THE FRAGILE BACKBONE OF WEST AFRICA'S DIGITAL INFRASTRUCTURE

HENRY EL BAHNASAWY

In an era where digital connectivity is the backbone of social development and economic growth, a number of West African countries lag behind in building the foundations for digital transformation. The coastal countries Mauritania, The Gambia, Guinea-Bissau, Guinea, Sierra Leone, and Liberia continue to depend largely on a single subsea cable—the Africa Coast to Europe (ACE) system—for access to the global internet. While internet penetration in this region has grown—reaching an average of 32,6% with a growth rate of 3.12% between 2024 and 2025—the foundations of connectivity remain fragile (Kepios, 2025).

With a combined population of approximately 39.1 million people growing at 2.43% per year, these countries are home to millions of individuals whose access to the digital economy depends on a single point of failure (United Nations, 2024). Any disruption to the ACE cable can have outsized consequences—cutting off entire nations and slowing progress toward digital inclusion, resilience, and long-term economic growth.

This structural fragility underscores the need for diversification beyond the ACE system. Key strategies encompass the deployment of additional submarine cables, expansion of cross-border terrestrial fibre backbones, establishment of carrier-neutral data centres, and development of regional Internet Exchange Points (IXPs). However, simply increasing capacity is not enough to address the region's digital challenges. Equally important are transparent cost structures, infrastructure neutrality, and equitable market access—ensuring that all service providers have a fair and equal opportunity to participate in the market. This promotes fair competition, innovation, and more affordable digital services. Moreover, GDP per capita, small population sizes, competing commercial priorities, and complex regulatory and political environments all influence the pace and viability of such developments. There is a need to create a more resilient, affordable, and inclusive digital ecosystem that can support sustainable socioeconomic change.

THE PRE-ACE ERA

Before the Africa Coast to Europe (ACE) subsea system went into service in 2012, internet connectivity in many West African countries was very limited—both in capacity and affordability (World Bank, 2012). At this time, countries such as Sierra Leone, Liberia, The Gambia, and Guinea-Bissau relied almost entirely on satellite-based connections—particularly Very Small Aperture Terminal (VSAT) systems—as well as on microwave and fiber links to neighboring countries for internet access (Pushak & Foster, 2011). For example, Sierra Leone's National Telecommunications Commission (NATCOM) estimated that the entire country, with a population of approximately six million, possessed only about 155 Mbps of international bandwidth (World Bank, 2020). At the time, this was roughly equivalent to the bandwidth demand of a small town in the US or Western Europe. In The Gambia and Guinea-Bissau, the cost of bandwidth ranged from $4,000 to $5,000 USD per Mbps per month, compared to approximately $500 USD per Mbps per month in East African countries which were already connected to subsea cables at this time (World Bank, 2022). End users faced very limited and extremely expensive options: in Sierra Leone, low-speed packages cost around $200 USD per month, equivalent to 56.8% of per capita GDP, and in Liberia, users paid two to three times more than the regional average for connectivity (World Bank, 2012).

THE ACE SUBSEA CABLE SYSTEM

The launch of the Africa Coast to Europe (ACE) Subsea Cable System in 2012 is considered a milestone in the transformation and advancement of telecommunications in Africa. The Project, led by Orange S.A. (formerly France Telecom), was developed by a consortium of 20 companies, including its regional subsidiaries and local partners. Its three segments currently connect 24 landing points—three in Europe (France, Portugal, Canary Islands) and the rest in Africa, from Mauritania to South Africa. For seven African countries (The Gambia, Guinea, Equatorial Guinea, Liberia, Mauritania, São Tomé and Príncipe, Sierra Leone), it's the first direct link to a fiber-optic submarine cable (ACE Consortium, 2021). By providing direct connectivity to Europe, the ACE system has significantly reduced costs and increased the capacity of available international bandwidth across the region.

The ACE cable system, built with an investment of approximately $700 million USD, was primarily funded by the Orange Group, which contributed around $250 million USD alongside its subsidiaries (Orange, 2015). Each connected country contributed approximately $25 million USD to secure a landing station in its territory (World Bank, 2012). Supplied by Alcatel Submarine Networks (ASN), the cable features two fiber pairs and initially delivered a capacity of 5.12 Tbps. In June 2021, an extension to South Africa was completed, upgrading the system's total capacity to 24 Tbps (France Télécom-Orange, 2012). Several cable landings in West African countries were financed through loans from the World Bank's development agency, the International Development Association (IDA), to support digital development and expand international connectivity (SubTel Forum, 2011). According to a former Google employee who was involved in the rollout of Google's network in Africa, landing costs in some locations have been significantly higher than average due to difficult marine conditions. Extremely shallow coastal waters and intense, often uncontrolled marine activity—such as fishing and anchoring—have made the installation process more complex and costly. These factors also raise the risk of cable damage during operation, which can lead to increased long-term repair and maintenance costs. In addition to these physical challenges, the effective cost of using capacity is further driven up by low utilization rates and the high cross-connect fees charged by Cable Landing Station operators. These issues are not unique to ACE, but they remain particularly relevant at some of its landing sites.

> While ACE has played a crucial role in expanding West Africa's connectivity, it also has persistent and costly vulnerabilities that limit its effectiveness and reliability. One of the most critical challenges is recurrent service outages—so much so that it has been referred to as a "problem child" in the subsea cable industry.

TECHNICAL AND GEOGRAPHICAL VULNERABILITIES

While ACE has played a crucial role in expanding West Africa's connectivity, it also has persistent and costly vulnerabilities that limit its effectiveness and reliability. One of the most critical challenges is recurrent service outages—so much so that it has been referred to as a "problem child" in the subsea cable industry. A major contributing factor is that ACE, as well as other submarine cables along the Atlantic coast of Africa, traverse canyons that are highly susceptible to debris flows and turbidity currents.

Two particularly vulnerable areas are the Trou Sans Fond Canyon, located just off Abidjan in Ivory Coast, and the Congo Canyon (Clare, 2025). Impacts of turbidity currents in the Congo Canyon, such as landslides and rock movements, have damaged multiple subsea cables on six separate occasions between 2019 and 2024 (Ingale et al., 2025). Another major incident took place on 14 March 2024, when the ACE cable, along with three other cables serving West African countries, suffered breaks in the Trou Sans Fond Canyon. The repair took over a month and was completed on 17 April 2024 (Clare, 2025). A notable earlier outage occurred on 30 April 2018, when cable damage caused by a trawler led to significant disruptions. According to Dyn, a web-infrastructure company owned by Oracle, ten countries were affected, and Mauritania even experienced a complete internet blackout lasting 48 hours (Baynes, 2018).

Due to these numerous outages, the demand for more resilient and redundant international connectivity is growing. The only currently viable way to mitigate the hazards of the Congo Canyon is to route the cable further offshore into deep waters exceeding 5,000 meters, as was done with Google's Equiano cable. This approach allows the submarine canyon and any associated deep-sea fan to be avoided, but it also entails considerably longer cable spans, which may make the solution economically unviable for some systems (Clare, 2025).

GOVERNANCE AND MONOPOLY STRUCTURES AT CABLE LANDING STATIONS

Despite its potential to improve international connectivity, the ACE submarine cable system has not fostered a competitive or resilient digital ecosystem in West Africa. This is due to deep-rooted structural and governance-related constraints that persist across the region. Cable Landing Stations (CLS) along the ACE system are predominantly controlled either by incumbent national operators or non-representative ISP consortia.

These monopolistic structures significantly hinder competition by acting as gatekeepers, enforcing restrictive conditions and charging excessive fees for capacity, cross-connects, and colocation services on buyers. According to telecom broker and editor of the Subsea Cable Blog, Roderick Beck, cross-connect fees at some of the ACE CLSs can range from $4,000 to $15,000 per month. Modern OTT-led subsea cable projects, such as 2Africa, by contrast, rely on an open-access model and require operators to guarantee effective wholesale access to international capacity—at fair and reasonable prices, and under transparent and non-discriminatory conditions (2Africa Consortium, 2022). Here, cross-connects are capped at $150 per month at the CLS, and most hand-offs occur at carrier-neutral facilities (Beck, 2025).

These monopolistic structures significantly hinder competition by acting as gatekeepers, enforcing restrictive conditions and charging excessive fees for capacity, cross-connects, and colocation services on buyers.

However, ACE's high prices cannot be explained solely by strategic displacement of other market participants. As one industry expert explains: "One could argue that the high costs associated with capacity, and cross-connects are partly a function of low volumes, which drive up unit costs. But this may well represent a vicious cycle—where high prices suppress demand, and limited demand, in turn, prevents price reductions."

Nonetheless, without regulatory oversight or competitive pressure, these cost structures often become entrenched and disconnected from actual service value—especially when the same entities that operate the CLSs are also market participants with a commercial interest in limiting access by potential competitors, creating a clear conflict of interest. As Beck explains: "It is reform of the CLSs that is the key ingredient. ACE is of little value to carriers in general. Only the party that controls the CLS benefits." This view is echoed in a 2017 study by Dr. Uchenna Jerome Orji, Research Fellow at the African Center for Cyber Law and Cybercrime Prevention, which examined the implementation of the ECOWAS Supplementary Act C/REG.06/06/12. ECOWAS (the Economic Community of West African States) is a regional political and economic union of fifteen countries in West Africa, established in 1975 to foster economic cooperation and sociocultural exchanges among its member states (Ejike, 2023). Adopted in 2012, the act sought to establish a harmonized legal and technical framework for open, transparent, and cost-oriented access to submarine CLSs across West Africa.

However, as Orji's analysis highlights, the regulation has remained legally ineffective: none of the ECOWAS member states had incorporated it into national law at the time, rendering its provisions non-binding (Orji, 2017). Orji also criticized the persistent dominance of incumbent telecom operators, who continued to control CLS infrastructure and pricing in direct contradiction to the regulation's objectives. The absence of legally enforceable access rules has allowed opaque, non-cost-oriented pricing structures to prevail. Compounding the problem, national regulatory authorities in many member states lacked both the independence and the institutional capacity to enforce the open-access principles envisioned by the act. As a result, instead of achieving regional harmonization, the region has remained fragmented, with each country taking its own approach to submarine cable access—ultimately deterring new market entrants and reinforcing existing monopolies (Orji, 2017).

Another structural factor contributing to inflated pricing is the typical market configuration in ACE countries: in most cases, there is only one licensed operator with exclusive landing rights—such as the GUILAB consortium in

Guinea. GUILAB is a limited company established in 2011 as a public–private partnership (PPP) between the Government of Guinea and eight internet service providers (ISPs) to manage the country's ACE landing station (World Bank, 2021). As a result, international capacity is often only sold on a half-circuit basis. In this outdated model, customers purchase just one side of a connection and must then procure the other half separately from another provider.

This not only increases transaction complexity but also gives the landing operator disproportionate market power, particularly when no competitive alternatives exist. In contrast, a full circuit provides end-to-end connectivity between two points via a single operator, ensuring transparency, efficiency, and fairer pricing. However, such models are rarely available in the current ACE setup. For example, in Liberia, licensed operators are unable to activate full circuits independently at the Monrovia landing station. Instead, they are forced to purchase the Liberian half-circuit from the local monopoly at inflated prices—further reinforcing the lack of competition. This approach is detrimental not just to all licensees in the market but also to government objectives, since it typically deters investors from buying capacity into the country at all and artificially reduces international capacity. In Liberia specifically, high access costs have discouraged investment in additional capacity, creating an artificial scarcity of international bandwidth that hinders the growth of the telecommunications sector and slows progress toward digital inclusion (Google, 2011).

"Because there are no domestic data centers, every piece of content—from video streaming to basic web services—is served from abroad. This structural gap ensures that no local internet traffic exists, reinforcing the region's dependence on costly international bandwidth." —Andreas Fink, CEO, Cajutel

ABSENCE OF DOMESTIC INTERCONNECTION AND IXPS

The lack of interconnection between ISPs in West African countries further increases dependence on international capacity. Even traffic between ISPs within the same country is routed internationally—typically via Europe—before returning to a neighboring network. This results in unnecessarily high transit costs, higher latency, and degraded user experience. In none of these countries does an established Internet Exchange Point (IXP) currently exist to facilitate domestic traffic exchange between providers.

Establishing IXPs is therefore a critical step toward reducing costs, improving performance, and keeping local traffic local (Internet Society, 2014). Examples from other African countries, such as Nigeria and Kenya, demonstrate the potential impact that IXPs can have. According to the Internet Society, IXPs can save millions of dollars annually in transit costs by offloading traffic from expensive international links onto more affordable local links (Kende, 2020). While these countries did not transform their internet ecosystems overnight, the success of these projects was the result of a collective effort by governments, business leaders, and other stakeholders working together (FINN Partners, 2020).

In order for IXPs to succeed in West Africa, addressing regulatory and market challenges is just as important as the technical deployment. Adequate numbers of ISPs and a supportive regulatory framework are critical to enable fair interconnection. Resistance may arise from incumbent providers, who might view IXPs as a threat to their revenue or market position, particularly where they hold monopoly control over key infrastructure such as international gateways. Small ISPs may also struggle with technical complexity or limited resources. Building awareness among stakeholders and fostering trust is therefore essential to ensure broad participation and long-term sustainability of local IXPs (Jensen, 2012).

Building local interconnection points like IXPs is essential to reduce dependence on international links, but they address only part of the region's connectivity challenges. Another factor influencing reliance on international bandwidth is the declining share of peer-to-peer (P2P) traffic on the Internet, which has become marginal in recent years.

Today, nearly all traffic follows client–server architectures, making the location of servers critical. As Andreas Fink, CEO of Cajutel, notes: "Because there are no domestic data centers, every piece of content—from video streaming to basic web services—is served from abroad. This structural gap ensures that no local internet traffic exists, reinforcing the region's dependence on costly international bandwidth." However, content providers deploy cache servers within local ISPs to reduce reliance on international links. These caches—such as Google Global Cache (GGC) or Meta Network Appliances (MNA)—can lower transit costs and improve performance (Volmer, 2017). But they are only effective if the local ISP handles a sufficient volume of traffic to achieve a high cache hit ratio; otherwise, the cache provides little to no benefit. The performance of a cache improves with the number of users it serves, because a larger user base increases the likelihood of repeated content requests, resulting in a higher cache hit rate (Carlinet et al., 2010).

LACK OF LOCAL DATA CENTERS AND POWER INFRASTRUCTURE CONSTRAINTS

While the establishment of domestic data centers is a critical step toward reducing dependence on international bandwidth and strengthening digital sovereignty, data center deployment in these countries faces substantial challenges. One of the most pressing constraints is the instability and limited capacity of national electricity grids. Frequent power outages, unpredictable voltage fluctuations, and unreliable service levels make it extremely difficult to operate energy-sensitive infrastructure like data centers. In many areas, operators must therefore rely on expensive diesel generators to power their equipment, particularly at CLSs located in remote coastal sites. Transporting diesel to these locations is often slow and costly, especially where roads are underdeveloped. In addition, diesel is costly to procure and its use results in high CO_2 emissions, adding both environmental and financial strain to operations.

While the establishment of domestic data centers is a critical step toward reducing dependence on international bandwidth and strengthening digital sovereignty, data center deployment in these countries faces substantial challenges.

A second challenge lies in the lack of investment capital. Data centers require not only high upfront expenditure but also sustained operational funding to meet global standards for cooling, security, uptime, and connectivity. However, in markets where internet penetration remains low and local digital services are underdeveloped, the business case for such infrastructure is perceived as weak. This discourages both private sector investment and public infrastructure financing.

POLITICAL INSTABILITY AND SECURITY-DRIVEN INVESTMENT RISKS

Furthermore, West Africa's fragile security situation represents a major obstacle to the development of digital infrastructure, particularly when it comes to long-term capital projects such as data centers or subsea cable systems. As highlighted by Siaplay and Werker (2023), the region has experienced a surge in political instability, including five successful coups between 2020 and 2023, along with increasing violence spilling from the Sahel into coastal states like Benin and Togo. These developments contribute to a broader environment of governance fragility, elevated political risk, and investor uncertainty (Siaplay & Werker, 2023).

For infrastructure investors, the perceived and real risks of instability translate into higher capital costs, insurance premiums, and security-related expenditures. The threat of civil unrest, weak institutions, and sudden regime changes discourages long-term commitments and complicates operational planning. As a result, even when demand and technical potential exist, digital infrastructure projects can be stalled or scaled back.

BUILDING BEYOND ACE: NEW REGIONAL INFRASTRUCTURE INITIATIVES

Recognizing the systemic weaknesses of the ACE system, a range of public and private actors are now exploring alternative infrastructure projects to strengthen regional connectivity. These initiatives aim to expand bandwidth and create redundancy to enhance resilience. They also address underlying issues such as cost structures, market access, and infrastructure neutrality—ultimately lowering access prices for end users. Notably, some segments of ACE have now been in operation for almost 13 years—surpassing half of the system's 25-year design lifespan—which underscores the growing urgency of developing alternatives (Keck, 2019).

While many of these efforts face significant challenges—financial, political, and operational challenges—they address the urgent need to meet future demand. According to TeleGeography, between 2020 and 2024, internet traffic in Africa grew at a compound annual growth rate of 41% (Brodsky, 2024). It is expected to continue rising by 38% annually through 2030—well above the global average of 31% (Christian, 2024). Key growth drivers include accelerated fiber-to-the-home (FTTH) and fixed 5G adoption, and the need to cater for heavy data-consuming applications. Increasing adoption rates in emerging markets are contributing considerably to this growth (Africa Analysis, 2024).

However, in many of the target West African countries, basic connectivity and internet adoption remain largely constrained by economic factors and the viability of the business case. Many households and businesses cannot yet afford high-speed broadband services, and operators often face limited incentives to invest in infrastructure without a guaranteed return. In more developed markets, such as South Africa, where infrastructure and income levels are higher, FTTH and 5G adoption can directly drive demand for bandwidth-intensive services, contributing significantly to overall digital growth.

Even though current economic constraints limit internet adoption in many West African countries, demand is gradually increasing and could soon create a bottleneck, as existing systems like ACE—and even more recent deployments such as 2Africa and Equiano—may no longer be sufficient to meet regional demand in the near future. According to Salience Consulting, international capacity requirements in West Africa could exceed 500 Tbps by 2049 (Ramos, 2025). In this context, investments in diverse and resilient digital infrastructure—both subsea and terrestrial—are essential to support long-term growth, improve affordability, and close the digital divide.

Many households and businesses cannot yet afford high-speed broadband services, and operators often face limited incentives to invest in infrastructure without a guaranteed return.

One such initiative is the Amilcar Cabral Submarine Cable Project, named after the Bissau-Guinean independence leader (PIDA, 2023). It is a regional ECOWAS-backed project aimed at connecting the under-served countries—Liberia, Sierra Leone, Guinea, Guinea-Bissau, and The Gambia—with Cabo Verde, where several systems already land: WACS and EllaLink, which provide connectivity to Europe, and SHARE, which connects to Senegal. The planned route spans approximately 3,130 km, with branching units (BUs) for all five coastal countries and an estimated cost of USD 91.3 million (Ramos, 2025). For potential regional expansions, the design also includes two additional BUs, intended for later connection to Dakar (Senegal) and Abidjan (Côte d'Ivoire)—two emerging West African key hubs that could significantly enhance the project's strategic reach.

However, as Roderick Beck points out, the project's overall impact on connectivity costs may be limited. As Europe remains the ultimate destination for both content and peering, providers connected via the Amilcar Cabral cable would still need to purchase costly capacity from Cabo Verde to Europe—thereby limiting the project's ability to substantially reduce bandwidth costs or foster local ISP growth (Beck, 2025).

There is also no guarantee that the CLSs tied to the project will be carrier-neutral or operate under open-access principles. Without clear regulatory safeguards, there is a risk that control may again concentrate in the hands of incumbent operators—driving up costs for capacity and cross-connects, limiting fair access to international capacity, and discouraging broader participation in the market.

In addition, the project has been already under discussion for years without securing the necessary funding, raising doubts about whether it will progress beyond the feasibility stage.

On July 16, 2025, Liberia's Ministry of Posts and Telecommunications announced an initiative for a successor project to the Amilcar Cabral cable. The project, titled the "Second Submarine Cable Project", aims to reduce dependence on the Africa Coast to Europe (ACE) cable and thereby enhance internet resilience in the region (Tanner, 2025). It is being developed in partnership with the ECOWAS Commission for Infrastructure, Energy, and Digitalisation, alongside the World Bank, with the objective of deploying a second subsea cable that will connect Liberia with four other West African countries: The Gambia, Guinea-Bissau, Guinea, and Sierra Leone. The consulting firm TACTIS was contracted to conduct a feasibility study covering the cable's technical design, financing, and implementation roadmap (Anyango, 2025). In Liberia, the cable is expected to land in Buchanan, Grand Bassa County. So far, no further information has been made publicly available, including whether the CLSs will operate under an open-access model. It remains to be seen whether this new project will advance more rapidly than the Amilcar Cabral cable, whether the necessary funding can be secured, and whether it will ultimately be constructed.

Driven by the assumption that the capacity of 2Africa and Equiano will no longer be sufficient in Africa in a few years' time, AFR-IX Telecom plans to extend the Medusa cable system in the Mediterranean Sea to West Africa (Yadav, 2025). To support this initiative, the company has already secured a €14.3 million grant from the Connecting Europe Facility (CEF) fund of the European Union. Rather than being a simple southward extension of a Mediterranean system, the project is better understood as a Portugal–West Africa configuration, with the potential for sheath sharing with the existing North African branches of Medusa. Beyond adding long-haul capacity, this initiative could be strategically relevant for countries that remain connected only via the ACE cable. By integrating them into a newer, more carrier-friendly system, the project would significantly improve resilience and reduce their exposure to a single point of failure. By complementing 2Africa and Equiano, it could mitigate the risk of future capacity shortages and reduce systemic dependence on just two OTT-driven systems. However, it has not yet been announced in which West African countries Medusa will land. It therefore remains to be seen whether the system will actually provide redundancy to those markets currently dependent on ACE alone. As AFR-IX Telecom has not yet provided concrete information or a timeline regarding the planned West African extension, both the scope and the financing of the project remain uncertain.

An industry expert notes that as the trunk capacity becomes allocated and utilized across the original landings, the business case to add further branches diminishes because of the relatively limited capacity demand at additional landing points.

Google's Equiano cable and Meta's 2Africa system have both introduced more open-access principles compared to older cables like ACE, offering competitive wholesale pricing and higher capacity (Google, 2011). Yet their reach within the ACE-dependent coastal states remains limited. While both systems include branching units (BUs) that could be potentially used to connect countries such as Liberia, Sierra Leone, or Guinea in the future, pre-installing BUs on a trunk provides only the technical capability to consider future branches. It remains a huge challenge to secure funding to actually deploy those branches. An industry expert notes that as the trunk capacity becomes allocated and utilized across the original landings, the business case to add further branches diminishes because of the relatively limited capacity demand at additional landing points. This dynamic can, of course, change in the event of a dramatic geopolitical shift in the region, but it is a truism that the longer the gap between Day 1 and Day 2, the smaller the chance of a successful business case to support new landings.

Thus, the main obstacle is therefore not technical feasibility but the challenge of securing a viable business case—given high entry costs, complex regulatory environments, and limited short-term market volumes. As another former Google employee who worked on Equiano explains: "We contacted all ACE countries where Equiano had a potential branching unit to land. The incumbent operators—mostly monopolies—were not receptive to an open, competitive cable, and their parent Orange was also lukewarm to the idea." In addition, several countries were unable to secure sufficient financing. Similar challenges arose during the development of 2Africa, highlighting the persistent financial and regulatory barriers to expanding open-access subsea infrastructure across the region. This highlights how entrenched market power and weak competitive incentives can prevent transformative infrastructure from reaching the countries that need it most, underlining the importance of effective regulatory and commercial frameworks to enable open and competitive networks.

On July 29, 2025, EllaLink signed an agreement with Mauritania's Ministry of Digital Transformation and Administrative Modernization (MTNMA) to build, operate, and maintain a new subsea cable branch (EllaLink, 2025). Construction is already underway, led by ASN. The system will include two fiber pairs and connect Nouadhibou, Mauritania's second-largest city, directly to Sines and Lisbon in Portugal, via a 500 km (310.6 miles) extension to the existing EllaLink transatlantic cable, which links South America to Europe. Once operational—expected in early 2027—the system will initially offer a 200 Gbps low-latency link from Sines and Lisbon, over terrestrial fiber to EllaLink's Point of Presence (PoP) in Madrid, Spain, with capacity expected to grow over the next 25 years. The new system also complements recent domestic infrastructure efforts, such as the launch of Mauritania's first national Tier III-certified data center in Nouakchott (Swinhoe, 2025).

Mauritania is currently especially reliant on the ACE cable, as the country lacks significant cross-border terrestrial fiber connections. This isolation became particularly evident during a major outage on April 30, 2018, when a fishing trawler damaged the ACE cable near Nouakchott. The result was a complete national internet blackout that lasted 48 hours (Belson, 2018).

The total investment amounts to €29.5 million, including €9.6 million in funding from the European Commission's CEF Digital program and additional support from the European Investment Bank (EIB) (Qiu, 2025). Once completed, the new connection is expected to support the country's digital transformation by providing direct, affordable access to major European internet hubs.

In 2020, Orange launched Djoliba, a 10,000 km terrestrial fiber network combined with 10,000 km of subsea cables (ACE, MainOne, SAT-3), connecting eight West African countries, including Senegal, Mali, Guinea, and Ghana (Bannerman, 2020). Promoted as the first pan-West African backbone, the system offers high-capacity connectivity of up to Nx100 Gbps, spanning 16 PoPs and nearly 155 technical sites (Qiu, 2020). While it is marketed as a single, seamless network, in practice the system is operated and controlled by Orange's national affiliates, which each manage their domestic segments independently. According to Fink, this operational structure creates significant barriers for third-party access. He recounts the case of an operator seeking capacity between Senegal and Burkina Faso, who was offered a price nearly 100 times above market level, effectively blocking entry. Even Orange's own international wholesale division has reportedly faced difficulties negotiating fair offers with local affiliates. As a result, despite the infrastructure being in place, access is often restricted—especially for potential competitors.

In 2020, Orange launched Djoliba, a 10,000 km terrestrial fiber network combined with 10,000 km of subsea cables (ACE, MainOne, SAT-3), connecting eight West African countries, including Senegal, Mali, Guinea, and Ghana

Another limitation is that Djoliba does not provide full redundant coverage. While countries like Senegal, Mali, and Ghana are well integrated via redundant subsea and terrestrial routes, others—such as Liberia and Guinea—still lack domestic terrestrial fibers and remain entirely dependent on the ACE submarine cable. This means their exposure to outages remains unchanged, with no secondary routes to mitigate disruptions of the ACE system.

Djoliba shows that building infrastructure is not enough—the way it's governed and accessed matters just as much. A truly open and regional system requires fair pricing, neutral access conditions, and consistent connectivity across all countries involved.

Moreover, CSquared, a pan-African technology company, is building a terrestrial fiber backbone between Nigeria and Senegal, providing a critical land-based alternative to West Africa's fragile internet infrastructure (CSquared, 2025). In partnership with Phase3 and SBIN, the network connects key coastal countries using OPGW (Optical Ground Wire), a type of cable designed to serve dual functions: it acts as a ground wire for power transmission lines and as a medium for high-speed data transmission via optical fibers (Michael, 2024). The project aims to strengthen regional digital resilience, particularly for hyperscalers and cloud providers that require redundancy on land, not just undersea.

Another ambitious initiative is the Teralink project, spearheaded by Cajutel and Fink Telecom Services. Rather than relying on subsea connectivity alone, Teralink proposes to construct a 6,000 km cross-border terrestrial fiber-optic backbone stretching from Dakar to Lagos, connecting over 110 PoPs across the region (Teralink Communications Ltd., 2025). The network is designed to be carrier-neutral and accessible to all operators, thereby breaking with the monopolistic control seen in the ACE system. The total cost of the project is estimated at USD 201 million, with plans to utilize a mix of existing fiber routes where feasible, while also laying new conduits. At this stage, the project has not yet secured funding and remains at the conceptual and fundraising phase.

What makes Teralink particularly noteworthy is its full independence from the power grid: all sites are solar-powered, with battery backups to maintain uptime during multiday outages—an essential design feature given the fragility of the region's energy infrastructure, as CEO Andreas Fink underlines. The project is structured into ten investment phases, with early deployments focusing on Senegal, Guinea, and Sierra Leone, and later phases extending to Liberia, Côte d'Ivoire, Ghana, Togo, Benin and Nigeria. In Senegal, Teralink plans to interconnect with open-access subsea cable systems like 2Africa, enabling access to affordable international capacity—key for lowering wholesale costs and driving competition across inland markets.

CONCLUSION

To unlock the region's full digital potential, stronger, more resilient, and genuinely open infrastructure is essential. Initiatives such as the Amilcar Cabral submarine cable, CSquared's terrestrial backbone, and the Teralink project aim to diversify routes, boost capacity, foster competition, and lower prices.

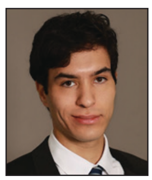
West Africa is facing a critical moment. The region's rapidly growing population, accelerating internet adoption, and ambitious digital agendas highlight both its potential and the urgency of addressing infrastructure gaps. The need for improved connectivity is based not only on the current digital divide but, more importantly, on anticipated future gaps. Notwithstanding a wealth of publicly accessible data projecting strong growth for the region—particularly given that it hosts the world's youngest demographic—current infrastructure remains fragile and often monopolized. The ACE cable marked a transformative step by providing first-time international connectivity to previously isolated nations. Yet it also exposed the risks of relying on a single system—technical vulnerabilities, prolonged outages, and persistently high costs.

To unlock the region's full digital potential, stronger, more resilient, and genuinely open infrastructure is essential. Initiatives such as the Amilcar Cabral submarine cable, CSquared's terrestrial backbone, and the Teralink project aim to diversify routes, boost capacity, foster competition, and lower prices. However, many remain delayed, underfunded, or constrained by the same governance and market structures that have hindered progress in the past.

Subsea cable landings have demonstrable economic effects. For example, in South Africa, subsea cables were associated with a 6.1% increase in GDP per capita between 2009 and 2014. Over a longer period (2002–2017), a 10% increase in broadband penetration corresponded to a 0.27% increase in GDP per capita, with similar results observed for international connectivity overall (O'Connor et al., 2020).

However, closing the digital divide will require more than new cables. West African countries must coordinate on shared regulatory frameworks, enforce open-access principles, and ensure fair, non-discriminatory market participation. Reliable, affordable, and competitive connectivity would not only strengthen economic resilience but also catalyze transformative growth in key sectors—enabling fintech innovation, expanding access to remote medical services, enhancing online education, and supporting e-government initiatives.

With the right investment, governance, and regional collaboration, West Africa can build a digital ecosystem that is secure, inclusive, and capable of meeting future demand. Without such change, millions will remain excluded from the digital economy, and the region will continue to face avoidable outages, high costs, and missed opportunities for sustainable development. **ST**



HENRY EL BAHNASAWY *is a graduate student at the Free University of Berlin, Germany, pursuing a master's degree in Computer Science, where he has specialized in networking and edge computing. He is part of the inaugural cohort of the Certificate in Global Digital Infrastructure, guided by Professor Nicole Starosielski at the University of California, Berkeley, where he focused on digital infrastructure in West Africa, particularly in countries currently dependent on a single submarine cable.*

Contact:
henry.bahnasawy@gmail.com
https://linkedin.com/in/henry-el-bahnasawy-747583231/

References

ACE Consortium. (2021). ACE Submarine Cable. https://ace-submarinecable.com/en/submarine-cable/

Africa Analysis. (2024). Africa Broadband Outlook 2024. https://atuuat.africa/wp-content/uploads/2024/11/Africa-Broadband-Outlook-2024-v1-00-DRAFT-FINAL-08.11.2024.pdf

Anyango, A. (2025). Liberia, ECOWAS, World Bank, launch second submarine cable project. https://www.logisticsbusinessafrica.co.za/liberia-ecowas-world-bank-launch-second-submarine-cable-project/

Bannerman, N. (2020). Orange launches Djoliba: the first pan-West African fibre network. https://www.capacitymedia.com/article/29ot42ikril15nn5zaosp/news/orange-launches-djoliba-the-first-pan-west-african-fibre-network

Baynes, C. (2018). Entire country taken offline for two days after undersea internet cable cut. https://www.independent.co.uk/tech/mauritiana-internet-cut-underwater-cable-offline-days-west-africa-a8298551.html

Beck, R. (2025). The Amilcar Cabral West African Subsea Cable Project. https://subseacables.blogspot.com/2025/06/the-amilcar-cabral-west-african-subsea.html

Beck, R. (2025). Subsea Cables & Internet Infrastructure. Update On The Medusa Cable. https://subseacables.blogspot.com/2025/08/update-on-medusa-cable.html

Beck, R. (2025). 2Africa Update - Cable Landings Stations, Capacity Availability & POPs - Part 1. https://subseacables.blogspot.com/2025/07/2africa-update-cable-landings-stations.html

Belson, D. (2018). ACE Submarine Cable Cut Impacts Ten Countries. https://web.archive.

org/web/20180807085008/https://dyn.com/blog/ace-submarine-cable-cut-impacts-ten-countries/

Brodsky, P. (2024). International Internet Bandwidth to Africa Nearly Quadrupled 2020-2024. Telegeography. https://blog.telegeography.com/international-internet-bandwidth-connected-to-africa-has-almost-quadrupled-since-2020

Carlinet, Y., Debar, H., Gourhant, Y., & Mé, L. (2010). Caching P2P Traffic: What Are the Benefits for an ISP? https://doi.org/10.1109/ICN.2010.67

Christian, P. (2024). Africa Networks Geography Update. Telegeography. https://www.afpif.org/wp-content/uploads/2024/08/Network-Infrastructure-Trends-in-Africa.pdf

Clare, M. (2025). Submarine Cable Protection and the Environment. https://www.iscpc.org/publications/submarine-cable-protection-and-the-environment/ICPC_Public_EU_June_2025.pdf

CSquared. (2025). CSquared, Phase3 and SBIN Commission Lagos-to-Accra Terrestrial Fibre Route, Strengthening West Africa's Digital Resilience. https://csquared.com/2025/05/06/csquared-phase3-and-sbin-commission-lagos-to-accra-terrestrial-fibre-route-strengthening-west-africas-digital-resilience/

Ejike, S. (2023). Formation of the Economic Community of West African States. https://www.ebsco.com/research-starters/politics-and-government/formation-economic-community-west-african-states

EllaLink. (2025). Mauritania trusts EllaLink for its new international submarine cable connection. https://ella.link/press-releases/mauritania-ellalink-international-submarine-cable-connection/

FINN Partners. (2020). What Will It Take to Get the Internet Access We Need in The Gambia? https://www.finnpartners.com/news-insights/what-will-it-take-to-get-the-internet-access-we-need-in-the-gambia/

France Télécom-Orange. (2012). France Telecom-Orange announces the launch of service for the ACE submarine cable. https://www.oafrica.com/broadband/france-telecom-orange-announces-the-launch-of-service-for-the-ace-submarine-cable/

Google. (2011). https://www.google.org/docs/liberia-internet-ecosystem.pdf

Google, Africa Practice, & Genesis Analytics. (2021). Equiano Subsea Cable: Regional Economic Impact Assessment. https://africapractice.com/wp-content/uploads/2021/10/Equiano-Regional-Economic-Impact-Assessment-6-October-2021.pdf

Google, Africa Practice and Genesis Analytics. (2022). Equiano Subsea Cable: Regional Economic Impact Assessment. https://africapractice.com/wp-content/uploads/2021/10/REIA-7-February-2022.pdf

Ingale, V. V., Parnell-Turner, R., Fan, W., Talling, P., & Neasham, J. (2025). Hydroacoustic Signals Recorded by CTBTO Network Suggest a Possible Submarine Landslide in Trou Sans Fond Canyon, Offshore Ivory Coast, March 2024. https://doi.org/10.1785/0220240448

Internet Society. (2014). The Internet Exchange Point Toolkit & Best Practices Guide. https://www.internetsociety.org/wp-content/uploads/2021/04/Global-IXPToolkit_Collaborative-Draft_Feb-24.pdf

Internet Society. (2024). 2024 West Africa Submarine Cable Outage Report. https://www.internetsociety.org/resources/doc/2024/2024-west-africa-submarine-cable-outage-report/

Jensen, M. (2012). Promoting the Use of Internet Exchange Points: A Guide to Policy, Management, and Technical Issues. https://www.internetsociety.org/wp-content/uploads/2012/12/promote-ixp-guide.pdf

Keck, M. (2019). Options Study for State-Owned Communications Infrastructure in the Gambia: Final Report. https://www.ppiaf.org/sites/default/files/documents/2019-01/Gambia_options_study_final_report_.pdf

Kende, M. (2020). Anchoring the African Internet Ecosystem: Lessons from Kenya and Nigeria's Internet Exchange Point Growth. https://www.internetsociety.org/wp-content/uploads/2020/06/Anchoring-the-African-Internet-Ecosystem-Lessons-from-Kenya-and-Nigeria.pdf

Kepios. (2025). Digital 2025. https://datareportal.com/reports/

Michael. (2024). What is OPGW? https://www.eescable.com/what-is-opgw/

O'Connor, A. C., Anderson, B., Lewis, C., Brower, A. O., & Lawrence, S. E. (2020). Economic impacts of submarine fiber optic cables and broadband connectivity in South Africa. https://www.rti.org/publication/economic-impacts-submarine-fiber-optic-cables-broadband-connectivity-south-africa

Orange. (2015). Orange announces the connection of Benin and the Canary Islands to the ACE submarine cable (Africa Coast to Europe). https://web.archive.org/web/20150705011518/https://www.orange.com/en/press/Press-releases/press-releases-2015/Orange-announces-the-connection-of-Benin-and-the-Canary-Islands-to-the-ACE-submarine-cable-Africa-Coast-to-Europe

Orji, U. J. (2017). Harmonising the Regulation of Access to Submarine Cable Landing Stations in the ECOWAS: A Review of Regulation C/REG/06/06/12. https://www.researchgate.net/publication/328559598_Harmonising_the_Regulation_of_Access_to_Submarine_Cable_Landing_Stations_in_the_ECOWAS_A_Review_of_Regulation_CREG060612

PIDA. (2023). Programme for Infrastructure Development in Africa. Construction of Amilcar Cabral Submarine Cable System. https://www.au-pida.org/project/construction-of-amilcar-cabral-submarine-cable-system/

Pushak, N., & Foster, V. (2011). Country Report. Sierra Leone's Infrastructure: A Continental Perspective. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/345051467990934557/sierra-leones-infrastructure-a-continental-perspective

Qiu, W. (2020). Orange Launches Djoliba, the First Pan-West African Network. https://www.submarinenetworks.com/en/nv/news/orange-launches-djoliba-the-first-pan-west-african-network

Qiu, W. (2025). EllaLink Cable to Connect Mauritania. https://www.submarinenetworks.com/en/systems/trans-atlantic/ellalink/ellalink-cable-to-connect-mauritania

Ramos, J. d. L. (2025). Feasibility Study for the Development of the Amilcar Cabral Submarine Cable. https://www.youtube.com/watch?v=kLDXMXNeySs

Siaplay, M., & Werker, E. (2023). Will rising insecurity erase West Africa's economic development gains? https://www.brookings.edu/articles/will-rising-insecurity-erase-west-africas-economic-development-gains/

SubTel Forum. (2011). ACE-Sierra Leone okays $31m loan for fibre optic cable. https://subtelforum.com/76ace-sierra-leone-okays-31m-loan-for-fibre-optic-cable/

Swinhoe, D. (2025). Ellalink to expand subsea cable to Mauritania. https://www.datacenterdynamics.com/en/news/ellalink-to-expand-subsea-cable-to-mauritania/

Tanner, J. (2025). Liberia, ECOWAS plan second subsea cable for five West African countries. https://developingtelecoms.com/telecom-technology/optical-fixed-networks/18809-liberia-ecowas-plan-second-subsea-cable-for-five-west-african-countries.html

Teralink Communications Ltd. (2025). TeraLink. https://teralink.com/

2Africa Consortium. (2022). FAQ | 2Africa Cable. https://www.2africacable.net/faq

United Nations. (2024). World Population Prospects. https://data.worldbank.org/indicator/SP.POP.TOTL

Volmer, T. (2017). Google Global Cache - enabling content. https://www.afpif.org/wp-content/uploads/2017/10/06_Google-Global-Cache-Enabler-2017.pdf

World Bank. (2012). West Africa Regional Communications Infrastructure and Central African Backbone Programs. https://documents1.worldbank.org/curated/en/248641468188045518/pdf/96373-BRI-2012Apr5-P116273-West-Africa-Regional-Communications-Infrastructure-Box-391427B-PUBLIC.pdf

World Bank. (2020). Sierra Leone Digital Economy Diagnostic. https://hdl.handle.net/10986/35805

World Bank. (2021). Market Assesment Report. West Africa: Regional Broadband Market Development Assessment. https://www.ppiaf.org/sites/default/files/documents/2021-01/West_Africa_-_Regional_Broadband_Market_Development_Assessment_-_final.pdf

World Bank. (2022). Western Africa - Regional Communications Infrastructure Project. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/920521646421347997

Yadav, N. (2025). AFR-IX secures $15.6m of EU funding for Medusa subsea cable expansion to West Africa. https://www.datacenterdynamics.com/en/news/afr-ix-secures-156m-of-eu-funding-for-medusa-subsea-cable-expansion-to-west-africa/