



Pre-feasibility Study for International Broadband Redundancy Options for Yemen

Technical Assistance P179887



Executive Summary

Abbreviations and Acronyms

ASN	Alcatel Submarine Networks	HH	Household	PSTN	Public Switched Telephone Network
BB	Broadband	ICPC	International Cable Protection Committee	PTC	Public Telecommunications Company
BU	Branching Unit	ICT	Information and Communications Technology	RFS	Ready for Service
CAGR	Compound Annual Growth Rate	IP	Internet Protocol	ROYG	Republic of Yemen Government
CAPEX	Capital Expenditure	IRG	Internationally Recognized Government	SLTE	Submarine Line Terminating Equipment
CDN	Content Delivery Networks	ISP	Internet Service Provider	TEAS	Trans Europe Asia System
CLS	Cable Landing Station	LEO	Low Earth Orbit	TRA	Telecommunications Regulatory Authority
EEZ	Economic Exclusive Zones	Mbps	Megabits per second	TW	Terrestrial Water
FO	Fiber Optics	MNO	Mobile Network Operator	TY	TeleYemen
GCX	Global Cloud Xchange	MoTIT	Ministry of Telecommunications and Information Technology	VoIP	Voice over Internet Protocol
GDP	Gross Domestic Product	O&M	Operations and Maintenance	VSAT	Very Small Aperture Terminal
GEO	Geostationary Earth Orbit	OPEX	Operational Expenditure	WEF	World Economic Forum
GOY	Government of Yemen	OTT	Over the Top	WIPO	World Intellectual Property Organization
		Pop	Population		

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1. Context, objectives and key outputs of the study

2. High-level analysis of market structure
3. Options for improving international connectivity in Yemen

Introduction

Yemen's economy has been negatively transformed over nearly a decade by the ongoing violent conflict, damaging its digital and telecom sector which is in dire need of an overhaul to pave a path for improving the socioeconomic conditions in the country. Efforts for digitalization will reap socioeconomic benefits at an increased pace as the region strives for stability.

Resilient International Connectivity an Enabler for Digitalization

- Digitalization in a safe and trusted manner holds the key to an improved approach to unlock economic growth and opportunity and face fundamental challenges, while also addressing humanitarian crises.
- Connectivity is a foundation for digitalization and ensuring resiliency in Yemen's international connectivity is crucial for moving toward sustainable digitalization in the conflict-stricken region.
- Building redundancy into Yemen's international connectivity will reduce vulnerability to country-wide internet blackouts and strengthen the country's development efforts.

Private Sector Investment to Boost International Connectivity

- Mobilizing private sector investment for realizing the identified options for diversification of international connectivity routes and using innovative solutions would be important in achieving redundancy.
- Leveraging IFC and MIGA expertise and capacity to facilitate private investment opportunities can help with unlocking financing solutions through joint efforts.

Objective of the study and key outputs

The World Bank has conducted the study, with support from Salience Consulting and AP Telecom.

Study objective:

- Yemen mainly relies on one submarine cable that provides internet capacity to 80% of the country, which makes it vulnerable to a single point of failure that has led to almost country-wide internet blackouts on a number of occasions in recent years¹. Identification of options to increase international connectivity routes and capacity through the prefeasibility study would inform the Government and the international community on approaches that would increase Yemen's reliability to remain connected to the global internet and would therefore strengthen socially vital communications.
- The objective of the study was to assess how the ongoing conflict is impacting access to the existing and new submarine cables and landing stations, and examine what additional capacity and diversity routes will be required to create redundancy and resilience in the country's access to international internet bandwidth capacity, including via the use of innovative solutions.

Key outputs:

- An assessment and mapping of the status of the existing submarine and terrestrial and international cables and landing station, satellite connectivity, and missing gaps needed for redundancy and resiliency;
- Options to restore and/or upgrade existing links
- Options to increase routing diversity via new routes
- Options for using innovative solutions
- Policy recommendations following a review of regulatory gaps for international connectivity.

¹ Yemen Internet was almost down from January 21 to 24 2022 due to an incident affecting the telecommunications site in Hudaydah

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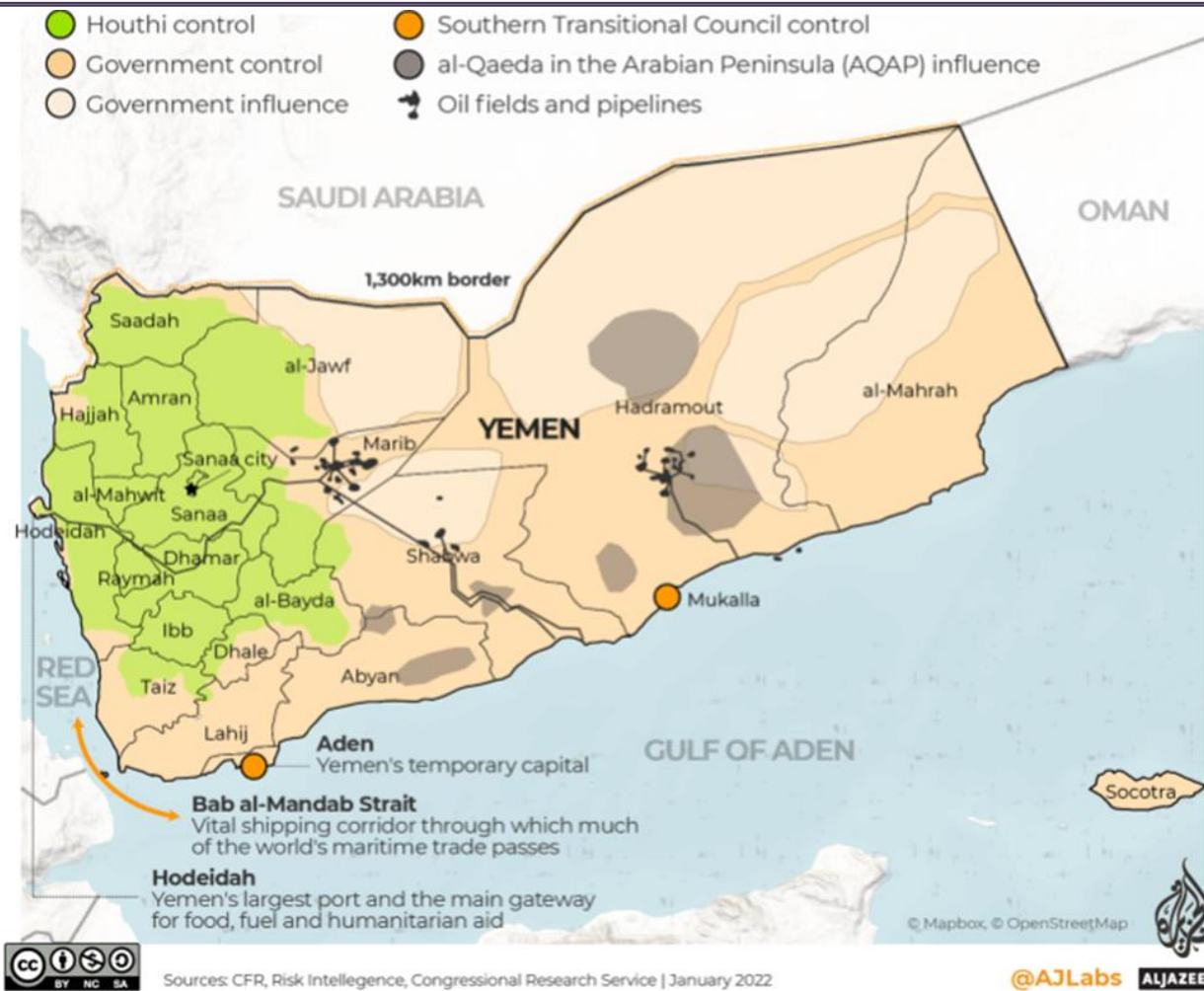
1. Context, objectives and key outputs of the study

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Recent history and developments

Yemen has an ongoing conflict for nearly a decade which has negatively affected the telecom market development setting it behind that of neighboring countries



Telecom Market overview:

- The ongoing conflict has severely impacted the overall telecom sector in Yemen costing it over \$10.9 billion dollars according to a report from the Yemeni ministry. Telecom infrastructure has been damaged or destroyed, making it difficult for operators to provide reliable services. The political and economic instability in the country has also made it difficult for telecom operators to invest in and expand their networks.
- Wholesale, fixed and mobile markets are dominated by the state-owned Public Telecommunications Company (PTC) which owns TeleYemen (wholesale operator for IPT, backbone as well as retail satellite services), Yemen Net (fixed broadband ISP), and Yemen Mobile (mobile services; ~56% market share). PTC is under Houthi control.
- There is a lot of national and regional politics influencing this market. The De Facto Authority constantly prevent cables from landing in all parts of the country (incl. Al-Hudaydah in the North and Aden in the south) which hinders the development of the sector.

Sources: The economist, Aljazeera

1) SabaNet. "Eight years of aggression targeting infrastructure in Yemen." Accessed June 12, 2023. <https://www.saba.ye/en/news3231599.htm>

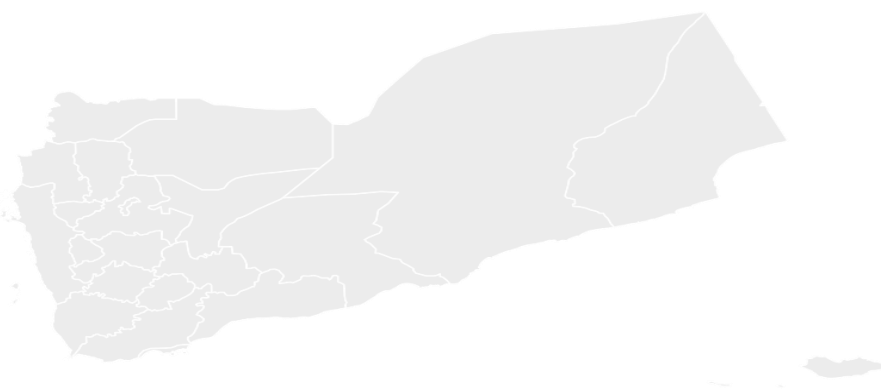
Country Overview (1/2)

Socio-economic Indicators

As of 2022, unless stated otherwise

Area (km ²):	527,968
Population (M):	34
Urban / Rural:	40% / 60%
Number of households:	5.1M
Average HH size (2013):	6.7
Pop. density (per km ²):	64.4
2023 Pop. Growth est:	1.83%
Nominal GDP (Current \$):	19.53B
GDP per capita (\$):	573.19
2023 GDP growth:	-0.5%
Access to electricity (% of population):	73.8% (2020)

Gini Co-efficient (2017):	38.5%
Unemployment Rate (2021):	13.57%
Public debt (% of GDP, 2017):	74.5%
Education level and literacy:	70.1%
GDP ICT Sector Contribution (2018):	7%
Prosperity Rank (2021):	166 th / 167
















- Most of the Yemeni population, about 60% live in rural areas.
- The average household size in Yemen is high, standing at 6.7 people per household.
- The country's GDP per capita is relatively low and is forecasted to drop further by 0.5% in 2023.
- As per the latest available data, the public debt as a percentage of GDP was high in 2017 standing at 74.5%.
- The ICT sector is a significant contributor to the country's economy, adding 7% to the GDP (as of 2018).
- As per the Legatum prosperity index, which measures different socio-economic factors, Yemen ranks at the bottom standing only above South Sudan.

Country Overview (2/2)

Connectivity Indicators and World Indices

As of 2022, unless stated otherwise

	Mobile subscribers:	18M
	Mobile penetration (pop):	52.8%
	Mobile BB penetration (2021, pop):	14%
	Smartphone penetration:	NA
	Fixed BB subscriptions:	427,000
	Fixed BB penetration (HH):	8.4%
	Fixed line subscriptions: (VoIP+PSTN, 2021)	810,000
	Fixed line penetration (HH, 2021):	15.9%
	Internet users (% of pop.):	26.7%

<i>Out of 131 countries</i>		2020 Rank	2021 Rank	Change
Global Innovation Index (WIPO):		131	131	 +0
Information & communication technologies (ICTs)*:		131	130	 +1
<i>Out of 141 countries</i>		2019 Rank	2020 Rank	Change
Global Competitiveness Index (WEF):		35.5	35.5	 +0
ICT adoption:		139	139	 +0
Innovation capability:		130	130	 +0
<i>Out of 134 countries</i>		2019 Rank	2020 Rank	Change
Network Readiness Index (NRI):		121	132	 -11
Technology:	 	121	131	 -10

- The country's mobile, mobile broadband and Fixed broadband penetration is relatively low at 52.8%, 14% and 8.4% respectively.
- Yemen landed towards the bottom of every ICT indicator in 2020/2021. On top of the on-going conflict since 2014, COVID-19 exacerbated an already fragmented sector.
- It is also important to note that some of the data used in the indices for Yemen is outdated. However, in 2021 Yemen improved in the rankings, rising above Madagascar.

Market Overview

Owned by PTC - Public Telecommunications Company

Internet Service Providers (ISPs)



Mobile Network Operators (MNOs)



Telecom Operators

Wholesale, fixed and mobile markets are dominated by the PTC and its subsidiaries - Tele Yemen is the monopoly for the international connectivity and acts as a wholesale provider of IPT, national backbone which is owned by PTC and also provides satellite retail services; Yemen Net is the main ISP for residential and business customers (even through PTC itself also provides ADSL retail services), while Yemen Mobile provides mobile services. AdenNet is an ISP launched in Aden in 2018 as an initiative to deploy an alternative backbone network to the one of PTC's, however without much success since. 3 other private mobile operators are present in Yemen, however all of them combined have lower than 50% market share.

Regulation

The telecommunications sector in Yemen is regulated by the Telecommunications and Information Technology Authority (TITA), which is a government body responsible for licensing and regulating telecom operators in the country. Additionally, the ministry of Telecommunications and Information Technology (MoTIT) also controls the different ISPs and MNOs. However, the ongoing conflict has made it difficult for the government to enforce telecom regulations, leading to a lack of oversight in the sector. The regulatory "regime" is likely to be more arbitrary and unpredictable in the Houthis controlled area.

Security

The conflict in Yemen has created significant security challenges for telecom operators in the country. Telecom infrastructure has been targeted by attacks, and there have been reports of telecom employees being kidnapped or threatened by armed groups. This has made it difficult for telecom operators to operate in certain areas of the country.

Import

The import of telecom equipment into Yemen is subject to government regulation, and all telecom operators must obtain licenses from TITA before importing equipment. However, the ongoing conflict has led to disruptions in the supply chain for telecom equipment, making it difficult for operators to obtain the equipment they need to maintain and expand their networks. This issue prevents some of the cables from being connected and activated due to the restrictions imposed by sanctions.

Very low per user consumption indicates stifled demand

Poor quality of services and low broadband penetration indicate stifled demand and need for improved international connectivity

8.4%

Fixed BB (HH)
penetration

14%

Mobile BB (pop.)
penetration

4 kbps/user

Average bandwidth
per user

- The international bandwidth of Yemen was growing at a CAGR of 37% over the last 6 years.
- It was driven by an increasing number of mobile and fixed broadband subscribers while based on the average bandwidth per user there does not seem to be an improvement in the quality of service.
- The estimated bandwidth usage per internet user of 4 kbps/s is estimated to be 99% lower than the 442kbps/user average of neighboring countries.
- Currently low mobile and fixed broadband penetration and poor quality of service indicate a strong need for better international connectivity access which could result in better quality, more affordable broadband services.
- As per Telegeography's forecast of international bandwidth demand, the usage is expected to grow at a CAGR of 43% until 2028. While it is reasonable considering currently low mobile and fixed broadband usage, the actual demand would be much higher if the service quality was improved, reaching bandwidth usage per user as seen in neighboring countries.
- Nevertheless, as a first step for this demand to be addressed, more options for accessing international capacity are needed.

Used International Bandwidth (Gbps) in Yemen

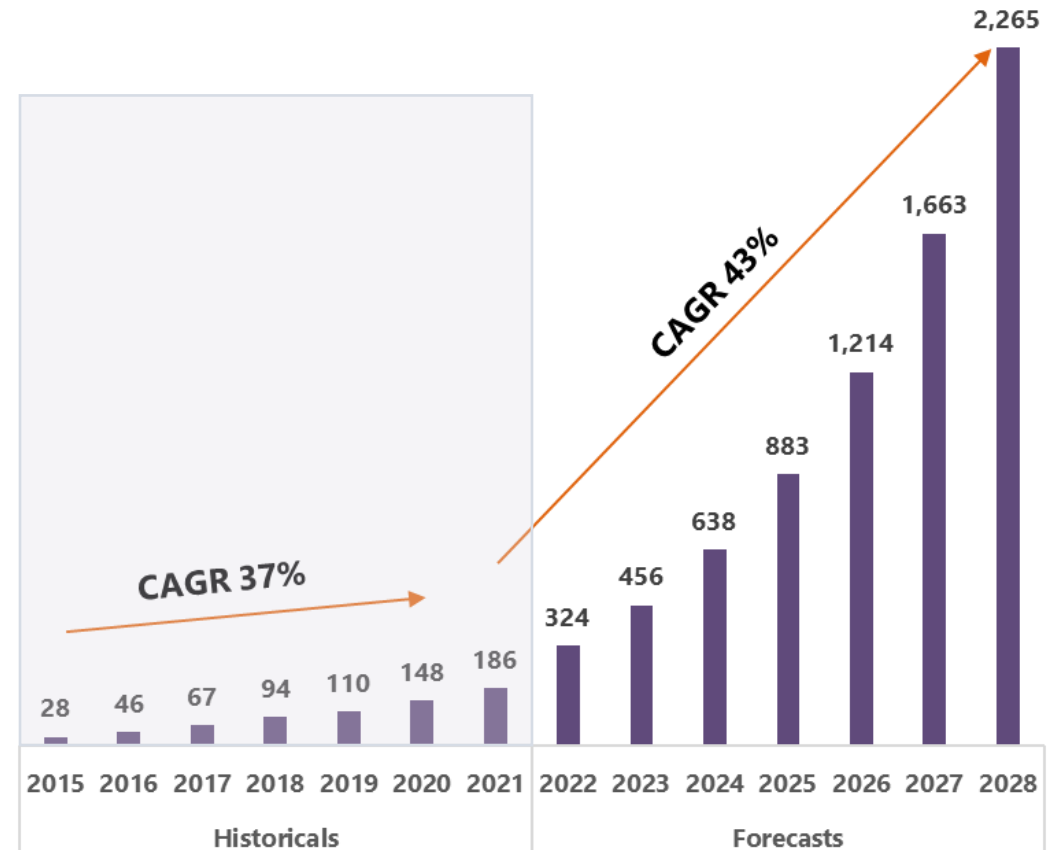


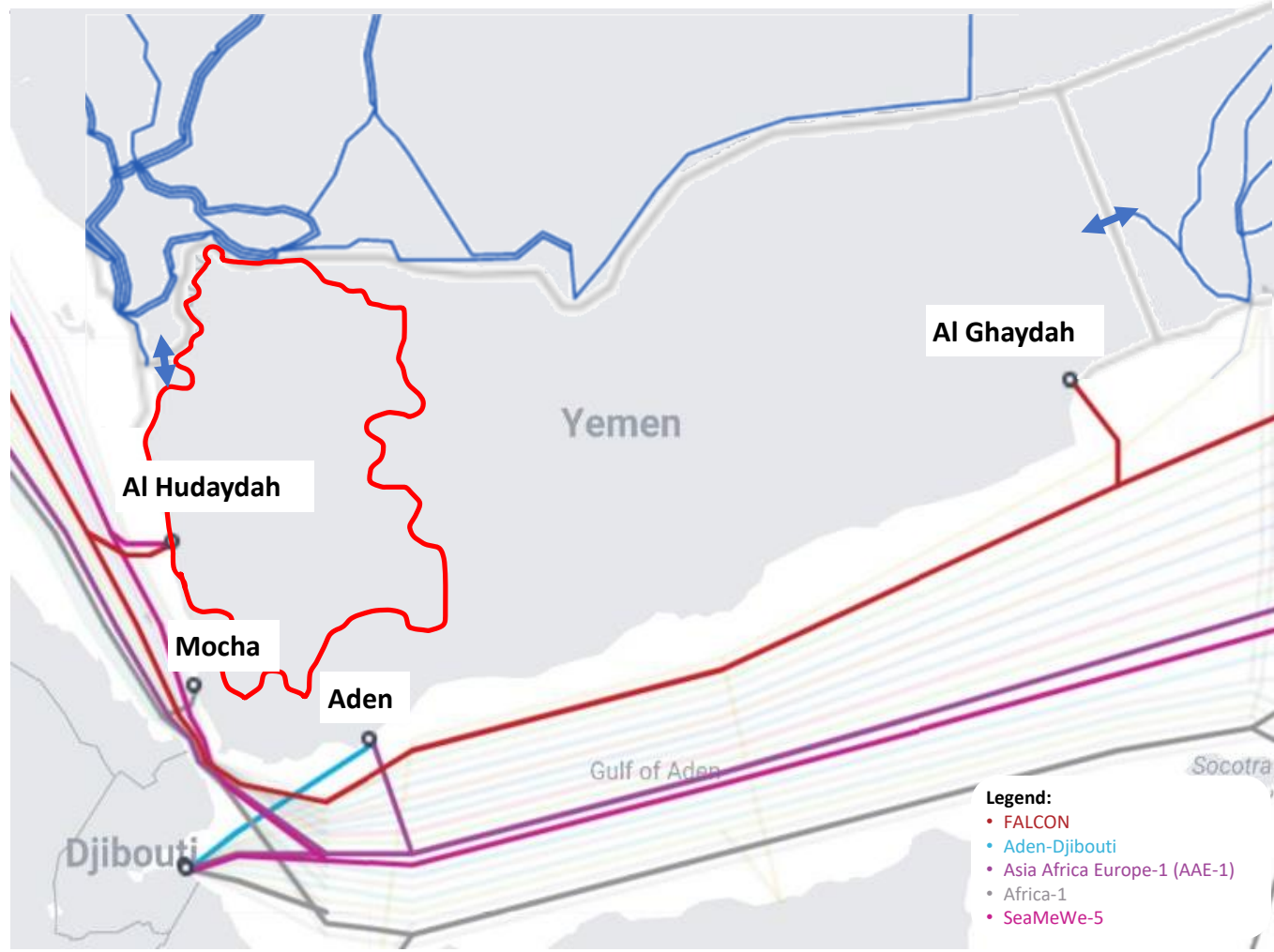
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International connectivity status in Yemen

Currently Yemen acquires around 80% international capacity through FALCON subsea cable while the rest is being acquired through Aden-Djibouti subsea cable and terrestrially through the cross-border link with Oman (caching)



Sources: fiberatlantic.com, submarinecablemap.com

Existing subsea and terrestrial fiber links connecting Yemen to international capacity:

Subsea cables:

1. FALCON – **ACTIVE**
2. Aden-Djibouti – **ACTIVE**
3. Asia Africa Europe-1 (AAE-1) – **INACTIVE**
4. SeaMeWe-5 – **INACTIVE**
5. Africa-1 – **2024 Plan (pending approvals)**
6. Blue Raman – **2024 Plan (pending approvals)**

Cross-border links:

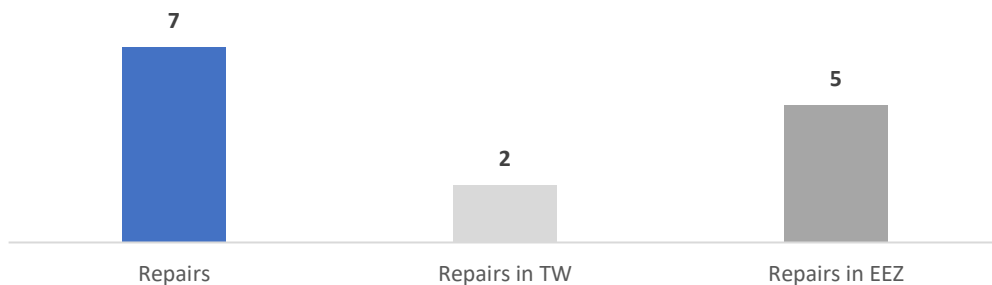
1. Oman: Omantel's fiber link to the border of Yemen – **ACTIVE FOR META CACHES ONLY**
2. KSA: STC's fiber link to the border of Yemen – **INACTIVE**

Fault reports summary

All of the existing cables in Yemen are facing frequent outages, including Falcon which is the key cable providing the most of the international capacity in Yemen

Cable	Outages
Falcon	<ul style="list-style-type: none"> In 2020, two major cutoffs hit the cable near Suez by an anchor from a merchant ship, 80% of Yemen's connectivity was lost. In January of 2022, there was an airstrike that affected the nation's internet connectivity and caused a 4-day outage.
Aden-Djibouti	<ul style="list-style-type: none"> In October of 2022, the cable faced multiple outages affecting connectivity caused by defects in external links on the Djiboutian side.
AAE-1	<ul style="list-style-type: none"> In December of 2022, there was a cut on terrestrial connectivity in Egypt similar to that of SMW-5.
SeaMeWe-5	<ul style="list-style-type: none"> In November of 2022, the cable was severed, and connectivity was impacted. In December of 2022, there was a cut on terrestrial connectivity in Egypt.

Outage and Repair History for the cables connecting to Yemen (2009-2020)



Note: Includes data for Falcon, Aden-Djibouti and AAE-1 cables as these are the only cables landed in Yemen

Sources: [ICPC](#)

According to International Cable Protection Committee (ICPC), there have been 7 repairs on the cables connected to Yemen during the last 11 years, 2 in Terrestrial Waters (TW) and 5 in Economic Exclusive Zones (EEZ) with an average of 33 days required to fix the issue

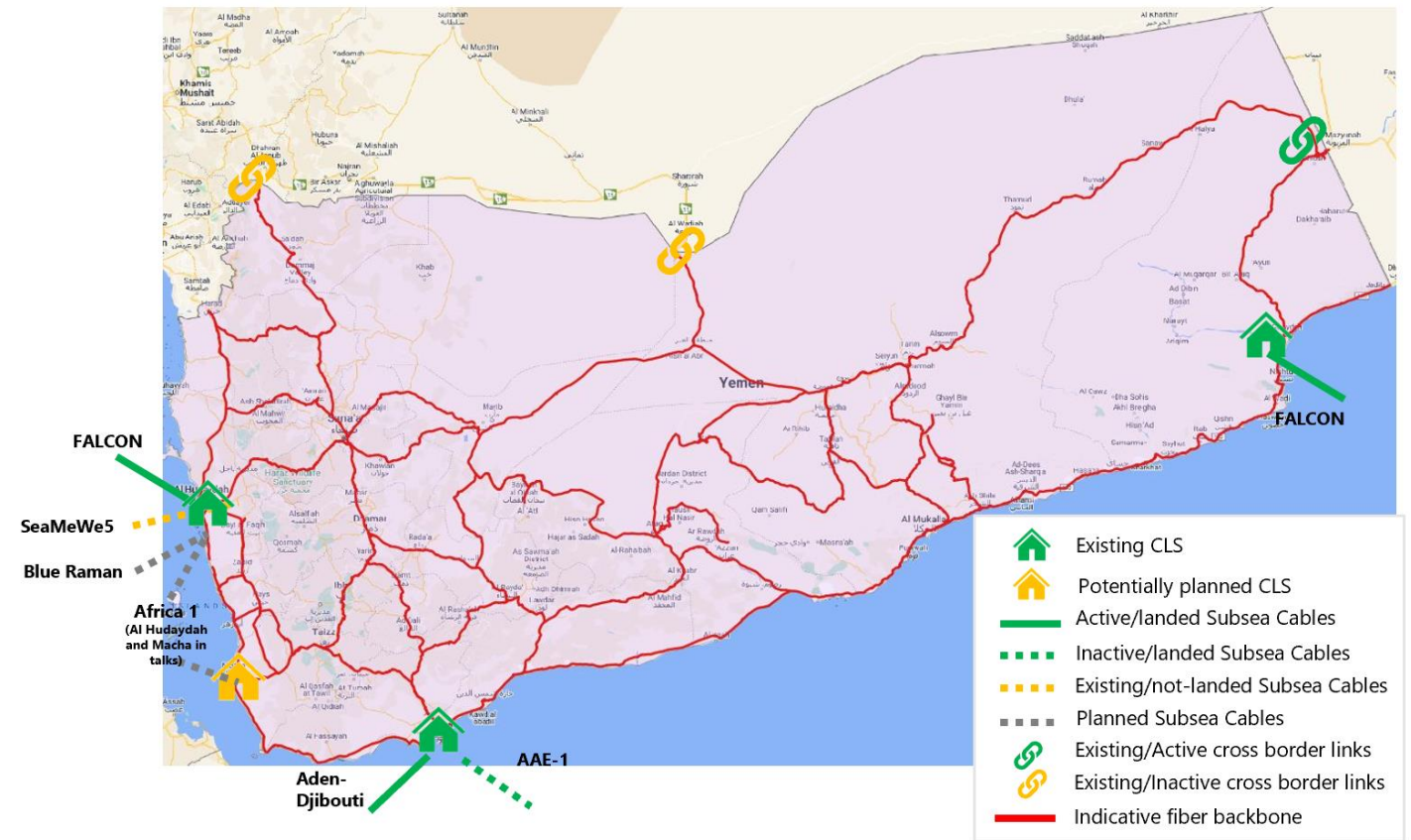
Current state in Yemen indicates unreliable links, political issues and fragmentation

Yemen has had an ongoing conflict for nearly a decade which has negatively affected the telecom market development setting it behind that of neighboring countries. Due to the conflict, the national incumbent TeleYemen is effectively divided between north and south and the company HQ have been moved from Sana to Aden in 2019. It operates 3 landing stations: Al-Hudaydah/North (Falcon), Aden/South (Djibouti P2P cable) and Al-Ghaydah/South (Falcon).

Current international connectivity:

- **Subsea connectivity:** FALCON and Aden-Djibouti cables are the only active cables in Yemen, they are both old and due for replacement or upgrade.
- **Terrestrial connectivity:** Terrestrial connectivity to Oman is active but very unstable (mainly due to Omani engineers refusing to work on repairs citing security concerns), Omantel provides some links mainly to its META caches. Links to KSA are mainly inactive.
- **Satellite connectivity:** Thuraya, a UAE-based company used to provide satellite services through TeleYemen – this is probably discontinued at present. Second is YemenSat, is owned and operated by the Yemeni government. In February of 2022 TeleYemen's building was destroyed.
- **Issue with permits for deploying cables through Yemeni waters** – Yemeni side is refusing the passage of new cable deployments in Yemeni waters for the subcontractors such as ASN (e.g. SeaMeWe 5, Africa 1) and Subcomm (e.g. IEX). While new cables like IEX which do not have originally planned branching into Yemen are replanned to be deployed along the Eritrea waters, this results in higher deployment costs and similarly limits future opportunities for potential branching units into Yemen due to longer resulting distance (i.e. CAPEX) requirements.
- **AdenNet** was launched in 2018, backed by UAE with aims to provide an alternative national network to the existing PTC's network in non-Houthi controlled territories, however so far only some deployments are known to have been completed within Aden.

Indicative map of existing fiber backbone, cross border links and CLSs



Potential subsea cable connectivity – future cables

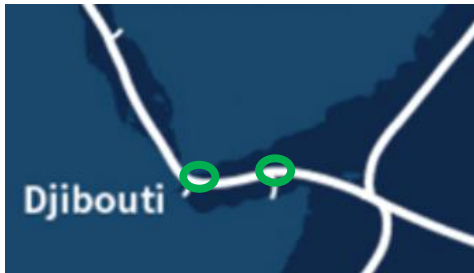
7 new subsea cables are planned to be deployed within the next 3 years out of which 2 (Africa 1 and Blue Raman) have planned landings in Yemen

Cable	Landing Party / CLS	Status of Yemen Connectivity	Route	Distance	RFS date	Available capacity & Fiber pairs	Consortium / Partnerships	Sub-Contractor/Su pplier
Africa 1	NA	Planned/ Pending approvals	Africa-Middle East-Asia	10,000 km	Q4 2023	192 Tbps/ 8FP	Etisalat, G42, Mobily, Pakistan telecom, Telecom Egypt	ASN
Blue Raman	NA	Planned/ Pending approvals	India-Europe via Israel and Jordan	8,000km	2024	216 Tbps; 16FP	Google partnership with Italia Sparkle for the blue portion and Omantel for the Raman portion	Italia Sparkle
PEACE	NA	Not planned	Africa-Asia-Europe	12,500km	2023	192 Tbps / 12FP	Peace Cable International Network Co.	Huawei Marine Networks
2Africa	NA	Not planned	Africa-Asia-Europe	45,000km	2024	180 Tbps / 16FP	China Mobile, MTN, Meta (Facebook), Orange, Saudi Telecom, Telecom Egypt, Vodafone, WIOCC	ASN
IEX	NA	Not planned	India-Europe (and US east coast)	9,775km	Q2 2024	200 Tbps/ 13FP	Reliance Jio Infocomm, Meta, SubComm, Google	SubComm
SeaMeWe-6	NA	Not planned	Southeast Asia-Middle East-West Europe	19,200km	2025	120 Tbps / 10FP	Djibouti Telecom, Bangladesh Submarine Cable, Bharti Airtel Ltd, Dhiraagu, Mobily, Orange, Singtel, Sri Lanka Telecom, Telecom Egypt, Telekom Malaysia, Telin, Trans World Associates	SubComm
TEAS (Cinturion)	NA	Not planned	India-Middle-East-Europe	13,000km	Q2 2025	413 Tbps / 24FP	GCCIA (KSA), Supported by local partners in each market	SubComm

Planned subsea cables passing by but without planned branches to Yemen

5 new subsea cables are planned within the next 3 years. While not in the original plans potential branches could potentially be built connecting to Yemen

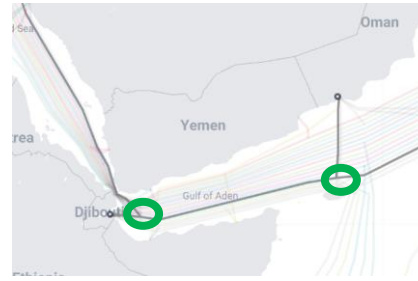
PEACE (2023)



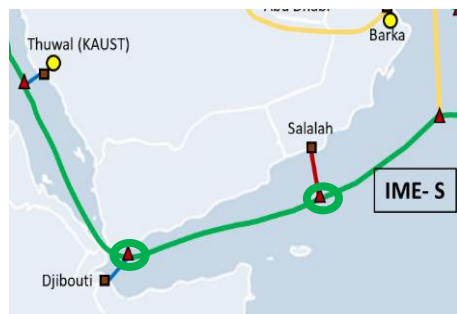
2 Africa (2024)



IEX (2024)



Cinturion - TEAS (2025)



SeaMeWe6 (2025)



 Planned branching units near Yemen

5 new cables planned passing by Yemen:

1. **Peace (2023)** – planned branches to Djibouti and Somalia
2. **2 Africa (2024)** – planned branches to Djibouti and Berbera (Somalia)
3. **IEX (2024)** – planned branch to Djibouti
4. **Cinturion – TEAS (2025)** – planned branches to Djibouti and Salalah (Oman)
5. **SeaMeWe6 (2025)** – planned branch to Djibouti

Given that the detailed technical specifications of these cables are not available, it is unknown whether the existing branches could potentially support another branch to Yemen. These BUs however would need to be planned for before the cable becomes operational, otherwise the additional BUs would be more complicated to implemented given that it would result is some downtime for the whole cable.

The potential opportunities will be analyzed in more detail as options for Yemen’s international connectivity improvements.

Options for improving Yemen's international connectivity

Long list of options are categorized into 3 main categories based on the nature of the proposed project

Category 1 New proposed project	Category 2 Project in development, with some plans to connect Yemen	Category 3 Implemented project / advanced stages with some possibility to amend for Yemen
<ul style="list-style-type: none"> • Completely new proposed project for improving the international connectivity to Yemen. • Pre-planning stage of implementation. • Options under this category might have longer timeline to implement and higher costs given that it would need to undergo the initial planning stage. 	<ul style="list-style-type: none"> • Ongoing project, with planned international connectivity to Yemen or opportunity to connect with modification of design. • Planning stage or early stage of implementation. • Options under this category might medium timeline to implement and medium costs, however some of these options might be limited by geopolitics. 	<ul style="list-style-type: none"> • Adjustment will be needed to the existing implemented and operational cable. • Advanced stage of implementation with little or no possibility to modify • Options under this category might have shorter timeline to implement and lower costs given the advanced stages of the overall project implementation, however some of these options might be limited by geopolitics and technical feasibility.
<ol style="list-style-type: none"> 1. Yemen-Oman new point-to-point subsea cable 2. Aden-Djibouti subsea cable replacement 3. Free Space Optics connectivity to Djibouti (<u>innovative technology</u>) 	<ol style="list-style-type: none"> 4. FALCON – SLTE Equipment to upgrade the cable 5. Africa-1 – landing in Al-Hudaydah 6. Raman – landing in Al-Hudaydah 7. TEAS - New BU to Yemen, as no build contract in force 8. LEO Satellite back-up gateway (incl. OneWeb, Starlink, Amazon, Telesat etc..) 	<ol style="list-style-type: none"> 9. AAE-1 – SLTE Equipment to activate the cable 10. SeaMeWe-5 (SMW-5) – BU in place potential of landing to Al-Hudaydah 11. PEACE - New BU to Yemen 12. 2Africa - New BU to Yemen 13. IEX - New BU to Yemen 14. SMW6 - New BU to Yemen 15. Activation of the terrestrial Cross border fibre link to KSA 16. Yemen-Oman full utilization of the terrestrial Cross border fibre link

SWOT analysis for Yemeni connectivity internationally



STRENGTHS

- Large market size with a population of 33 million and growing at 2% per annum (46% of the population being under 15 years old and 2.7% above 65 years).¹
- In 2018, the telecom and IT sector contributed to 7% of the country's GDP and provided employment opportunities (second contributor after oil and gas).¹
- The geographical position, most of the subsea cables linking ASIA to Europe go through Yemen waters.
- Extensive fiber backbone reaching to Oman and KSA borders and main existing/potential CLS points.
- Existing landings of Falcon, AAE1 and Djibouti-Aden cables across 3 different CLS locations



WEAKNESSES

- Institutional fragmentation and competing policies and financial demands by the opposing authorities in Aden and Sana'a has affected the international connectivity.
- Inactive cross border links for terrestrial international capacity even though the links are in place .
- AAE-1 cable already has a CLS in Yemen but is not used due to internal political issues.
- SMW5 cable is partially owned by TeleYemen and is being monetized by TY for Europe-Asia capacity, however its branch to Yemen is not built, potentially due to global sanctions for needed equipment even if it was built.
- FALCON cable, which provided 80% of Yemen's international traffic is outdated and needs upgrades.
- The currently active cables go through Egypt's bottleneck and keeps facing outages for numerous reasons.
- Africa 1 and Blue Raman which have planned Bus into Yemen are facing approval issues.
- New cables are not receiving permits to deploy their cables in the Yemeni waters, hence limiting future branches to Yemen due to resulting cable distance from the coast.



OPPORTUNITIES

- The existing landing of AAE-1 cable could be quickly activated if internal political issues are resolved. Issue is related to vendors not being able to import equipment
- Africa-1 and Blue Raman planned landing in Yemen pending approvals.
- Existing cross-border links to Saudi and Oman could be potentially utilized for IPT. In particular, the Oman link given that it is already active for META's caching and good relations between TY and Omantel. KSA link – due to KSA's backing of the Southern Transitional Council (incl. southern ISP AdenNet).
- Better utilizing proximity of Djibouti which is becoming a hub with many subsea cable landings.
- Potentially utilizing LEO satellites for international capacity redundancy.
- Untapped demand for international connectivity given currently low fixed and mobile broadband penetration.



THREATS

- Due to geopolitical situation the terrestrial links could remain disconnected.
- Infrastructure prone to damage by external parties (like the recent bombing of Hodaida).
- Confiscation of assets and extortion by militia forces.
- Houthis restricting the deployment of the new cables and increasing entry barriers.
- NEOM is partnering with OneWeb making it unlikely for OneWeb's services to be provided in Yemen given the status quo limiting options for LEO satellite connectivity.

Private sector investment is critical to leverage to boost international connectivity

Identifying and operationalizing new international connectivity options leveraging private sector involvement is key to addressing Yemen's low broadband penetration and internet consumption.

Role of Private Sector

- Submarine cables are owned and operated by private companies, therefore deploying and protecting a nation's economy typically rely upon third-party agreements, commercial models and maintenance arrangement, including highly specialized foreign-owned repair vessels, in the case of submarine cables.
- In this context, it would be critical for the Yemeni authorities to drop their blocking of the use of Yemeni waters by international cable consortia, so that deployment and repair activities of submarine cables, landing in Yemen or crossing its waters, could be completed.
- Mobilizing private sector investment for realizing the identified options for diversification of international connectivity routes and using innovative solutions would be important in achieving redundancy.

Role of Government

Facilitate private investment opportunities through establishing an enabling policy, legal and regulatory environment

- Licensing Framework
- Data localization requirements
- Management of backhaul associated with subsea connectivity
- Regulations governing interconnection
- Non-discriminatory access to essential facilities (CLS)
- No/light regime for content delivery networks (CDNs)
- Regime for Importation, Type Approval and Distribution of Communications Equipment Regulation

Yemen: High level assessment of the regulatory items related to international connectivity 1/2

Regulatory item	Status analysis for Yemen	Regional benchmarks
<p>Licensing Framework for submarine cable landing, international gateway, and content service providers</p>	<ul style="list-style-type: none"> - We understand licenses are telco specific and no licensing classes or licensing framework rules are available - “licenses not only lack clear criteria for their assignment, upgrading, renewal, and symmetry across operators, but there is no mutual recognition of licenses issued across GOY and Houthis” – IGC report - TeleYemen is the only licensed provider for international connectivity and international gateway. Aden net might also have similar license but no evidence was found. - There is no reason to believe that, particularly in Aden, a competitive alternative to TeleYemen could be created. - No licenses for content providers are known - The proposed telecom regulator is to take the responsibility for issuing and managing licenses once implemented 	<ul style="list-style-type: none"> - License issuance is a fundamental tool for promoting competition - Usually, Classes of licenses A,B etc. and Class A are the ones that could land and operate international connectivity (example Oman) - Wholesale Infrastructure license holders might also be licensed to land cables (KSA) - Unified license holders (KSA) have right to deploy and operate all networks including landing of cables. The unified licenses are most advanced licensing frameworks we have seen in the GCC region.
<p>Data localization requirements including safeguards with respect to the sovereignty, security and protection of personal data (relevant to satellite ground station and terrestrial connectivity with neighbor countries).</p>	<ul style="list-style-type: none"> - No information on data localization has been found; however, the enforceability of such regulations would be dubious. - Not a material restriction of addressing the international connectivity gaps as the regulations will apply to service providers storing data not necessarily the licensee providing international connectivity. 	<ul style="list-style-type: none"> - Some countries such as Oman and Bahrain require satellite ground station to be based in the country in order for satcom service to be provided over that country, others do not - Also, some restriction of cross border terrestrial data flow (UAE-Oman example)
<p>Legal regime relating to the administrative and operational aspects of managing backhaul associated with subsea connectivity vis a vis connecting captive, cloud and co-location data centers.</p>	<ul style="list-style-type: none"> - Part of the PTC license (no copy has been obtained) - Will be a key element of policy in order to effectively implement a competitive or open access alternative to incumbents. 	<ul style="list-style-type: none"> - Some limited regional directives are imposed on cross-connect and backhaul charges between operators that seek access to subsea cables from others. However generally high fees for these services are common in GCC and used as a means of competitive advantage of the incumbent (UAE, Oman, KSA, Bahrain) - Regional benchmarks are therefore not best international practice

Source: IGC

Yemen: High level assessment of the regulatory items related to international connectivity 2/2

Regulatory item	Status analysis for Yemen	Regional benchmarks
The Communications (Interconnection and Provision of Fixed Links, Access and Facilities) Regulations governing all interconnect licensees and interconnecting licensees .	<ul style="list-style-type: none"> - Specific regulation not found. If absent or unenforceable, competitive market entry is a substitute. Non-incumbents, as a matter of survival, are likely to have mutually beneficial interconnection regimes amongst themselves. Promotion of non-incumbents can therefore increase leverage against incumbents in an ineffective regulatory environment. 	<ul style="list-style-type: none"> - Interconnect guidelines and principles are usually governed by the regional TRA and in some cases published as Interconnection Reference Offers.
The legal regime concerning non-discriminatory access to essential facilities for all operators and ISPs, with a view to enabling fair competition in retail markets.	<ul style="list-style-type: none"> - Specific regulation not found. However, see above. 	<ul style="list-style-type: none"> - Most of the GCC TRAs have provisions for non-discriminatory access to essential facilities especially targeting dominant incumbent players.
The legal regime in relation to content delivery networks (CDNs) vis a vis intermediary liability of ISPs.	<ul style="list-style-type: none"> - No info, we believe these are not developed. 	<ul style="list-style-type: none"> - CDNs are usually not regulated, however the content censorship is generally applicable within GCC.
The regime for Importation, Type Approval and Distribution of Communications Equipment Regulations in the region.	<ul style="list-style-type: none"> - The proposed 2008 telecom law document Article 30 states - “Importers or those willing to import telecommunication devices with specifications are not announced shall submit a request to the authority requesting its prior consent to import these devices provided this request is supported by evidence from manufacturing company indicating specifications of these devices” - However please note the security embargo on telecommunications equipment imposed by the Saudi-led coalition 	<ul style="list-style-type: none"> - Importation is usually subject to TRA clearance of the equipment to be used in the country. Process requires telecom companies to apply (usually online) and TRA to examine and approve use.

Source: IGC

Thank you

