Centre for WTO Studies

INDUSTRIAL SUPPLY CHAIN SERIES

Optical Fibre Cables (OFC) in Global Value Chains

Trade Dynamics, Production Landscape and India’s Position

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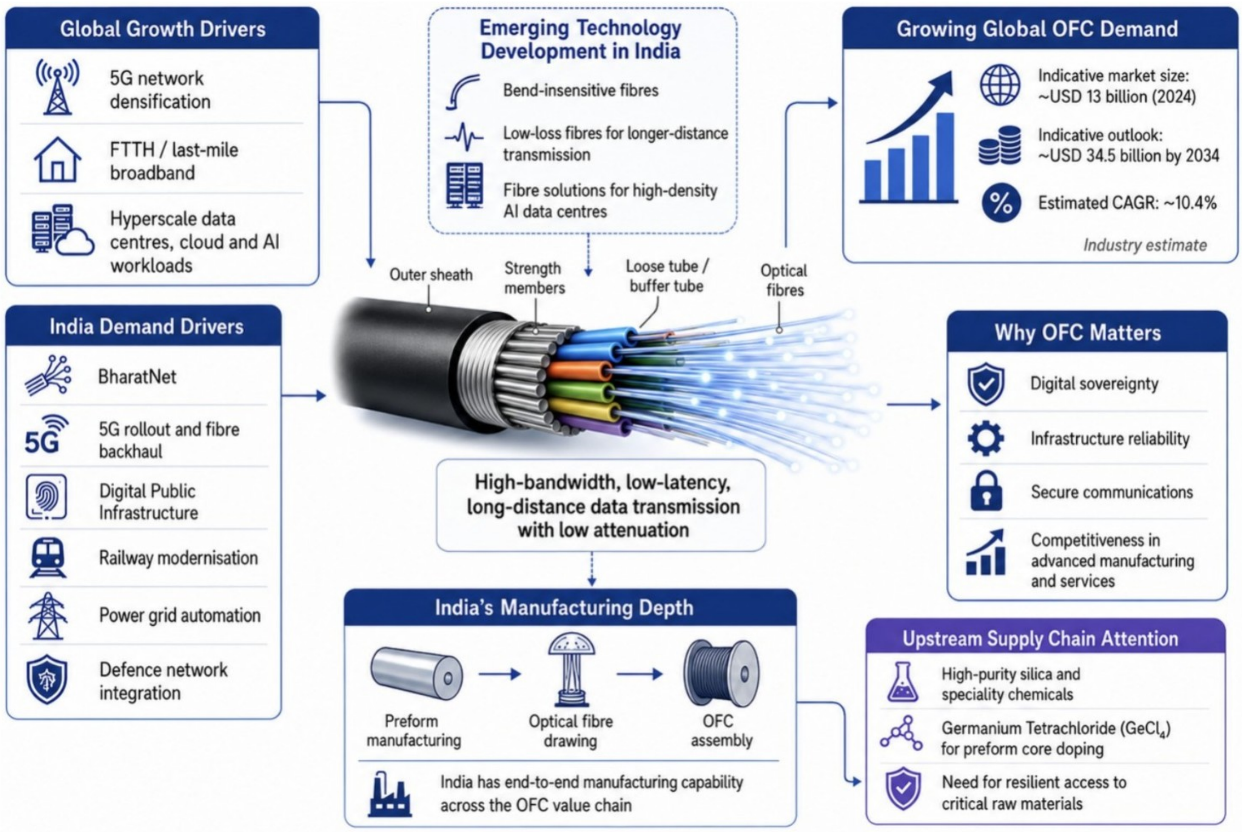
1. Introduction and Context[1]

Optical Fibre Cable (OFC) forms the foundational layer of modern digital infrastructure. Unlike legacy copper-based communication networks, optical fibre enables high-speed, low-latency transmission of data over long distances with minimal signal loss. As economies digitise and transition toward 5G networks, cloud computing, artificial intelligence, industrial automation, and secure defence communications, fibre networks have become central to economic growth, technological advancement, and national security.
The global fibre optic cable market was valued over USD 13 billion in 2024 and is projected to grow at a CAGR of 10.4 percent, reaching an estimated USD 34.5 billion by 2034[2].

Globally and in India, OFC demand is being driven by three major factors:

- increased fibre capacity requirements for 5G network densification and tower fibreisation
- expansion of fibre-to-the-home (FTTH), BharatNet and last-mile broadband connectivity; and
- rapid growth of hyperscale data centres, cloud infrastructure and AI-led workloads, which require high-capacity optical interconnects and reliable fibre networks.

Figure 1: Optical Fibre Cable (OFC): Foundation of Digital Infrastructure



[1]The authors sincerely acknowledge *Dr. Pritam Banerjee*, Head of the Centre for WTO Studies, and *Dr. Jaijit Bhattacharya*, Founder and President of C-DEP Research, for their guidance, encouragement, and continuous support throughout this research initiative.

[2]https://www.gminsights.com/industry-analysis/fibre-optic-cable-market?

Additionally, the demand for OFC is growing in sectors such as power utilities, industrial automation, and secure communications, reflecting its increasing role in critical infrastructure.

India's digital transformation has created sustained structural demand for fibre infrastructure. National programmes such as BharatNet, the rapid rollout of 5G services, expansion of digital public infrastructure (DPI), railway modernisation, power grid automation, and defence network integration are driving fibre deployment across sectors.

The Union Budget 2026–27 reinforces this demand signal. The Department of Telecommunications has received a budgetary allocation of ₹73,990.94 crore, while BharatNet has been allocated ₹20,000 crore, making rural broadband connectivity one of the largest telecom-sector priorities for the year. This indicates that fibre-led connectivity will remain a major area of public investment[3].

The Budget also strengthens the future demand case for OFC through its emphasis on AI data centres, cloud infrastructure, electronics components and semiconductor supply chains. The Government has announced India Semiconductor Mission 2.0 to focus on semiconductor equipment, materials, full-stack Indian IP and supply chain strengthening. The allocation for the Electronics Components Manufacturing Scheme has also been increased to ₹40,000 crore, while Budget 2026–27 includes measures to support AI data centres and cloud infrastructure.

These sectors require high-capacity, low-latency and reliable fibre networks to support data movement across telecom networks, computing clusters, industrial systems and secure digital platforms. OFC should therefore be viewed as an enabling infrastructure for India's next phase of digital and manufacturing-led growth[4].

India has developed manufacturing capability across preforms, fibre drawing, and cable assembly, placing it among a very limited number of countries with end-to-end production capacities. Indian firms are also developing key next-generation technologies in fibre optic that includes high-bend fibres, fibres that can carry signals for longer distances and fibres that are appropriate for high power AI data centers. However, access to upstream raw material remains an area requiring policy attention, particularly for specialised inputs such as Germanium Tetrachloride and other high-purity materials used in preform and OFC manufacturing.

In this context, supply chain resilience in optical fibre cable extends beyond trade performance. It is directly linked to digital sovereignty, infrastructure reliability, secure communications, and long-term competitiveness in advanced manufacturing and services. This paper evaluates the Optical Fibre Cable (OFC) industry from a supply chain resilience perspective, assessing India's manufacturing depth, upstream vulnerabilities, downstream demand, and emerging technological transitions in fibre infrastructure.

[3]https://prsindia.org/budgets/parliament/demand-for-grants-2026-27-analysis-telecommunications
[4]https://www.pib.gov.in/PressReleasePage.aspx?PRID=2221894&lang=2&reg=3

1.1 Global Value Chain of OFC and India's position

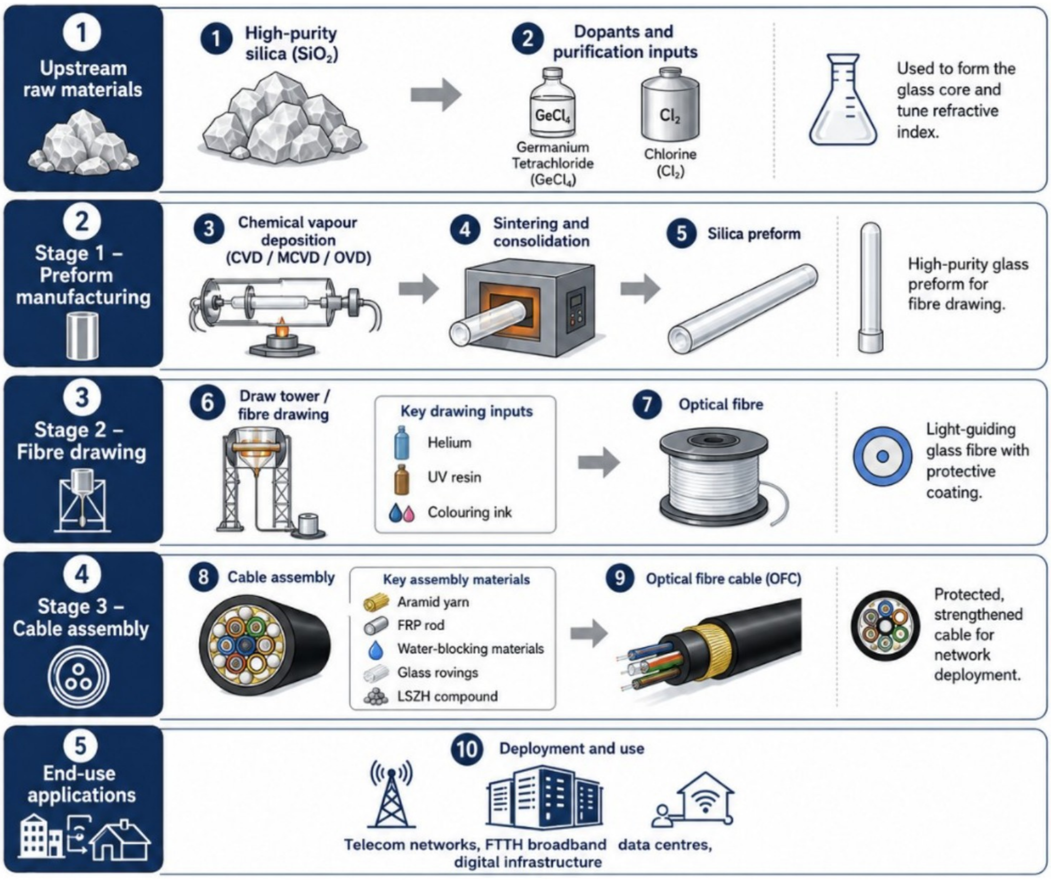
Optical Fibre Cable manufacturing is a specialised, multi-stage process that converts high-purity chemical and material inputs into a finished cable capable of carrying large volumes of data over long distances at very high speeds. The core material is high-purity silica (SiO_2), which forms the glass medium used to guide light signals through the fibre. During preform manufacturing, small quantities of dopants, particularly Germanium Tetrachloride ($GeCl_4$), are added to adjust the refractive index of the fibre core which determines how light is guided through the fibre.

Fibre drawing requires controlled heating, coating and colouring processes, supported by inputs such as helium, UV-curable resins and colouring inks. In the final cabling stage, materials such as aramid yarn, fibre-reinforced plastic rods, water-blocking materials, glass rovings and low-smoke zero-halogen compounds are used to protect the fibre and provide mechanical strength, flexibility, fire safety and deployment durability.

These inputs differ sharply in their criticality and availability. Some inputs, such as chlorine, are produced domestically at scale, although optical-grade purity requirements may still require validation. Others, such as Germanium Tetrachloride, Helium, high purity Quartz glass and optical grade UV resin, are highly specialised, produced by a handful of global manufacturers. This creates a supply chain concern for India, particularly at the upstream stages of preform manufacturing and fibre drawing.

India's end-to-end manufacturing presence is also reflected in its scale. India has an estimated optical fibre manufacturing capacity of around 100 million fibre-kilometres (FKM) per annum.

Figure 2: India's End-to-End OFC Capability, from glass inputs to gigabit connectivity



Stage 1 - Preform Manufacturing

Input	HS Code*	Demand for 1 FKM[5]	Total requirement for 100 million FKM [6]	Import as % of Domestic Demand	Top 5 Exporting Countries to India
Germanium Tetrachloride	28121990	0.015 grams/fibre-km incorporated	~1.5 MT	100%	Belgium, USA, Germany, Netherlands, China
Silicon Tetrachloride	28121920	~0.076 kg/fibre-km	~7,600 MT	100%	Germany, Netherlands, China, Switzerland, USA
Silica Tube, other than preform	7002 3100	Process-specific	NA	100%	China, Germany, USA, Hong Kong, Italy
Ultra-High-Purity Chlorine	28011000	Process specific	NA	100%	France, China
Preform of Silica	70022090	0.030 kg/fibre-km	~3,000 MT	~53%	Japan, China, USA, Hong Kong, Malaysia

Stage-level observation: India's current domestic preform capacity is estimated over 1,300–1,600 MT per annum**,** led by domestic companies such as Sterlite (STL) with the existing preform manufacturing capability and Finolex's 100 MT preform facility. This capacity is expected to increase to approximately 1,600–1,910 MT per annum once HFCL's proposed 300–310 MT preform facility becomes operational.[7]

[5]Fibre Kilometre

[6]https://indextb.com/files/2024/6/a12418a7-3ce0-4ab9-9db1-419d9a79e3a1_15.%20Manufacturing%20Optical%20Fiber%20Cables%20-%20Final.pdf

* No dedicated HS code, so the HS code indicated is a broader customs classification

[7]Complied from annual reports of STL, Finolex and HFCL

Stage 2 - Fibre Drawing

Input	HS Code	Demand for 1 FKM	Total requirement for 100 million FKM	Import as % of Domestic Demand	Top 5 Exporting Countries to India
Refrigerated Helium Liquid	**28042910**	10 litre/km	125,000 MT	100%	Qatar, China, Singapore, Thailand, UAE
UV Resin 1	**39069090**	17 g/fibre-km[8]	1,700 MT	100%	Netherlands, Taipei, China, Japan, Thailand
UV Resin 2	**39073010**	22 g/fibre-km[9]	2,200 MT	100%	
Colouring Ink	**32151990**	5 g/fibre-km[10]	500 MT	100%	Korea, Saudi Arabia, Taipei, UAE

Stage 3 - Cable Assembly

Input	HS Code	Demand for 1 FKM[11]	Total requirement for 100 million FKM	Import as % of domestic demand	Top 5 Exporting Countries to India
Aramid Yarn	**54021110**	~100g/fibre-km	10,000 MT	100%	Netherlands, Korea, China, USA, Japan
Water Swellable Yarn	**56090090**	30g g/fibre-km	3,000 MT	35%	China, Netherlands, USA, Hong Kong, Germany
FPR Rod	**39199090**	~500g/ fibre km	50,000 MT	100%	China, Korea, USA, Hong Kong, Japan
Glass Rovings	**70191200**	NA	NA	27%	China, Thailand, Bahrain, USA, Hong Kong
LSZH Compound	**39013000**	3.0 kg/km	~3,00,000 MT	81%	Korea, Saudi Arabia, Taipei, Thailand, USA

[8] Author's analysis: Calculated from primary coating annulus volume (glass 125 µm OD → primary coating OD ~190 µm) × resin density (~1.05 g/cm³)
[9] Author's calculation based on consumption norms
[10] Author's analysis: Calculated from ink layer (typically 2–10 µm, taken at ~5 µm) applied over the secondary coating × ink density (~1.2 g/cm³)
[11] Fibre Kilometre

2. Global Trade Patterns in Optical Fibre Cables

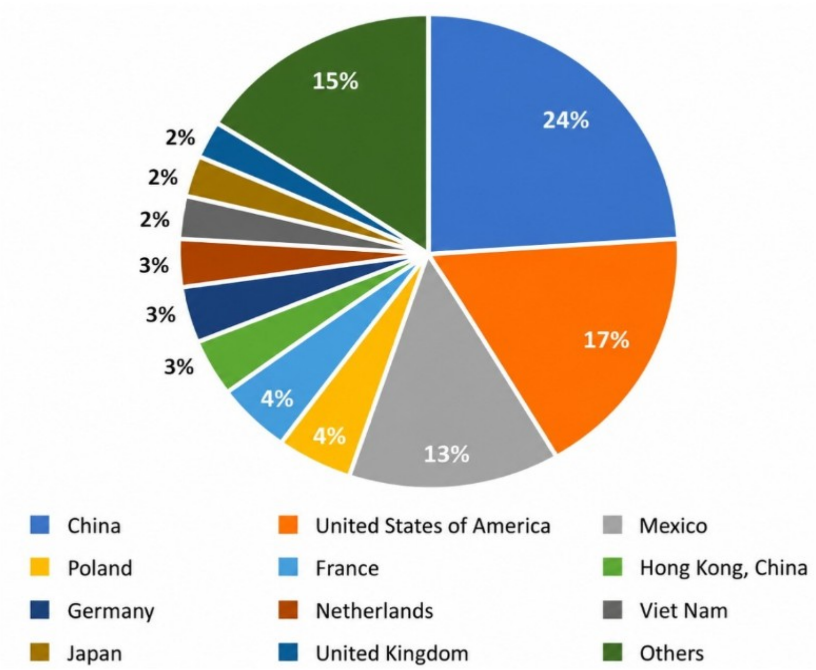
Global trade in optical fibre cables has expanded steadily over the past decade, driven by sustained investment in fibre-based digital infrastructure. However, global export capability remains concentrated in a limited number of manufacturing hubs, while demand is geographically dispersed across telecom, broadband, enterprise, data centre and infrastructure markets. This section examines global trade patterns across two relevant product categories - optical fibre cables under HS code 854470 and optical fibres and fibre bundles under HS code 900110.

2.1 HS Code 854470: India's negligible export presence

HS code 854470 covers optical fibre cables and represents the largest globally traded category of finished optical fibre cable products. These cables are used across telecommunications networks, enterprise connectivity, broadband systems and digital infrastructure deployment. Between 2018 and 2024, global imports under this category increased from USD 7.87 billion to USD 9.24 billion, reflecting a CAGR of 2.7 percent[12].

China remains the leading global exporter under HS code 854470, accounting for approximately 24 percent of global exports in 2024. Its position is supported by large-scale fibre drawing, cable manufacturing capacity and export-oriented production infrastructure. In contrast, India's export share remained below 1 percent in 2024, despite the scale of domestic fibre deployment and the presence of domestic manufacturing capacity. This indicates that India's current role in this category is still primarily domestic-market oriented, with significant headroom to expand its export footprint in finished optical fibre cables.

Figure 3: Global Export Share by Country for Optical Fibre Cables (HS Code 854470)



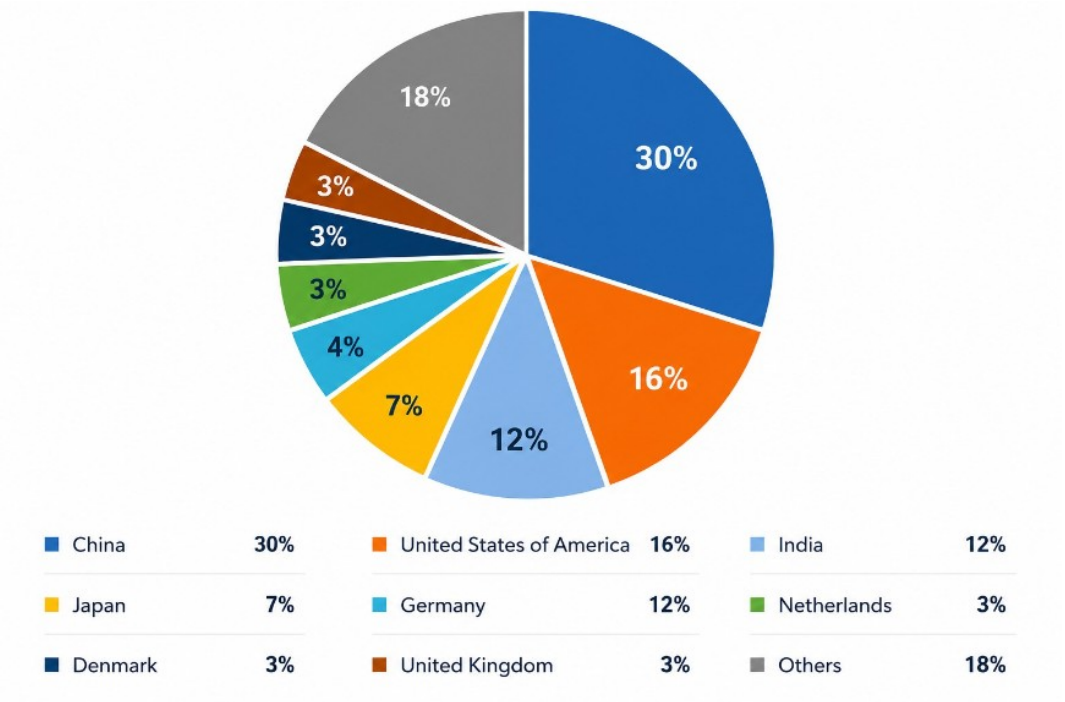
[12] *Source: ITC Trade Map*

2.2 HS Code 900110: India’s Stronger Export Presence

HS code 900110 covers optical fibres and optical fibre bundles. Unlike HS 854470, where India’s export presence remains limited, India has a stronger position in this segment. India accounted for approximately 12 percent of global exports under HS 900110 in 2024, reflecting its established fibre production and cable manufacturing capability[13].

At the same time, India also remains a significant importer under this category. In 2024, India ranked among the top ten importing countries under HS 900110, with imports of approximately USD 74.68 million. China and the United States were the two largest importers globally, with imports of USD 333.2 million and USD 179.27 million respectively. This indicates that even major optical fibre producers continue to participate in two-way trade, importing specific product categories based on technical requirements, performance specifications and network deployment needs.

Figure 4: Global Export Share by Country for Optical Fibre Cables (HS Code 900110)



2.3 Implications of Intra-Industry Trade for India

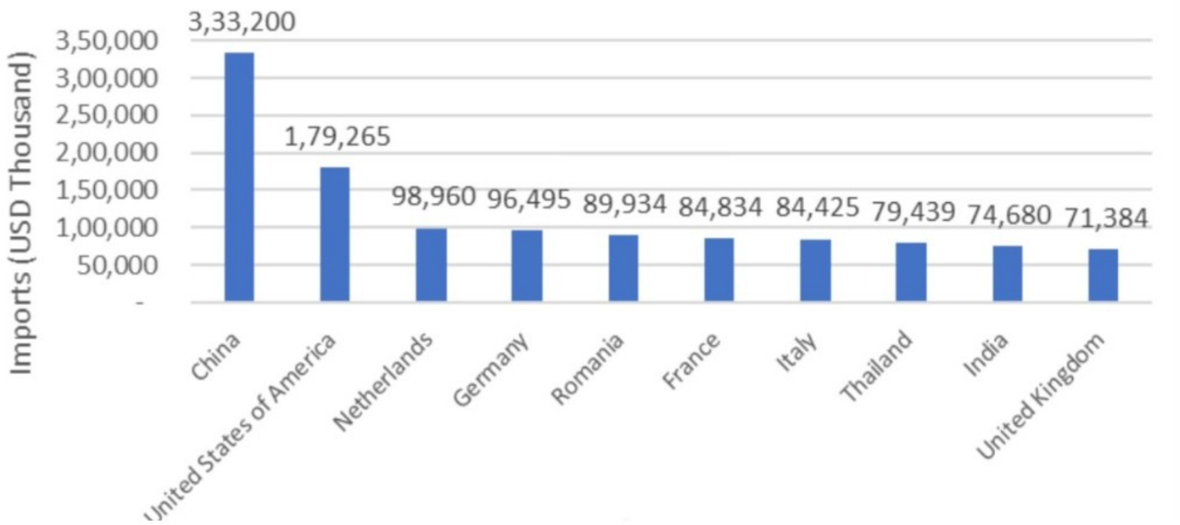
From India's perspective, the two-way trade present among major producers such as China and the United States highlights the fragmented nature of the global optical fibre ecosystem. This reflects the segmented nature of the OFC industry, where product specifications, fibre performance, network use-cases and technology requirements influence trade flows.

For India, this creates an important policy and industrial opportunity. The country's manufacturing ecosystem has already demonstrated strength across key segments of the optical fibre value chain particularly in fibre production and cable manufacturing reflecting a solid industrial foundation.

[13]*Source: ITC Trade Map*

At the same time, segments such as specialised fibre types and advanced components represent significant headroom for expansion, pointing to areas where India can deepen its value chain participation and capture greater share of high-value trade with the US.

Figure 5: Imports of Optical Fibre Cable (HS Code 900110) by Country in 2024



India's export opportunity is therefore strongest in two directions.

- Scale exports of standard and deployment-grade fibre products where domestic capacity is already established.
- Invest in specialised fibre technologies and advanced components to reduce dependence on imported variants and improve competitiveness in high-value markets. Strengthening these segments would improve India's supply chain resilience while allowing domestic manufacturers to service a larger share of global demand.

2.4 India's Exports of Optical Fibre Cable: The American Pivot

India exports optical fibre cable across two HS classifications: HS 854470 (assembled cables) and HS 900110 (optical fibres and bundles) to markets spanning Europe, the USA, the Gulf, and Asia-Pacific. Across both the HS categories, the United States has emerged as India's largest export destination. Under HS 854470, India's exports to the US stood at USD 11.69 million in 2024, ahead of the United Kingdom at USD 9.47 million.

Figure 6: India's top export destinations for optical fibre (HS 900110), 2024

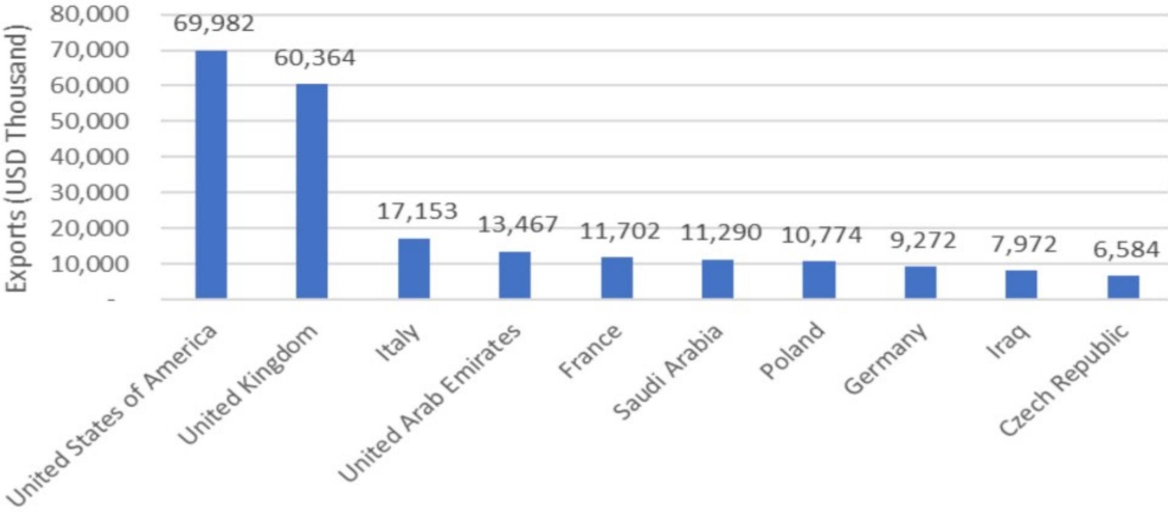
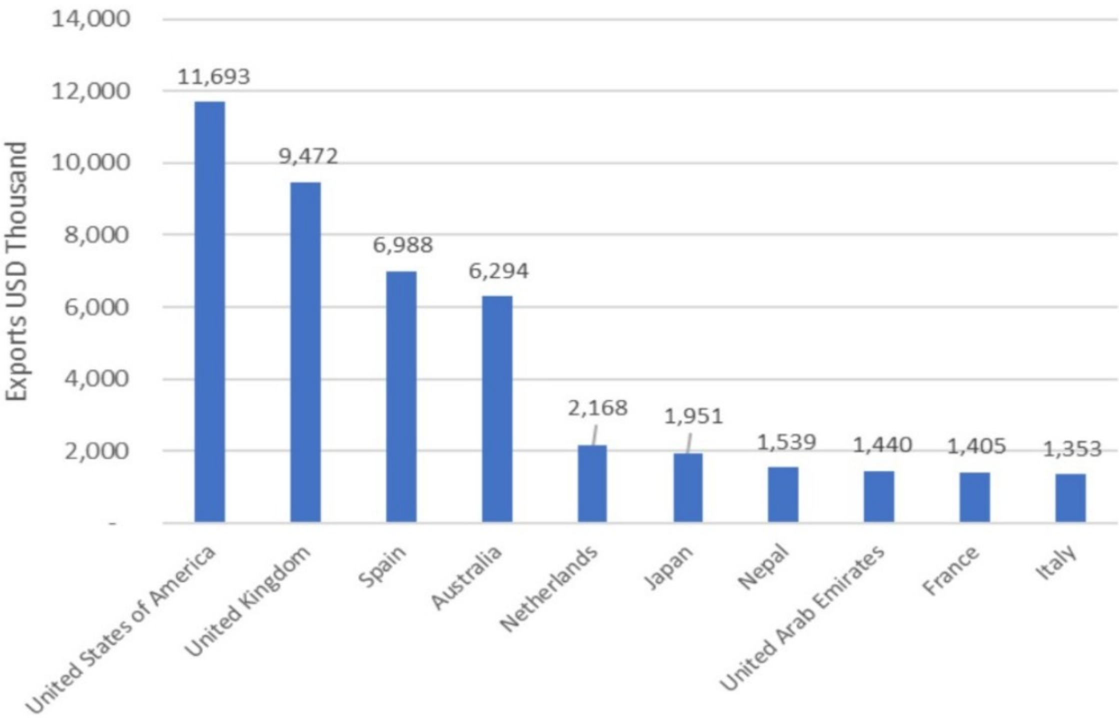


Figure 7: India's top export destinations for optical fibre cable (HS 854470), 2024



This presents a significant export opportunity for India. The US is expanding fibre infrastructure through the USD 42 billion BEAD Programme, 5G densification and FTTP deployment. These programmes are creating sustained demand for optical fibre cables and related products. Indian OFC manufacturers are well placed to serve this demand, given India's established fibre and cable manufacturing capacities.

However, the full potential of this trade corridor remains affected by tariff uncertainty and market-access barriers. In 2025–26, Indian exports to the US faced elevated tariff pressure, with some measures reportedly taking the overall tariff burden as high as 50 percent. The February 2026 India–US interim trade framework reduced this burden, with available reports indicating a revised reciprocal tariff level of around 18 percent rather than 10 percent. Lower and more predictable tariff barriers would improve cost competitiveness for Indian OFC exporters and help them scale exports to a high-demand market.

3. India's production landscape: Evidence from Annual Survey of Industries (ASI)

The analysis uses ASI data for NPC MS code 4636000, where NPCMS refers to the National Product Classification for Manufacturing Sector. This code covers optical fibre cables made up of individually sheathed fibres.

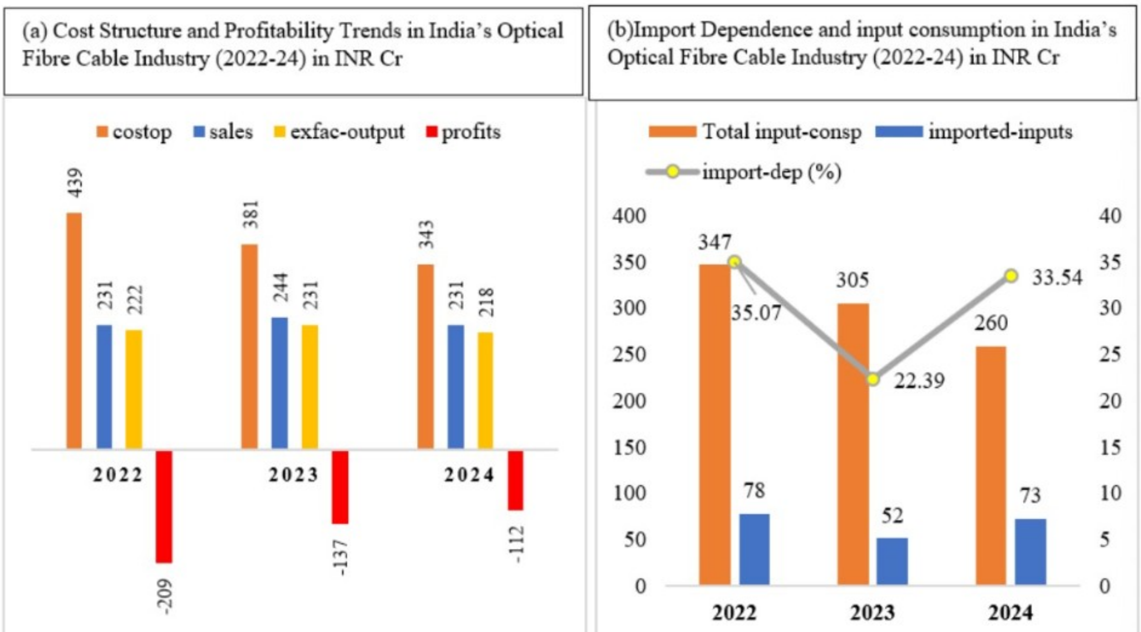
Between 2022 and 2024, the cost of production declined from ₹439 crore to ₹343 crore. This suggests some improvement in operating efficiency. Ex-factory output also remained broadly stable, at ₹222 crore in 2022, ₹231 crore in 2023 and ₹218 crore in 2024. The key concern is that production costs continued to remain higher than both sales and ex-factory output in all three years.

The industry's losses have narrowed over the same period, from ₹209 crore in 2022 to ₹137 crore in 2023 and ₹112 crore in 2024, reflecting improving cost efficiency though the sector has yet to turn profitable on reported ASI data.

This is significant from a supply chain resilience perspective. It shows that even as the industry improves efficiency, its cost structure remains exposed to imported inputs. For a sector dependent on specialised materials such as preforms, UV resins, helium, aramid yarn and other high-performance inputs, such exposure can affect both cost competitiveness and production reliability[14].

Overall, the ASI data shows an active domestic OFC manufacturing base with improving efficiency, though margins remain constrained and import dependence on raw materials continues to pose a structural challenge.

Figure 8: Trends from ASI showing cost pressure and imported input dependence in India's OFC Industry (2022–2024)



[14]**Note:** As some reporting units are multi-product entities, ASI figures should be read as broad sectoral indicators rather than precise, OFC-specific profitability data.

4. India’s strategic position in the global optical fibre cable value chain

4.1 Telecom Networks and Broadband: The Primary Demand Driver

Telecommunications infrastructure remains the largest driver of optical fibre demand in India. The rollout of 5G networks, increased fibreisation of telecom towers, expansion of FTTH broadband connections, and government connectivity programmes have significantly increased the demand for fibre deployment.

India’s annual fibre demand has grown rapidly in recent years. Estimates indicate that domestic demand increased from approximately 18 million fibre-kilometres in 2018 to nearly 32 million fibre-kilometres in 2023, and is expected to exceed 40 million fibre-kilometres in 2025 as 5G network deployment accelerates.

The expansion of fibre infrastructure is closely linked to telecom tower fibreisation. India currently has approximately 770,000 telecom towers, but only 38–40 percent of these towers are connected through fibre networks, compared with 70–80 percent fibreisation levels in advanced telecom markets such as the United States, Europe, and China[15]. Closing this gap will require large-scale deployment of optical fibre networks across urban and semi-urban regions.

The BharatNet initiative, the world’s largest rural broadband project, aims to connect approximately 250,000 Gram Panchayats through high-speed fibre networks and has already resulted in the laying of over 650,000 kilometres of optical fibre[16]. Together, these developments indicate that telecom infrastructure will continue to remain the dominant driver of fibre demand in India.

4.2 Data centres: A high-growth demand segment

The expansion of India’s digital economy is creating a second major source of demand for optical fibre cables through data centres and cloud infrastructure.

The global data centre cabling market is projected to grow from USD 7.7 billion in 2025 to USD 18.1 billion by 2035, expanding at a compound annual growth rate of 8.9 percent.[17] Fibre optic cables are expected to account for approximately 59 percent of the total market, reflecting the increasing preference for fibre-based systems in high-bandwidth computing environments.

India is expected to be one of the fastest-growing markets within this segment, with the country’s data centre cabling market projected to expand at a **CAGR of 11.1 percent between 2025 and 2035**[18]. Growth is being driven by the expansion of hyper-scale data centres, cloud services, digital financial infrastructure, and artificial intelligence computing clusters.

These developments require extensive fibre connectivity, both for long-distance network interconnections and for high-density structured cabling inside data centre facilities. As a result, fibre networks are becoming increasingly central to India’s digital infrastructure ecosystem.

[15] https://telecom.economictimes.indiatimes.com/news/65-telecom-towers-need-fibreisation-12l-towers-to-be-deployed-to-make-india-5g-ready/98612401?utm_source=chatgpt.com
[16] https://usof.gov.in/en/bharatnet-project#:~:text=BharatNet%2C%20one%20of%20the%20biggest,as%20on%2026.05.2025)
[17] https://www.futuremarketinsights.com/reports/data-center-cabling-market
[18] https://www.futuremarketinsights.com/reports/data-center-cabling-market

4.3 Defence: A Critical Application for Optical Fibre Cables

The global military fibre optic cable market is over USD 3.82 billion in 2025 and is projected to reach USD 5.77 billion by 2031, growing at a 7.12 percent CAGR[19] This growth reflects a broader shift in defence communication architecture. Modern militaries are replacing copper links with fibre solutions that resist electromagnetic interference and carry substantially higher data loads. Command and control systems, radar networks, and satellite communication links all depend on this shift toward high-bandwidth, low-latency infrastructure.

Glass fibre accounts for 90.10 percent of the military fibre optic cables market by material, and land systems capture the largest share of platform-level revenue at 39.55 percent. By application, C3ISR[20] represents the single largest use case at 42.25 percent of 2025 revenue. This confirms that fibre's core value to defence is in securing the flow of sensor data, weapons systems telemetry, and mission-critical intelligence across integrated networks, rather than any single standalone application.

Asia-Pacific is the fastest-growing regional market, projected to expand at a 9.05 percent CAGR through 2031 as India, Japan, South Korea and Australia accelerate defence modernisation. India offers a concrete illustration of this trend. India's Network For Spectrum programme, sanctioned by the Cabinet at a total cost of roughly Rs 24,664 crore, has built out 57,015 km of fibre routes across seven packages for defence communication, directly linking India's domestic OFC manufacturing capacity to India's national security requirements.[21]

Figure 9: Optical Fibre Cable applications in Defence

[19] Mordor Intelligence, Military Fibre Optic Cables Market, https://www.mordorintelligence.com/industry-reports/military-fibre-optic-cables-market

[20] C3ISR - Command, Control, Communications, Intelligence, Surveillance, Reconnaissance

[21] https://sansad.in/getFile/lsscommittee/Communications%20and%20Information%20Technology_18_Communications_and_Information_Technology_5.pdf?source=loksabhadocs

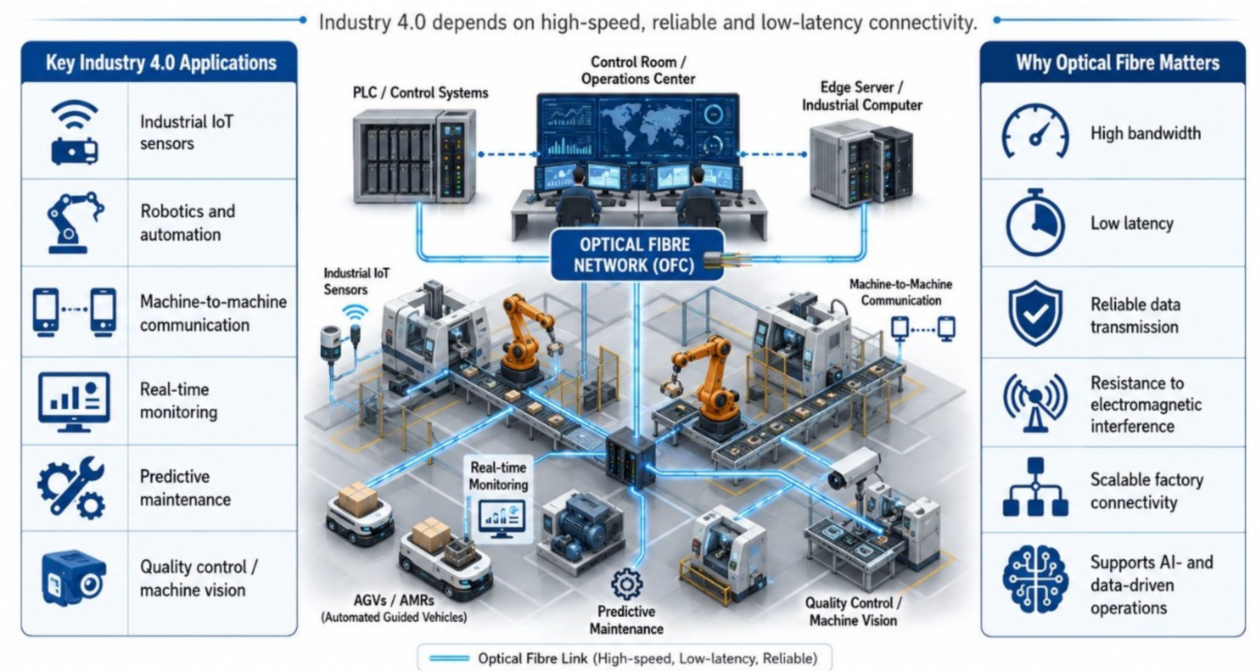
4.4 Industrial Automation and Smart Manufacturing: The fourth industrial revolution

The shift toward Industry 4.0[22] is driving the demand for fibre optic cables in industrial automation and smart manufacturing. With the integration of IoT, AI, robotics, and big data, industries require high-speed, reliable communication to optimize production and improve real-time monitoring. fibre optics play a critical role in enabling seamless data transfer between automated systems, sensors, and control units.

The global market for industrial fibre optic cables is projected to exceed USD 7.34 billion by 2034, driven by the continuous growth of smart manufacturing[23]. fibre optic solutions are essential for supporting high-bandwidth and low-latency communication, ensuring operational efficiency and scalability in automated factories.

As smart manufacturing and automation technologies evolve, the role of fibre optics will continue to grow, providing critical connectivity for industries to maintain competitiveness in a rapidly changing landscape.

Figure 10: India's End-to-End OFC Capability: From Glass Inputs to Gigabit Connectivity



[22]Industry 4.0 refers to the fourth industrial revolution, characterized by the integration of advanced technologies such as artificial intelligence (AI), the Internet of Things (IoT), robotics, big data analytics, and cyber-physical systems into manufacturing and industrial processes

[23]Fibre Optic Cable Market Size, Share & Trends Report, 2034

5. Next Generation Products

5.1 Next-Generation Optical Fibre Products

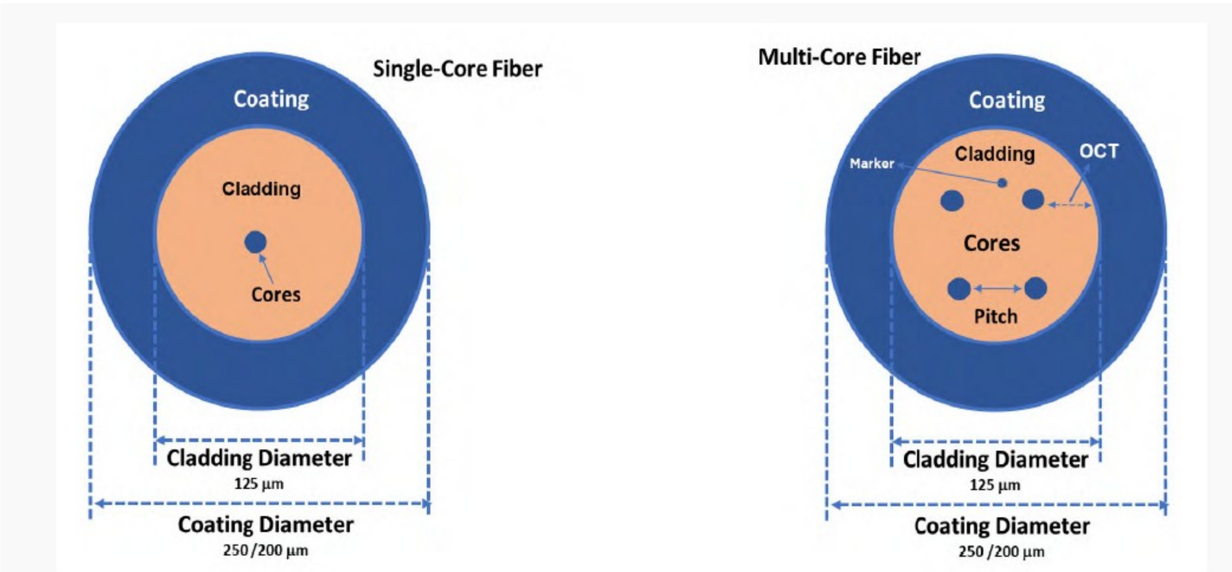
Optical fibre technology is entering a new phase. The growth of 5G networks, hyperscale data centres, artificial intelligence workloads and cloud computing is increasing the need for networks that can carry more data, over longer distances, with lower latency and lower signal loss. The next generation of optical fibre products is therefore focused on improving the performance of the fibre itself, rather than only increasing the number of fibres in a cable.

One important development is ultra-low-loss fibre**,** such as ITU-T G.654.E. This fibre is designed for long-distance and high-capacity networks. Compared to conventional G.652 fibre, it has lower signal loss and can carry stronger optical signals over longer distances. This reduces the need for frequent signal boosting through amplifiers and repeaters, improving network performance and lowering deployment costs.

Another important direction is Multi-Core Fibre (MCF). Conventional fibre usually carries data through a single core. Multi-core fibre places multiple cores inside the same fibre structure, allowing several data streams to move through one fibre. This increases capacity without requiring a proportionate increase in cable size. It is especially relevant where duct space is limited and networks need to carry much higher data volumes.

A third emerging technology is Hollow Core Fibre (HCF). Traditional optical fibre carries light through solid glass. Hollow core fibre guides light through an air-filled core. Since light travels faster through air than through glass, this technology can reduce latency and improve performance in applications where speed is critical, such as data centres, financial networks, defence systems and advanced computing environments.

Figure 11: Single-core vs Multi-core optical fibre - structural comparison



Indian optical fibre manufacturers are beginning to develop next-generation products suited to the demands of AI-led and high-capacity digital networks. One example is the development of hybrid cable architectures that combine different fibre types within a single cable design. Such architectures can bring together:

- **Hollow Core Fibre** is suited for ultra-low latency and high-power transmission.
- **G.654.E Fibre** is optimised for ultra-low loss and long-distance high-capacity transmission;
- **G.657.A1 Fibre,** which provides bend-insensitive performance and is suitable for broader network deployment.

Alongside fibre-level innovation, cable architectures are also evolving toward significantly higher fibre density. Advanced ribbon and rolled-ribbon cable designs allow several hundred to several thousand fibres within a single cable, while enabling faster mass-fusion splicing and more efficient deployment. These high-density designs are particularly relevant in high-capacity network environments where duct space is limited and rapid deployment is required.

Collectively, these technologies show that future network expansion will depend on both scale and performance. India's OFC industry will need to strengthen capabilities in ultra-low-loss fibre, high-density cable design, multi-core fibre and hollow core fibre to remain competitive in the next phase of global fibre demand. For India, this creates an opportunity to move from scale-based manufacturing toward higher-value fibre and cable technologies suited for AI data centres, long-haul networks, telecom expansion and secure digital infrastructure.

5.2 India's Position in Next-Generation Optical Fibre Technologies

India has developed a strong manufacturing base across the optical fibre value chain, including preform production, fibre drawing, and cable manufacturing. Domestic companies such as Sterlite Technologies Limited (STL), HFCL Limited, and Birla Furukawa Fibre Optics and alike produce a wide range of optical fibre and cable products, supported by sustained domestic demand from broadband expansion, 5G rollout, and digital infrastructure projects.

The domestic industry has established capability in manufacturing standard fibre, bend-insensitive variants, and high fibre-count cable designs required for large-scale network deployment. This positions India among a limited set of countries with end-to-end manufacturing presence in optical fibre cables and the ability to serve both domestic and export markets.

Indian manufacturers have also begun to participate in next-generation fibre segments. Developments aligned with ultra-low-loss fibre standards such as G.654.E indicate emerging capability in high-performance transmission systems. In addition, early-stage work on multi-core fibre reflects initial segqay into advanced capacity-scaling technologies. These developments suggest that India is moving beyond scale-driven manufacturing toward selective participation in fibre-level innovation.

However, the most advanced frontier segments of optical fibre technology particularly hollow-core fibre, submarine-grade ultra-low-loss fibre, and commercially scaled multi-core fibre remain concentrated among a small number of international players such as Corning, Prysmian, and Sumitomo Electric. India's participation in these segments is currently limited and remains at an early stage of development.

In addition, several upstream inputs required for advanced fibre production including high-purity silica materials, specialised dopants, and precision manufacturing equipment remain globally concentrated. This creates structural dependencies that constrain the domestic industry’s ability to fully integrate into the highest value segments of the optical fibre technology stack.

India’s current position can therefore be characterised as strong in manufacturing scale and deployment-driven segments, with emerging capability in next-generation fibre technologies. The next phase of growth will require targeted investment in advanced preform technologies, access to specialised raw material ecosystems, testing facilities and fibre-level R&D.

From a supply chain resilience perspective, expanding domestic capability in next-generation optical fibre technologies would reduce reliance on concentrated global suppliers while supporting the long-term competitiveness and scalability of India’s digital infrastructure ecosystem.

6. Policy Recommendations

India has set clear deployment targets for optical fibre infrastructure. BharatNet aims to extend fibre connectivity to 2.65 lakh Gram Panchayats, while the Department of Telecommunications has committed to providing operational OFC connectivity to 2.70 lakh villages by 2030 with 95 percent uptime. The National Broadband Mission 2.0, launched in January 2025, also targets a national average fixed broadband download speed of 100 Mbps by 2030, compared with the current average of approximately 60 Mbps[24].

Achieving these targets will require a multifold increase in fibre deployment over the rest of this decade. Data indicates that India’s annual fibre demand could increase to nearly **60 million fibre-kilometres**, driven by 5G rollout, FTTH expansion, BharatNet, data centres and wider digital infrastructure needs.

The real question is India's capacity to meet this demand. Domestic manufacturing and supply chains must deliver fibre reliably, at scale, and free of import dependencies that could threaten programme timelines or the security of national digital infrastructure.

The following recommendations are proposed to strengthen India’s optical fibre cable ecosystem:

1. **Secure critical upstream inputs such as Germanium Tetrachloride, Silicon Tetrachloride etc for Preform and Fibre Manufacturing**

India’s OFC capability cannot be assessed only at the finished cable stage. The supply chain risk is concentrated in upstream, particularly in inputs such as Germanium Tetrachloride, Silicon Tetrachloride, helium, optical-grade UV resins, silica tubes and high-purity materials. Several of these inputs are either fully import dependent or sourced from a small number of global suppliers.

India may consider preparing a critical input security plan for OFC manufacturing. This should include supplier diversification, long-term supply arrangements with trusted partners, support for domestic production where technically feasible, and strategic reserves for materials exposed to geopolitical disruption.

2. **Continue trade-remedy support by leveraging Anti-dumping duties where injury from dumped imports persists**

The DGTR[25] recommended imposition of anti-dumping duties on imports of Single-Mode Optical Fibre from China, South Korea, and Indonesia in August 2023, following an investigation that confirmed both the fact of dumping and the material injury caused to the domestic industry. The duties, ranging from USD 122 to USD 857.23 per thousand fibre-kilometres, were imposed for five years and the sunset review is due in 2028[26].

3. **Developing Domestic Telecom Manufacturing Champions**

India has built strong capabilities across the optical fibre ecosystem, including preform production, fibre drawing, and cable manufacturing. As digital infrastructure demand expands globally, there is an

[24] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2206477&reg=3&lang=1

[25] Directorate General of Trade Remedies – Investigative body under Ministry of commerce

[26] https://www.wirecable.in/finance-ministry-applies-5-year-anti-dumping-duty-on-optical-fibre-imports-from-china-south-korea-indonesia/

opportunity for Indian firms to scale these capabilities and strengthen their presence in international telecom markets.

A focused policy framework to support Indian telecom manufacturing champions could combine targeted public procurement support, export promotion, R&D incentives, and access to capital for capacity expansion.

As Indian optical fibre manufacturing industry is expanding their global footprint there is a need for protection of overseas investments and trade from growing geopolitical and regulatory risks. Following policy initiatives are recommended

- **Strengthen Export Competitiveness:** Telecom equipment exports are a key indicator of global leadership. India's share stands at 0.3%, significantly lower than China (26%), Vietnam (9.5%), Hong Kong (5.5%), Thailand (5.4%), and Japan (4.8%).[27]
- **Protect Overseas Investments:** Consider establishing an Office for International Investment Protection (OIIP) under the Ministry of External Affairs or Ministry of Commerce to monitor geopolitical risks, coordinate diplomatic engagement, and provide legal support to Indian companies facing challenges abroad.
- **Strengthen Investment Safeguards:** Incorporate robust investment protection provisions in future trade and economic agreements to ensure reciprocal safeguards for Indian OFC firms operating overseas.
- **Mitigate Political Risks**: Create a sovereign political risk insurance and legal support fund, similar to the U.S. OPIC model, to support Indian companies operating in high-risk markets, particularly in Africa and Southeast Asia.
- **Facilitate Global Market Access:** Establish Telecom Export Facilitation Cells within Indian embassies in key markets (North America, Europe, Africa, and Southeast Asia) to assist Indian firms with regulatory compliance and market access.

4. Align public procurement with supply chain resilience

Government-funded digital infrastructure should support domestic value-chain depth in addition to the final cable assembly. Current procurement rules largely focus on the nationality of the bidder and the origin of finished goods. This leaves a gap where upstream inputs such as preforms, optical fibre and specialised materials may still be sourced from risk-prone suppliers while the finished cable is treated as domestically manufactured.

To address this gap, the Public Procurement Preference to Make in India (PPP-MII) framework could be amended to incorporate supply chain transparency for critical OFC inputs used in government-funded networks. Sector-specific procurement guidelines may require bidders supplying OFC to disclose the origin of key upstream inputs such as preforms, optical fibre, and specialised materials and progressively encourage sourcing from domestic or trusted suppliers where adequate capacity exists.

In addition, optical fibre and optical fibre cable are part of the mandatory testing (MTCTE-4[28]) list. However, there is need for constant oversight to ensure all importers are adhering to the MTCTE.

[27] ITC Trade map

5. Pursuing a Zero-Duty Reciprocal Tariff Arrangement for Optical Fibre Products

India has developed significant manufacturing capability across the optical fibre cable, optical interconnect value chain, particularly in fibre drawing and cable manufacturing. Indian firms already export to several global markets and can scale production as demand for fibre-led digital infrastructure expands.

The United States is a key opportunity, driven by broadband deployment, FTTP expansion, 5G densification and hyperscale data centre growth. However, tariff barriers can affect the cost competitiveness of Indian manufacturers.

India may therefore consider pursuing a reciprocal zero-duty arrangement with the United States for optical fibre, optical fibre cables, optical interconnects and related telecom infrastructure products. This would improve market access, support export growth and strengthen India's position as a reliable manufacturing partner for critical digital infrastructure.

6. Mitigating the impact China's Germanium Export Restrictions on India

To mitigate the impact of China's Germanium Tetrachloride export restrictions, India can diversify its supply sources, invest in domestic production capabilities, and establish strategic reserves. Engaging with alternative suppliers in regions like Europe and Japan can secure long-term agreements, while incentivizing R&D and manufacturing within India can build domestic production capacity. Incorporating supply chain transparency for critical inputs such as Germanium in public procurement guidelines will encourage sourcing from trusted suppliers. These measures will strengthen India's optical fibre supply chain, ensuring stability and resilience for the country's growing digital infrastructure needs.

7. Promoting domestic manufacturing of data centre fibre and cables

India's data centre sector is emerging as a major demand driver for optical fibre, alongside telecom. With capacity expected to scale to **4–5 GW by 2030** and an announced investment pipeline of **USD 60–70 billion**, demand for data cables, structured cabling and high-density fibre systems will increase sharply.

Current data centre policies mainly focus on land, power and fiscal incentives. They do not sufficiently link incentives to the domestic sourcing of fibre and cabling systems. As capacity expands, this could lead to higher import dependence despite India's existing OFC manufacturing capability.

As capacity scales, this risks an increasing share of cabling demand being met through imports even as India builds competitive domestic capability across the fibre value chain.

Data centre policies could be linked more directly with domestic fibre and cable manufacturing. Fiscal incentives and infrastructure-status benefits can be made conditional on phased local sourcing of structured cabling, data-centre-grade fibre and related cable systems. Data centre parks can also provide space for component and cable manufacturers near major facilities. This would ensure that India's data centre expansion creates demand for domestic OFC manufacturers, rather than increasing dependence on imported cabling systems.

[28]MTCTE-4 refers to Phase IV of the Mandatory Testing and Certification of Telecommunication Equipment framework administered by TEC under DoT. This is relevant for ensuring quality compliance in critical telecom infrastructure.

8. Strategic Imperative for a National Sovereign Sovereign Fund for AI Infrastructure and Data Centres in India

India's AI and data centre expansion will require large-scale investment in compute infrastructure, power systems and high-capacity fibre connectivity. Private investment has already started flowing into hyperscale data centres, but the scale of future demand may require a dedicated public financing mechanism to support nationally important digital infrastructure.

India may consider creating a National AI and Data Infrastructure Fund to support data centres, AI compute clusters and the fibre networks that connect them. The fund can be structured through long-term public financing, viability support and co-investment with private operators. Its objective could be to accelerate AI-ready infrastructure while linking public support to domestic sourcing of optical fibre, structured cabling, network equipment and related digital infrastructure components.

China is currently mobilizing an unprecedented 2 trillion yuan (approximately USD 295 billion) plan for the next five years. The fund is backed by ultra-long-term special government bonds and state strategic industry funds. This initiative aims to build a unified, nationwide network of interconnected data centres and AI computing hubs across public sectors including healthcare, transportation and urban management. This national push integrates computing infrastructure directly with their national power grid, ensuring that 80% of the underlying technology, ranging from high-speed optical fiber communications to domestic hardware is sourced locally.

Similarly, a dedicated "National Data Infrastructure and AI Fund" in India would yield critical strategic benefits including rapid deployment of dense, high-capacity optical fibre networks and wireless optical links required to handle the massive traffic backhaul between hyper-scale data centers.

Figure 12: Optical Fibre Cable Ecosystem: Policy recommendations at a glance

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ABOUT THE CENTRE

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