Palestine Economic Policy Research Institute (MAS)

معهد ابحاث السياسات الاقتصادية الفلسطيني (ماس)

The Destruction of Gaza's Telecommunications Infrastructure and the Eroded Internet Accessibility

Situational Assessment Report

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The Destruction of Gaza's Telecommunications Infrastructure and the Eroded Internet Accessibility

Main Researcher: Raheeq Hurani

Supervisor: Dr. Sameh Hallaq

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Contents

1. INTRODUCTION **1**

2. METHODOLOGY **2**

3. ANALYSIS OF CURRENT CONNECTIVITY CHALLENGES **3**
3.1 Pre-existing Fragility of Gaza's Telecommunications Sector 3
3.1.1 Israeli Control Over Telecommunications Infrastructure 3
3.1.2 The Impact of the Blockade and Repeated Israeli Aggressions 3
3.1.3 Import Restrictions and Limited Access to Equipment 3
3.1.4 Regulatory and Governance Challenges 4
3.1.5 Challenges Facing Private Sector Operators 5
3.1.6 The Energy Crisis and Its Impact on Telecommunications 5
3.2 The Impact of Recent Escalations on Connectivity 5
3.2.1 Widespread Destruction of Telecommunications Infrastructure 5
3.2.2 Deliberate Disruptions and Network Blackouts 6
3.2.3 Strain on Telecommunications Networks Due to Displacement 6
3.2.4 Challenges in Restoring Telecommunications Services 6
3.2.5 Efforts by Telecom Operators and Financial Struggles 7
3.3 Seeking Alternatives to Telecom Companies' Network 7
3.3.1 Reliance on Roaming Services 7
3.3.2 Adopting e-SIM Cards 8
3.3.3 Exploring Satellite Internet Solutions 8
3.3.4 The Emergence of Small Unregulated Internet Vendors 8

4. EMERGING SOLUTIONS AND OPPORTUNITIES **10**
4.1 Unregulated Small Businesses 10
4.2 Infrastructure Development 10
4.3 Legal and Regulatory Adjustments 11

5. RECOMMENDATIONS **13**

6. REFERENCES **15**

1. Introduction

The telecommunications sector in the Gaza Strip has long been hindered by systemic underdevelopment and external constraints, leaving it unable to meet the growing needs of Palestinians in the Gaza Strip. This situation has been exacerbated by years of economic blockades, restrictions on importing essential equipment, and various political factors accompanying recurring aggressions that have made this sector highly vulnerable (World Bank Group, 2024). The recent Israeli aggression on Gaza, since October 7, 2023, has severely devastated Gaza's already fragile telecommunications infrastructure. As of August 2024, the Palestinian Ministry of Telecommunication and Digital Economy (MTDE)[1] has reported that approximately 75% of telecommunication networks were destroyed during the current conflict (MTDE, 2024).

As a result of this destruction, 2.1 million people have become further isolated (OCHA, 2024a). Many reside in refugee camps or schools with limited access to functional networks, which has left them unable to access the internet, communicate for information, maintain contact with family, utilize essential services such as telemedicine and education, and promote communication between aid organizations' operations and emergency workers who have been affected by disruptions to the telecommunications network (UNRWA, 2024a).

Amid the widespread destruction and in response to the urgent connectivity needs of Palestinians in Gaza, initiatives have emerged to restore and expand access to telecommunications. These initiatives aim to bridge the connectivity gap through small, unregulated businesses, such as internet vendors who provide temporary internet access through vouchers. These businesses allow users to connect to private networks for a limited time in exchange for low fees. However, despite the innovative nature of these solutions, they are considered illegitimate and depend on the remnants of Gaza's already severely damaged telecommunications infrastructure.

Therefore, this situational analysis report aims to assess the eroded accessibility to telecommunications and internet connections. It focuses on the potential to scale up these innovative yet unregulated solutions and explores recommendations for infrastructure upgrades and regulatory changes. These recommendations consider the significant infrastructural and regulatory challenges that hinder these initiatives, limiting their ability to expand and improve internet access in the Gaza Strip.

[1] Its name changed from the Ministry of Telecommunications and Information Technology to the Ministry of Communications and Digital Economy in 2024, according to a decree-law issued on 9/30/2024. mjr.ogb.gov.ps/Decrees/Download/?p=b1b99445-6efd-423d-b81c-36b01d0262a1.pdf&d=-2024-لسنة-15-رقم-بقانون-قرار-بشان-تعديل-اسم-وزارة-الاتصالات-فلسطين

2. Methodology

This situational assessment report utilizes a mixed-methods approach, combining comprehensive desk research with qualitative stakeholder interviews to understand Gaza's telecommunications challenges and emerging opportunities thoroughly. Semi-structured interviews were conducted with key stakeholders, including representatives from MTDE, Paltel Group, and Ooredoo. Stakeholders provided actionable input on the feasibility of scaling up innovative solutions, such as integrating unregulated providers into the formal telecommunications sector. The desk research involved a comprehensive review of secondary data from credible sources, including reports from international organizations, government authorities, publications, and others. These documents were analyzed to understand the pre-existing vulnerabilities of Gaza's telecommunications infrastructure, the impacts of recent escalations on connectivity, and the role of small, unregulated internet service providers. Special emphasis was placed on identifying viable pathways for addressing Gaza's connectivity challenges by exploring emerging solutions and opportunities such as formalizing unregulated small businesses, advancing infrastructure development, and implementing legal and regulatory reforms.

3. Analysis of Current Connectivity Challenges

3.1 Pre-existing Fragility of Gaza's Telecommunications Sector

3.1.1 Israeli Control Over Telecommunications Infrastructure

The telecommunications sector in Gaza has long been suffering from significant weaknesses. Even prior to the recent crisis, the sector faced systematic vulnerability due to a combination of structural and external challenges. A key factor in its vulnerability is the Israeli control over the telecommunications infrastructure, which has intensified after years of underdevelopment caused by Israeli-imposed restrictions. These restrictions became more pronounced after the Oslo Accords[2], which granted Israel complete control over international gateways, the mobile communication frequency spectrum, and the technologies Palestinians might develop (Abu Daqqa, 2023).

Under the Oslo Accords, Article 36 of Annex III grants Israel complete control over the Palestinian frequency spectrum[3]. It specifies that frequencies may be allocated to Palestinians when necessary and within a month of submitting a request. However, Israel has repeatedly ignored Palestinian requests for these frequencies, hindering efforts to achieve full independence from Israeli networks (Abu Daqqa, 2023). A major consequence of these restrictions on the cellular sector is that licensed operators in the West Bank are allowed to provide only third-generation (3G) services, while operators in Gaza are limited to second-generation (2G) services[4]. These limitations severely hamper internet speed and connectivity in the West Bank and the Gaza Strip. Furthermore, the Israeli control over the frequency spectrum increases service costs, reduces network quality, and stifles innovation (World Bank Group, 2021). Consequently, Palestinian operators face substantial challenges in providing mobile data services and broadband internet access (Abu Daqqa, 2023).

Another significant challenge is in the agreement's terms that give Israeli companies the right to build and operate networks and provide services in both the West Bank and the Gaza Strip, claiming the need to serve illegal colonial settlements. This has allowed Israeli companies to cover areas that would otherwise be served by Palestinian companies in the West Bank and Gaza, further weakening the Palestinian telecommunications market (Abu Daka, 2018).

3.1.2 The Impact of the Blockade and Repeated Israeli Aggressions

The blockade and successive Israeli aggressions in Gaza— starting with the 2008 war and extending through subsequent conflicts in 2012, 2014, 2021, and the most recent escalation on October 7, 2023— have further devastated the telecommunications infrastructure (Access Now, 2023). These disruptions have prevented necessary upgrades to expand network capacity or modernize services, leaving Gaza particularly vulnerable to disruptions caused by blockades or conflicts, and rendering existing networks outdated and insufficient for the region's growing population.

3.1.3 Import Restrictions and Limited Access to Equipment

Strict Israeli import restrictions have further hindered Gaza's telecommunications sector. Palestinians are required to obtain Israeli approval to purchase essential equipment such as routers, telecom towers,

[2] According to Annex 36 of the 1995 Israeli-Palestinian Oslo Interim Agreement, the use of radio spectrum in the West Bank and the Gaza Strip requires Israeli government approval. The radio spectrum refers to the invisible radio frequencies that enable wireless signals for mobile phone calls and data transmission.

[3] The frequency spectrum includes telephone, radio and television frequencies, satellite broadcasting, and determining the digital range of telephone services.

[4] 2G enabled digital voice and SMS with speeds up to 64 kbps, while 3G introduced mobile internet, video calls, and faster data speeds (up to several Mbps), shifting from voice-centric to data-centric communication.

and other necessary networking tools, including advanced "dual-use"[5] technologies. Since 2006, the Israeli government has imposed stricter regulations on the importation of equipment needed by ICT companies (7amleh, 2024), subjecting all imports to security checks and strict approval procedures. These restrictions have made it difficult for Palestinians to operate independently, leaving Gaza reliant on outdated copper networks (Abu Daqqa, 2023).

Even when equipment is available, constructing telecommunications infrastructure requires Israeli-issued permits. The Palestinian Authority has granted limited frequencies to wireless and radio service providers, but these allocations are still subject to Israeli restrictions. This limits the Palestinian Authority's regulatory or supervisory power over these frequencies and restricts its ability to manage telecommunications infrastructure (General Union of Palestinian Economists, 2017). For example, when Jawwal (Cellular Co.) applies for approvals to construct a new site, the request can be denied by Israeli Authorities if the location is deemed a military zone, public land, or confiscated property. In such cases, Jawwal must find an alternative site and restart the lengthy approval process, which can take over a year. Additionally, the Israeli government restricts the entry of construction materials and equipment, especially "dual-use" items, into Gaza. Companies must secure permits from the Coordination of Government Activities in the Territories (COGAT), a unit within Israel's Ministry of Defense, requiring them to submit extensive documentation, including detailed material lists, project maps, storage plans, and proof of proper usage, further delaying and complicating the process (World Bank Group, 2016).

3.1.4 Regulatory and Governance Challenges

In addition to external constraints, Gaza's telecommunications sector faces internal limitations, particularly concerning governance and regulatory oversight. MTDE primarily functions as a regulatory authority, issuing licenses and overseeing the Palestinian market. However, it has a limited capacity to develop or manage critical telecommunications infrastructure, such as fixed and mobile telephone exchanges, or effectively overseeing the frequency spectrum. The Ministry's dual role as both a policy-making and regulatory body raises concerns about transparency, governance, and potential conflicts of interest (MAS, 2024).

The Telecommunications Regulatory Authority[6] was established in 2009[7] as an independent regulator to regulate the Palestinian telecommunications sector in the West Bank and Gaza. However, its Board of Directors was only formed in early 2023[8]. In addition to lacking representation from consumer protection associations, the Authority's regulatory and supervisory roles and the extent of overlap with other relevant authorities remain unclear in practice. The government is still in the process of establishing governance mechanisms to delineate the responsibilities of the Ministry and the Authority (MAS, 2024).

The legal framework governing the Palestinian telecommunications sector, outlined in the Telecommunications Law No. 37 of 2021[9], assigns regulatory and monitoring responsibilities to the Telecommunications Regulatory Authority, while the Ministry retains authority over policy-making and international relations. However, overlapping roles and interdependence between these entities further

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5 Dual-use goods are defined as the group of goods included in the Israeli Ministry of Defense's list of "dual-use goods" that may only be imported with a specific license issued by the Coordination of Government Activities in the Territories (COGAT).

6 Non-ministerial government institutions affiliated with the Council of Ministers.

7 President of Palestine. (2009). Decree-Law No. (15) of 2009 on the Palestinian Telecommunications Regulatory Authority. *Palestine Gazette*, Issue 82, p. 78. Retrieved from https://mjr.ogb.gov.ps/Decrees/ViewText/23629/

8 Palestinian Council of Ministries. (2023). Council of Ministries Decision No. (1) of 2023 on the Formation of the Board of Directors of the Telecommunications Regulatory Authority. *Palestine Gazette*, Issue 199, p. 14. Retrieved from https://maqam.najah.edu/legislation/1453/

9 President of Palestine. (2021). Decree-Law No. (37) of 2021 on Telecommunications and Information Technology. *Palestine Gazette*, Issue 185, p. 5. Retrieved from https://maqam.najah.edu/legislation/1212/; President of Palestine. (2022). Decree-Law No. (23) of 2022 Amending Decree-Law No. (37) of 2021 on Telecommunications and Information Technology. *Palestine Gazette*, Issue 191, p. 10. Retrieved from https://maqam.najah.edu/legislation/1312/

complicate the governance structure, highlighting the urgent need for mechanisms to clearly define their respective powers and responsibilities (MAS, 2024).

3.1.5 Challenges Facing Private Sector Operators

The private telecommunications sector in Gaza is mainly served by a few key companies, including Paltel Group[10] (the parent company of Palestinian internet service providers, such as Paltel, Jawwal[11], and Hadara), Ooredoo[12], Mada, and CoolNet. While Paltel dominates the fixed-line market, mobile services are shared between Jawwal and Ooredoo (7amleh, 2024). These providers encounter difficulties in delivering reliable services and struggle to maintain and upgrade their infrastructure due to ongoing political instability, governance issues, and import restrictions (MAS, 2024).

3.1.6 The Energy Crisis and Its Impact on Telecommunications

The persistent energy crisis in Gaza, which started in 2006, further exacerbates the weakness of the telecommunications sector. The sole power plant in Gaza often operates below capacity, resulting in frequent power cuts that disrupt the functioning of cellular towers and data centers. As a result, internet service providers rely on fuel-powered generators to maintain their operations. However, ongoing fuel shortages regularly prevent them from sustaining these systems, leading to widespread service outages (UNCTAD, 2020).

Without reliable power sources, the telecommunications sector remains highly vulnerable to disruptions, particularly during escalations when fuel access becomes even more restricted. These recurring outages significantly impact residents' ability to communicate, access information, and receive essential services, further deepening the sector's instability.

3.2 The Impact of Recent Escalations on Connectivity

3.2.1 Widespread Destruction of Telecommunications Infrastructure

The recent conflict that began in October 2023 has severely damaged Gaza's already unstable telecommunications infrastructure. According to data from MTDE, Gaza operated 841 mobile telecommunications towers prior to the Israeli aggression. However, by mid-April 2024, 75% of these cell-mobile towers were out of service, leaving only around 30% functional (PCBS, 2024). Additionally, Paltel Group estimates that 70% to 80% of the landline network has been destroyed, as of December 2024.[13]

The financial losses in the information and communication technology (ICT) and postal sector infrastructure in Gaza during the first six months of the Israeli aggression are estimated to be approximately $223 million (PCBS, 2024). However, the true extent of the damage to Gaza's telecommunications sector can't be fully assessed until ground evaluations are possible.

More specifically, every aspect of Paltel Group company's infrastructure has been affected, this includes radio sites, switches, data centers, office buildings, showrooms, cable networks, and street cabinets. Damages were continuously increasing due to direct bombardment, widespread power outages caused by the shutdown of the Gaza power plant, fuel shortages, destruction of solar panels, and connectivity loss resulting from local network damage, which includes street poles, fiber and copper cables, and street cabinets (Human Rights Watch, 2023).

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10 Paltel Group, through its subsidiaries, offers fixed-line, internet, and mobile services.
11 Jawwal is a subsidiary of Paltel, provides mobile services in the WB and GS.
12 The second mobile service provider.
13 Interview with Fadi AbuZaid, Paltel Group on 19/1/2025.

3.2.2 Deliberate Disruptions and Network Blackouts

Since the conflict began, Gaza's telecommunications sector has faced significant disruptions to telecommunications and internet services. Israeli Authorities retain the capability to interrupt these connections at any moment, as evidenced during the recent crisis. All international fiber-optic cables that connect Gaza to the West Bank and the global network pass through Israeli territories, allowing Israel to halt the flow of communication along those cables and effectively cut off communication in Gaza at any moment (Human Rights Watch, 2023).

According to NetBlocks[14], Gaza has experienced approximately 16 telecom blackouts since the onset of the war on October 2023, as of November 2024[15]. These blackouts have predominantly coincided with escalations of Israeli aggression, which were accompanied by power outages and frequent population displacement, leading to overcrowding in shelters. This situation has hindered rescue efforts and exacerbated the suffering of Palestinians in Gaza. Telecommunication disconnection further limits the population's ability to communicate and seek help and it obstructs the work of journalists and correspondents in the field (UNRWA, 2024a).

3.2.3 Strain on Telecommunications Networks Due to Displacement

The widespread destruction of telecommunications infrastructure has severely impacted connectivity for Gaza's 2.1 million residents, including approximately 1.9 million internally displaced persons, many of whom have faced repeated displacements (OCHA, 2024a; UNRWA, 2024b). The ongoing displacement has placed immense pressure on telecommunications networks, particularly in southern Gaza, where most displaced individuals have moved after fleeing North Gaza. As of November 18, the United Nations and its partners estimated that only 65,000 to 75,000 people remained in North Gaza, which is less than 20% of the population that resided there prior to the crisis (UNRWA, 2024c).

The sudden surge in population density in southern Gaza, particularly in refugee camps and makeshift shelters, has overwhelmed network capacity, leading to severe communication challenges. Currently, over 1.6 million people are living in temporary shelters, with thousands of families residing in tents along the southern coast (OCHA, 2024b). The strain on telecommunications infrastructure has resulted in inconsistent and geographically uneven internet access. Connectivity is largely limited to a few areas in the north (Gaza City and North Gaza) and some southern regions, while relative availability has been reported in central areas such as Deir al-Balah and Nuseirat.[16]

3.2.4 Challenges in Restoring Telecommunications Services

The restoration of Gaza's telecommunications infrastructure faces significant challenges due to extensive damage across the sector. Severe electricity shortages, restrictions on the entry of essential repair and reconstruction equipment, and recent aggression have led to further destruction of critical service infrastructure.[17] Frequent disruptions, including power outages, fuel shortages, and physical damage to fiber-optic cables and cell-mobile towers, have crippled communication capabilities, exacerbating the severe humanitarian crisis in Southern Gaza.

While Paltel has implemented emergency contingencies based on past experiences, such as deploying deep-buried cables and multiple backup power sources (including standby generators, solar energy panels, and batteries), the continuity of telecom and internet services ultimately depends on external factors. The network's operation relies on Israel's provision of sufficient fuel supplies[18], and

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14 A company that tracks distribution to internet services in conflict zones.

15 NetBlocks (@netblocks@mastodon.social) - Mastodon

16 Interview with Fadi AbuZaid, Paltel Group on 19/1/2025.

17 Interview with Fadi AbuZaid, Paltel Group on 19/1/2025.

18 Al Jazeera. (2023, November 21). Keeping Gaza online: Telecom Heroes risk life and limb under Israel's bombs. *Al Jazeera*. Retrieved from Keeping Gaza online: Telecom heroes risk life and limb under Israel's bombs | Israel-Palestine conflict News | Al Jazeera

maintenance capabilities are limited to minor repairs, such as fuel refilling or power restoration (Human Rights Watch, 2023). Moreover, telecom companies face added difficulties in prioritizing maintenance tasks due to the ongoing movement of displaced persons.[19]

3.2.5 Efforts by Telecom Operators and Financial Struggles

Most internet service providers and broadcasting stations shut down during the initial days of the crisis due to electricity cuts, with the exception of the Paltel Group and Ooredoo, which managed to sustain temporary services through diesel generators. This temporary solution came to an end when fuel supplies became depleted, resulting in a complete service blackout (7amleh, 2024).

Partial recovery efforts during the conflict were facilitated by UN fuel supplies and repairs to damaged towers and facilities, which began in February 2024. Throughout the crisis, the two mobile operators also supported Gaza residents by providing free monthly call bundles, enabling them to stay connected and access humanitarian services.[20] Additionally, the main telecom operators deployed mobile towers on trucks, placing them near shelter sites and relocating them as people moved between shelters. However, maintaining even minimal services has come at a significant financial cost for telecom providers. The high costs associated with emergency repairs, fuel shortages, and infrastructure maintenance have resulted in substantial financial losses (World Bank Group, 2024).

3.3 Seeking Alternatives to Telecom Companies' Network

As the telecommunications sector in Gaza faced widespread destruction following the war's second month, residents were forced to seek alternative connectivity solutions. Both major telecom providers, Paltel Group (including its Jawwal network) and Ooredoo, faced severe disruptions due to extensive damage to antennas, transmission centers, and infrastructure leading to severe connectivity losses.[21] Despite these challenges, Ooredoo worked to maintain service continuity throughout the war by implementing various measures, innovations, and technical solutions developed by its teams in Gaza,[22] while Paltel introduced emergency strategies to sustain operations where possible. Both telecom companies later initiated repairs on certain networks and adopted alternative power solutions, such as replacing generators with solar cells, to improve power supply to transmission units. However, due to the ongoing damage to internet transmission stations, full restoration remained difficult.[23] With traditional networks heavily impacted, various alternative connectivity methods emerged, each with its own opportunities and challenges. These alternatives are outlined below:

3.3.1 Reliance on Roaming Services[24]

With local networks disrupted, many residents relied on **Israeli or Egyptian networks through roaming services** near the borders. However, this option faced several challenges (Human Rights Watch, 2023):

- **Limited Coverage**: Roaming services require numerous mobile cell sites to operate efficiently, but they only provide coverage in specific areas near borders.
- **Restricted User Capacity**: Due to the small number of operational cell sites, only a limited number of users could connect at any given time.
- **High Costs**: Roaming charges are significantly more expensive than domestic telecom services, making this option financially unsustainable for most residents.

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19 Interview with Samah Lahlooh, the Ministry of the Telecommunication and Digital Marketing on 18/12/2024.
20 Interview with Mohammed Ayesh, the head of the Food Industries Union in Gaza Strip, on 5/11/2024.
21 Interview with Mohammed Ayesh, the head of the Food Industries Union in Gaza Strip, on 5/11/2024.
22 Interview with Iyad Al-Refaei, Ooredoo, on 20/2/2025.
23 Interview with Mohammed Ayesh, the Head of the Food Industries Union in Gaza Strip, on 5/11/2024.
24 Traditional cellular networks that offer roaming services. In this case, people in Gaza use physical SIM cards from Egyptian or Israeli mobile operators to access their network services.

3.3.2 Adopting e-SIM Cards[25]

As the crisis persisted, residents began adopting e-SIM cards from Israeli or Egyptian operators, as well as international satellite-linked e-SIMs. However, it faces several limitations:

- **Geographic Restrictions**: Transmission coverage is restricted to areas close to the borders such as Rafah or Beit Lahia (7amleh, 2024).
- **Expensive International Roaming**: Calls and data usage rely on international roaming, making costs prohibitively high (7amleh, 2024).
- **Device Compatibility Issues**: the use of e-SIMs from abroad is operated by receiving a QR code to identify and connect the mobile device to the strongest available cellular network. However, these e-SIMs aren't compatible with all devices, limiting their accessibility.[26]

3.3.3 Exploring Satellite Internet Solutions

Another alternative considered for internet connectivity in Gaza is utilizing Low Earth Orbit (LEO) satellite technology for internet access, such as Starlink, which offers high-speed internet. However, its implementation in Gaza has been severely restricted: [27]

- **Regulatory Barriers**: Initially, Elon Musk, the owner of Starlink, indicated a willingness to provide service to Gaza, similar to its provision to Ukraine. However, the Israeli government later established an agreement with Starlink, requiring approval for any service in Gaza.
- **Limited Access**: To date, only the Emarati Hospital has been approved to utilize Starlink's service.
- **High Costs**: Even if access is expanded, the cost of satellite-based internet remains significantly higher than traditional services, limiting affordability for most residents.

3.3.4 The Emergence of Small Unregulated Internet Vendors

In response to the telecommunications crisis, small unregulated businesses have emerged as key players in providing internet access in Gaza. These businesses utilize fiber-optic lines that are provided by licensed telecom operators, such as Paltel, to deliver temporary internet access through vouchers in exchange for nominal fees. This model has become particularly popular in underserved areas, such as southern Gaza and refugee camps, where formal network coverage is limited or entirely disrupted. These informal vendors cover 70% of the southern Gaza Strip and all central camps, making their flexible and affordable services an attractive option for many.[28]

While these businesses have become crucial in areas where formal networks are disrupted, they face multiple challenges:

- **Regulatory Challenges**

Paltel Group recognizes the existence of small, informal networks in Gaza. As prior to the recent escalation, these wireless internet networks were widely spread across the region, though they lacked the necessary standards and foundations to ensure providing reliable and high-quality services to diverse user groups. Many of these networks were destroyed during the recent aggression, but some remain

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25 e-SIM refers to an electronic Subscriber Identity Module (SIM), that enables mobile service activation without a physical SIM. Users simply receive a barcode from the e-SIM purchaser and scan it on their device. For international roaming, the subscription must be pre-activated with the operator in their country.

26 Alim, T. (2024, March 6). "Let me tell them goodbye before they get killed": How e-SIM cards are connecting Palestinian Families. *The Markup*. Retrieved from 'Let Me Tell Them Goodbye Before They Get Killed': How eSIM Cards Are Connecting Palestinian Families – The Markup

27 Reuters. (2024, July 24). Musk activates internet service at Gaza hospital with help from UAE and Israel. *Reuters*. Retrieved from https://www.reuters.com/world/middle-east/musk-activates-internet-service-gaza-hospital-with-help-uae-israel-2024-07-24/

28 Interview with Mohammed Ayesh, the head of the Food Industries Union in Gaza Strip, on 5/11/2024.

operational.[29] However, these unregulated networks face **several regulatory and structural challenges**:

- **Lack of oversight, and licensing**: These networks require regulation by the Palestinian Telecommunication Regulatory Authority and the Ministry of Telecommunication to ensure compliance with service quality standards and the provision of dependable internet services.[30]
- **Legal barriers**: Since they operate without licenses, this limits their ability to scale up or receive formal support. Additionally, telecom companies prohibit third-party distribution of fiber-optic lines, which further restricts these businesses' capacity to expand their services.

- **Infrastructure and Technical Limitations**
  - Utilizing fiber-optic lines designed for residential or business use can overload the network, ultimately affecting service quality for all users and placing additional strain on the already fragile telecommunications infrastructure.[31]
  - Ongoing damage to transmission stations continues to disrupt services.

- **Financial and Logistical Constraints**
  - Many of these businesses are privately owned by individuals or small partnerships that lack the resources needed to upgrade their infrastructure.
  - The high cost of acquiring all the necessary components for internet installation, such as routers, cables, and other equipment poses a significant challenge for these small businesses.
  - The severe electricity shortages hinder their ability to maintain stable operations.
  - Israeli restrictions on importing essential telecommunications equipment required for repairs and reconstruction only exacerbate these challenges, further undermining the ability of these small businesses to sustain and expand their services effectively.[32]

Despite their informal nature, Paltel has indirectly supported these networks by supplying internet access to help maintain connectivity and ensure that essential communication services remain available in Gaza, within the constraints of available resources.[33] However, without a clear regulatory framework, these small vendors face significant operational and expansion challenges. Therefore, addressing these barriers is crucial for improving internet access in Gaza, particularly where the population has multiplied and been displaced, putting additional pressure on already insufficient infrastructure.

29 Interview with Fadi Abu Zaid, Paltel Group on 19/1/2025.
30 Interview with Fadi Abu Zaid, Paltel Group on 19/1/2025.
31 Interview with Fadi Abu Zaid, Paltel Group on 19/1/2025.
32 Interview with Fadi AbuZaid, Paltel Group on 19/1/2025.
33 Interview with Fadi AbuZaid, Paltel Group on 19/1/2025.

4. Emerging Solutions and Opportunities

Gaza can take significant steps toward overcoming its connectivity challenges, by combining the following emerging solutions and opportunities.

4.1 Unregulated Small Businesses

As mentioned in the previous section, unregulated small businesses have emerged as an innovative solution to Gaza's connectivity challenges. These vendors utilize fiber-optic lines provided by licensed telecom companies, such as Paltel. They temporarily distribute their internet access by selling vouchers for hourly or daily use in exchange for a fee, enabling underserved areas to affordably connect to the internet.

The services provided by these small businesses have become vital for underserved populations, particularly for displaced Palestinians living in refugee camps and residents of southern Gaza, where the formal telecommunications infrastructure is either damaged or non-existent. Their flexibility and affordability provide a crucial alternative for those lacking other options, enabling immediate access to important services such as educational platforms, communication, job opportunities, and humanitarian support.

However, despite their potential, these businesses operate in a legally grey area, which hinders their ability to scale up, enhance service quality, and meet the growing demand for reliable internet in underserved areas. Issues such as network overload, inconsistent service delivery, and data privacy risks arise due to the lack of formal oversight and regulation. From Paltel Group's perspective, formalizing these businesses under a clear regulatory framework would provide significant opportunities. By granting them official licenses through the Ministry of Telecommunication, these businesses could offer more reliable services, ensuring fair competition while protecting consumer rights. Such formalization would also enable the state to collect necessary taxes and fees, as is done with licensed networks while fostering investment in infrastructure and safeguarding the interests of investors and stakeholders in a regulated telecommunications sector.[34]

Paltel Group has supported these small businesses during the recent conflict, even if indirectly, by providing internet services to them during times of need. For instance, during the recent conflict, Paltel supplied internet bandwidth to these networks, enabling them to continue serving end-users despite limited resources.[35] Building on this, Paltel could further support these businesses through partnerships, technical assistance, capacity-building initiatives, and discounted bandwidth or technical resources. By doing so, these businesses could improve their coverage and service quality, providing scalable and cost-effective solutions to expand connectivity in underserved areas.

Integrating these informal providers into Gaza's telecommunications framework would require addressing regulatory gaps and establishing oversight mechanisms. With the right support, these small businesses could transform into legitimate players within the sector, contributing to sustainable and long-term connectivity solutions for Gaza's population.

4.2 Infrastructure Development

Restoring and developing Gaza's telecommunications infrastructure is critical to addressing the extensive damage caused by the recent conflict. Paltel Group, as the leading telecommunication provider, has been actively working to rehabilitate the sector and reconnect communities. These efforts include repairing damaged cellular towers, reestablishing crucial fiber-optic pathways that link Gaza to international internet gateways, and introducing fixed wireless services to temporarily compensate for

[34] Interview with Fadi AbuZaid, Paltel Group on 19/1/2025.
[35] Interview with Fadi AbuZaid, Paltel Group on 19/1/2025.

the destruction of both landline and wireless networks. In areas with limited connectivity, such as refugee camps, Paltel has implemented targeted initiatives to ensure essential services. During the conflict, additional internet bandwidth was provided to local network operators, enabling them to distribute services more effectively. Furthermore, equipment and tools were supplied to expand both wired and wireless networks, ensuring displaced populations retain access to communication services.[36]

Critical upgrades are needed to restore and enhance connectivity fully. Repairing cellular towers and extending fiber-optic networks are essential for ensuring robust and reliable service delivery. Addressing Gaza's ongoing energy crisis is equally important, as sustainable energy solutions such as solar-powered systems are necessary to provide backup power for telecommunications infrastructure. However, logistical challenges, including the restrictions on importing fiber cables, solar panels, spare parts, essential materials, and fuel for electricity supplies from the Gaza Power Plant and diesel generator, continue to impede large-scale restoration (World Bank, 2024). Although a few shipments were allowed in August 2024, they represented only a small fraction of what was needed to achieve the minimum level of expected services (MTDE, 2024). Comprehensive restoration timelines remain uncertain and depend on both the availability of resources and the ability to undertake broader reconstruction projects (Human Rights Watch, 2023).

Small, unregulated businesses have become essential in providing alternative connectivity solutions in underserved areas, particularly refugee camps and schools, during and after the war. However, their lack of formal regulation has led to challenges such as network strain, inconsistent service quality, and risks to data security. Integrating these businesses into the formal telecommunications system through regulatory frameworks can improve service reliability and security. Providing these vendors with incentives such as subsidies for high-quality equipment, including routers and antennas, can further improve their capacity and reliability. Additionally, partnerships with larger operators like Paltel Group could help enhance their operational capacity, by granting them additional fiber-optic lines to expand their services while maintaining quality standards.

The cost of rebuilding Gaza's telecommunications infrastructure is estimated at $146 million, with $68 million allocated for fixed services and $78 million for mobile networks (7amleh, 2024). However, frequent conflicts often damage the infrastructure faster than being repaired, forcing many areas to rely on temporary solutions provided by small vendors. By integrating small businesses into a formal regulatory structure, encouraging partnerships, and focusing on sustainable infrastructure development, Gaza's telecommunications sector can achieve broader access, improved service quality, and a more resilient network.

4.3 Legal and Regulatory Adjustments

The formalization and regulation of small internet providers in Gaza are critical for ensuring secure and reliable internet services while fostering fair competition. Licensing these businesses would also allow the government to effectively manage resources, such as frequencies, and collect revenues, including licensing fees, VAT, and income taxes. This process ensures equitable market treatment, protects current licensed investors, and promotes sustainability in the telecommunications sector.[37]

Although unregulated small businesses providing temporary internet access through vouchers have demonstrated potential, they face significant challenges that hinder their ability to expand and deliver consistent services. Addressing these issues requires adapting regulatory frameworks to formalize their operations, ensuring their long-term viability and effectiveness as alternative connectivity providers.

As a starting point, given the current situation, a recent interview with MTDE emphasizes the need for small businesses to approach the General Department of Licensing. By providing information about their internet source, technologies used, and other relevant service details, the Ministry can assess their

[36] Interview with Fadi AbuZaid, Paltel Group on 19/1/2025.
[37] Interview with Fadi Abu Zaid, Paltel Group on 19/1/2025.

eligibility for licensing. If no legal objections arise, the Ministry has shown support for regulating these businesses due to the critical need for their services, aligning with its goal of achieving comprehensive service provision across Gaza.[38]

Therefore, a flexible licensing system, developed in collaboration with the MTDE, and the Telecommunications Regulatory Authority, is essential to enable small vendors to operate legally without encountering excessive financial or bureaucratic burdens. Such a framework would legitimize their contributions to connectivity, particularly in underserved areas such as refugee camps, while ensuring compliance with service quality standards.

Regulatory adjustments and collaboration partnerships between small businesses and telecom providers like Paltel should be encouraged to enhance service quality, broaden access, and support the development of scalable connectivity models. For instance, granting vendors additional fiber-optic lines could improve their ability to expand operations while maintaining reliable services. Technical training, quality assurance measures, and capacity-building initiatives would further strengthen their integration into the broader telecommunications network, boosting efficiency and affordability.

Consumer protection mechanisms are vital regulatory adjustments that should be tailored to enforce minimum standards for service reliability, data privacy, and affordability. Addressing legal and regulatory gaps through these measures would create a more inclusive and resilient telecommunications sector in Gaza, ultimately expanding internet access and connectivity for Palestinians in need.

By fostering collaboration, adapting regulations, and providing targeted support, the formalization of small businesses as part of Gaza's telecommunications framework can lead to sustainable and equitable connectivity for all.

[38] Interview with Samah Lahlooh, the Ministry of the Telecommunication and Digital Marketing on 18/12/2024.

5. Recommendations

Based on the situational analysis of Gaza's current connectivity challenges, considering the current ceasefire, and the emerging solutions and opportunities, the following recommendations are proposed to address critical gaps, promote sustainable and scalable solutions, and improve telecommunications accessibility across Gaza Strip (the priorities are categorized based on urgency):

- **Policy Reforms and Regulation**

  1- **Formalizing Small Internet Service Providers (vendors) (High Priority- Short-Term)**
  - **Introducing Licensing Frameworks**
    MTDE should develop a simplified licensing system to legalize small, unregulated internet service providers that offer services through vouchers. This initiative should start with licensing a limited number of vendors as a pilot program to identify challenges and refine the process for future scaling. This will enable these businesses to operate legally, expand their reach, and improve service reliability.

  2- **Promote Consumer Protection and Accessibility (Medium Priority- Short to Medium-Term)**
  - **Regulate Pricing and Quality**
    MTDE should establish mechanisms to monitor the affordability and quality of internet services provided by small vendors, ensuring fair access and protecting consumers from exploitation, with a gradual increase in compliance over time.
  - **Protect User Data**
    MTDE, in collaboration with NGOs, should train several internet providers on user data protection standards within the first year by introducing basic guidelines on privacy and security, particularly for services provided by small vendors. This training will help build consumer trust in alternative connectivity solutions and safeguard user information.

- **Strengthening Telecommunications Infrastructure (High Priority- Medium to Long-Term)**

  1- **Repairing and Upgrading Networks**
  - MTDE, in collaboration with international donors, should conduct a needs assessment to prioritize repair efforts and align funding sources.
  - Restoration of critical damaged telecom assets, including fiber-optic cables, cellular towers, and other essential infrastructure should be prioritized, supported by international donor funding.

  2- **Alternative Connectivity Solutions**
  - The MTDE, along with NGOs, should support small businesses in deploying innovative technologies by investing in renewable energy solutions, such as solar-powered internet hubs. These hubs should target underserved areas and refugee camps, bypassing damaged infrastructure to provide reliable and continuous internet access.

  3- **Expanding High-Speed Networks**
  - Telecom Companies, in coordination with MTDE and international organizations, should invest in extending fiber-optic lines to multiple underserved areas to enhance access for small vendors, with a focus on regions with significant demand and potential for impactful service improvement.
  - Small vendors should be involved in distributing high-speed internet access to shelters and humanitarian support centers, including schools. This initiative will address immediate humanitarian needs in education and health until long-term recovery begins, facilitating e-learning and e-health platforms.

  4- **Addressing Energy Constraints in Telecommunications (High Priority- Medium-Term)**
  - **Energy-Supported Networks**
    - The Palestinian Energy Authority, with support from international donors, should invest in renewable energy systems, such as solar panels and energy storage solutions, to

support telecommunications infrastructure during ongoing power shortages. These systems will enhance the ICT sector's resilience to frequent power outages and disruptions.
    - Encouraging telecom companies to integrate solar energy systems into transmission stations would further enhance network sustainability.

- **Economic and Technical Support for Small Vendors**
  - **Financial and Technical Assistance**
    - MTDE, in collaboration with international donors and NGOs, should provide technical training and capacity-building programs for a selected number of vendors in the initial phase. This will ensure efficient service delivery and compliance with regulatory standards.
    - MTDE, in collaboration with international donors and telecom stakeholders, should establish a targeted subsidy program to support licensed small internet vendors in upgrading their equipment and improving service reliability in underserved areas. The program should prioritize vendors operating in high-need locations, with clear eligibility criteria and phased support transition from financial aid to capacity-building. By providing technical training, business resources, and regulated access to wholesale bandwidth, the initiative will enable vendors to become self-sufficient, ensuring long-term sustainability and expanding internet access in Gaza.
  - **Encourage Partnerships**
    - MTDE, in coordination with telecom companies, should facilitate a structured framework that allows small vendors to legally access fiber-optic networks or purchase bandwidth at discounted rates under formalized contractual agreements. This framework should ensure that small vendors can operate independently while adhering to service quality standards, with the Ministry overseeing compliance, fair pricing, and consumer protection to prevent monopolistic practices or unfair market conditions.

- **Securing International Support and Collaboration (Medium Priority- Short- to Medium-Term)**
  - **Mobilizing Resources**
    - Establishing a consortium of donors to support the telecommunication system in Palestine during the war is crucial to ensure connectivity, emergency response coordination, and access to vital information.
  - **Leveraging Expertise**
    - MTDE and telecom companies should establish several international partnerships with global technology organizations to obtain technical expertise, such as telecom infrastructure specialists, disaster recovery experts, cybersecurity professionals, regulatory advisors, and funding specialists. These partnerships should focus on building a resilient telecommunications system in Gaza and implementing innovative solutions, such as alternative connectivity systems.

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