiber optic supply will have many impacts on the economy of both small and large operators.

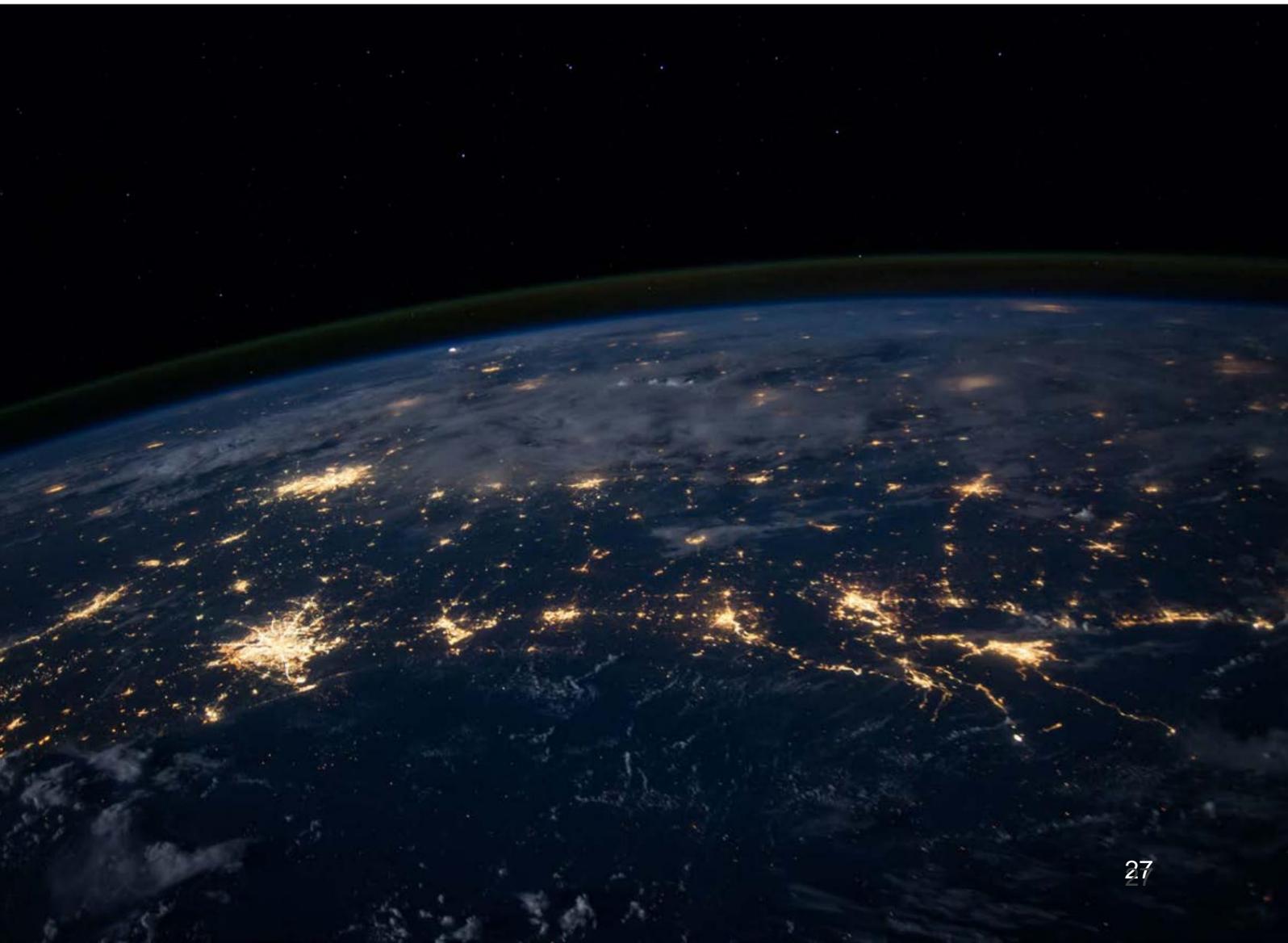
Similarly, they will have implications for the public sector by delaying different technological and economic developments in the region and by slowing down the reduction of the digital divide, with its corresponding impact on society in general and on the different productive sectors.

ILLUSTRATION 15

### Impact of inefficiencies in the fiber supply chain for all of the Americas Latina



Source: SmC+



The value of having a flexible supply chain for support the fiber growth that Latin America is experiencing that Latin America is experiencing

# The fiber supply chain requires special attention in light of the exponential growth of fiber.



## Risks in fiber deployments

Telecommunications operators in Latin America must understand that there are three types of risks and that their causes and mitigating factors need to be known when deploying fiber optic projects: that there is

The delays in deployments, errors in selecting appropriate specifications for fiber optic components, and the lack of financial resources to develop the projects.

ILLUSTRATION 16  
Risks in fiber optic deployments



Source: SmC+

Each of the three identified risks is described below.

- **Deployment stoppages:** refers to the probability that projects will be delayed or stopped due to different failures or poor sizing.
- **Error in the selection of appropriate specifications:** a lack of knowledge of the correct technologies and poor project implementation can affect deployments by creating incompatible network segments.
- **Lack of financial muscle:** many projects may be limited throughout their evolution due to insufficient capital and lack of financing options for investments with a long-term rate of return.

Of these three risks, the halting of deployments is the one most closely linked to the supply chain.

This risk can materialize in the event of delays in any of the 4 links described, delays that may be due to lack of inventory, longer production, transport or import times, errors in the specification or delivery of the products, among other issues.

The main mitigating factors to reduce the impact of this risk are having a detailed understanding of the supply chain and identifying its bottlenecks, detailed knowledge of all administrative processes, not depending on a single supplier or manufacturer, the ability to consolidate inventory in Latin America and Asia, and good capillarity for the final distribution of the products.

## Fiber deployments require specialization

There are many risks and variables associated with fiber supply that make this task very complex, especially for telecommunications operators, whose main activity is not deploying fiber or connectivity infrastructure in general, but rather providing a valuable service to their end customers.



### CAPEX Reduction:

Investments are being shifted towards operating costs. The aim is to make the structure of telecommunications operators more agile and adapted to new requirements.

Given this situation, the telecommunications industry is trending towards specialization and divesting itself of activities that are not the core of the business.



**Migration towards processes as a service (x-as-a-Service):** It is increasingly common to see different models that are provided as services, such as shared telecommunications infrastructure, use of third-party platforms, outsourcing of logistics processes and field work, among other things.

The following are some of the main trends in the industry.



### Focus on the core:

It is becoming increasingly expensive for telecommunications operators to have units and processes focused on areas that are not the core of the business.

The value of having a flexible supply chain to support the fiber growth that Latin America is experiencing

# Recommendations for operators to reduce delays in fiber optic deployments

Based on the foregoing, from both the commercial and business perspective of a telecommunications operator and the perspective of a public policymaker, it is crucial that fiber optic deployments in Latin America do not suffer delays due to an inefficient supply chain. To achieve this, the following recommendations are presented.

with warehouses at an international and regional level, and that manages the logistics systems mentioned above. Additionally, they must focus on forecasting the inventory demand required to increase the agility of the supply chain.



### Diversifying the supplier and manufacturer portfolio:

Operators should not limit themselves to a single supplier of fiber optic components. They should focus more on technical specifications to achieve greater versatility and maintain a pool of suppliers who can respond to delays. Similarly, a strong alliance with contracting companies or supply providers is essential to enable operators to deploy networks more efficiently.



### Having warehouses close to deployment sites is crucial:

it's important for operators to have readily available inventory that allows them to operate even in the face of supply delays. Response times to stockouts must be minimized.



### Having real-time data to improve decisions:

having data on new fiber deployment areas translates into a 20% to 25% reduction in construction costs and an additional 5% to 10% faster fiber adoption by end users.



**Process knowledge:** Operators must have knowledge of how fiber is supplied and be flexible and adaptable enough to handle internal as well as international processes in another language and with other cultures.

Similarly, having shared data on on-site deployments among different stakeholders reduces recurring visits and lowers construction costs by 20% to 30%. Finally, in rural areas, identifying potential customers and offering them wireless solutions prior to fiber deployment accelerates adoption by 12 to 18 months.<sup>33</sup>



### Tailored financing:

operators must understand that the scale of the deployment must go hand in hand with a cash flow adapted to their budgetary realities and be able to cope with the costs resulting from possible delays in supply.



### Manage permits in a timely manner:

it is recommended that operators be aware of the impact they have on the country where they operate, regarding authorizations for the passage or use of poles or other property.



### Managing dynamic inventory:

Operators must reduce costs and capital tied up in assets. Therefore, they must focus on reducing the amount of inventory in storage using techniques such as Just-in-Time (JIT) and Value-In-Motion (VIM), which requires a partnership with a supply provider that has



### Investing in the best training for technicians:

there is a gap between large-scale deployments and the qualified technicians required for these projects. Skilled resources are insufficient, forcing operators to invest in training their technical staff.

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