

**Input to The Yemen Policy Note no. 4. on
Inclusive Services Delivery**

**Yemen Information
& Communication
Technology (ICT)**

Table of Contents

ACKNOWLEDGEMENTS	iii
ACRONYMS	iv
BACKGROUND	1
INTRODUCTION: SECTOR SITUATION BEFORE CONFLICT	1
CONFLICT RELATED IMPACTS AND CHALLENGES	3
KEY PRINCIPLES OF RE-ENGAGEMENT AND RECONSTRUCTION	5
WAY FORWARD: SHORT TO MEDIUM TERM	7
MOBILE MONEY FOR CASH TRANSFERS AND FINANCIAL INCLUSION	8
HEALTH: TELEMEDICINE AND CROWDSOURCING DATA	9
CITIZEN FEEDBACK AND PARTICIPATION MECHANISMS	10
DONOR COORDINATION	13
ANNEX 1. TELECOM SERVICE RETAIL PRICE ANALYSIS	15
List of Tables	
Table 1. Mobile Phone Market, March 2016	2
Table 2. Yemeni Retail Price Ranking Among 20 Mena Markets And Comparison With Mena Average (June 2015, Us\$/Month Ppp With Vat Included, Oecd Methodology And Baskets)	15
Table 3. Actions For Broadband Infrastructure (3g And Faster Speeds)	4
List of Figures	15
Figure 1	16
Figure 2	

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Acronyms

CDMA	Code Division Multiple Access
EWS	Early Warning System
GPS	Global Positioning System
GSM	Global System for Mobile Communication
ICT	Information and Communication Technologies
IVR	Integrated Voice Recording
MoTIT	Ministry of Telecommunications and Information Technology
NDC	National Dialogue Conference
NREN	National Research and Education Network
PWP	Public Work Project
SFD	Social Fund for Development
SMS	Short Message Service
UNHCR	United Nations High Commissioner for Refugees
USSD	Unstructured Supplementary Service Data

Background

1. This note is a part of a series of policy notes prepared by the World Bank in anticipation of a post-conflict transition in Yemen. These notes aim to identify immediate priorities for stabilization, recovery and restoration of services and infrastructure in the aftermath of Yemen's current conflict. A subset within these notes specifically focused on ways to restore service delivery in an inclusive manner immediately after conflict. As such, these notes examined short-to-medium-term institutional challenges facing the restoration and improvement of service across sectors. They focused on the immediate post-conflict priorities and challenges facing Energy, Water, Telecommunication, Education, Health, and Transport sectors in restoring services while also contributing to higher-level objectives of addressing systemic inequities and reinforcing trust in the state. These notes make practical suggestions to the Government of Yemen and international development partners to provide immediate post-conflict support to ensure empowerment, accountability, and better governance in service delivery.

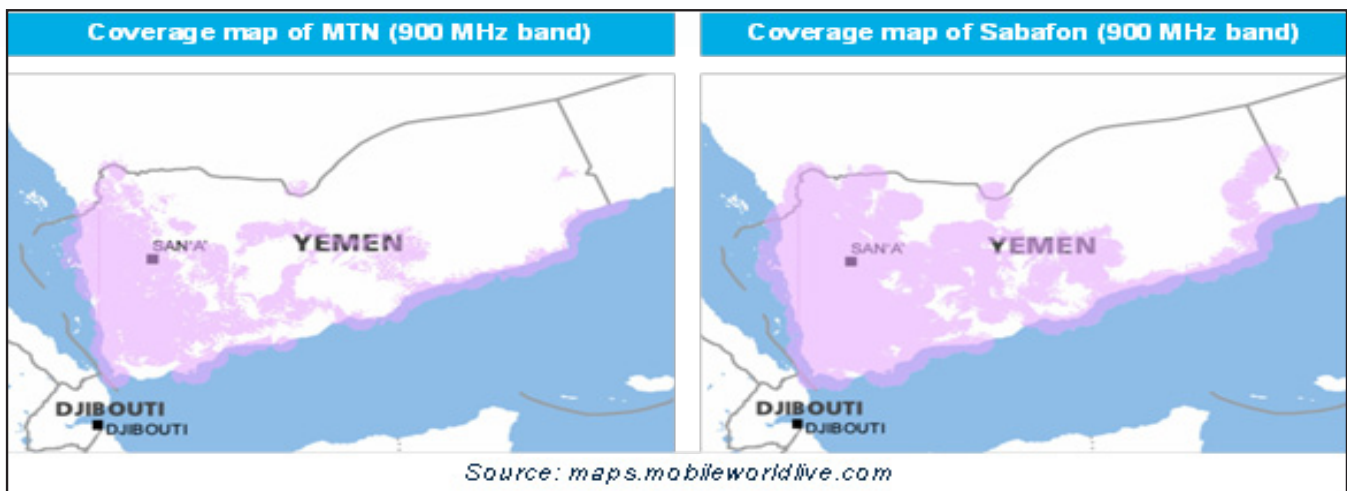
The current paper focuses specifically on how the information and communication

technology (ICT) sector can be mobilized more effectively to restore public services in a more inclusive manner immediately after the conflict ends Yemen.

Introduction: sector situation before conflict

2. Prior to the conflict, the main focus of the ICT sector in Yemen was on meeting the demand for basic voice services without expanding into data and Internet services. Basic mobile phone services were gradually becoming widespread with mobile networks reaching about 90 percent of the population (Figure 1). The number of mobile phone subscriptions had increased five-fold from 3 million in 2006 to 16 million in 2016, leading to an almost 56.9 percent penetration for a population of about 28 million. Still, the mobile penetration rate is one of the lowest in the Middle East and North Africa (MENA) region, the average for which is over 100 percent. Other neighboring countries have achieved a higher mobile penetration: Afghanistan (GNI per capita¹ US\$610; 89%); Oman (US\$16,910; 172%); Iraq (US\$5,820; 91%); and West Bank and Gaza (N/A; 82%).

Figure 1. 2G/2.5G Mobile Coverage Maps of MTN and Sabafon, 2016



3. Before the conflict, latent demand for internet-enabled services was becoming increasingly evident with consumers requesting for faster services

uncommon for residential customers to lease access to their broadband internet connection to others.

Table 1. Mobile Phone Market, March 2016

Operator	Market Share	No. of Subscribers	Technology	Spectrum Allocations	Ownership
MTN Yemen	31.8%	million 5.3	(GSM (2G, 2.5G	2x2 MHZ 900MHZ ((mainband	83%-owned by South Africa's MTN Group
Yemen Mobile	30.8%	million 5.1	CDMA2000 1x ((2.5G CDMA2000 (1xEV-DO (3G	MHZ 824-834 ((uplink MHZ, 869-879 10X2 MHZ (down-link	owned by PTC; 59.37% 17.13% ¹ owned by other government stakeholders; 23.5% private and individual ownership
Sabafon	22.7%	3.8million	(GSM (2G, 2.5G	3x2 MHZ in E-900 MHZ 10x2 in 1800 MHZ	Al-Ahmar Group (60%+), Bahraini Batelco (26.942%), others (including Iran Foreign Investment Company
Y-Telecom (HiTS Uni-tel)	14.9%	million 2.5	(GSM (2G	8x2 MHZ in 900 (MHZ (mainband	Mainly Kuwait and Saudi-based investment firms and private investors from Yemen, UAE, Saudi Arabia, Syria and Kuwait

Source: Public Telecommunication Corporation data from 2013, updates from Telegeography.

particularly in urban centers. The demand for internet-enabled 3G services was growing as Yemenis started switching from using basic mobile phones to smartphones and computers (i.e., laptop, tablet, desktop) that require mobile broadband speeds and data capacity. Seeing the latent demand and potential growth in revenue, the private mobile operators in Yemen were, for several years, requesting the government to upgrade their licenses so they could provide mobile internet services. Only the state-owned mobile operator, Yemen Mobile was provided permission to provide 3G services. The others only had licenses to offer 2G or 2.5G services, with 2.5G allowing for very limited data capacity (Table 1). The result was that only 1.7% of the total population was accessing 3G or mobile internet services. Citizens were also coming up with creative ways to access the internet and it was not

4. There were other significant market structure and regulatory issues hindering competitive growth of the overall internet, data and broadband markets in Yemen. The weakness of the sector arose from the lack of separation between policy, regulatory, and operational roles which resulted in a governance structure

Table 2. Yemeni retail price ranking among 20 MENA markets and comparison with MENA average (June 2015, US\$/month PPP with VAT included, OECD methodology and baskets)

Service	Basket (monthly consumption)	2015 Yemeni ranking	2010-2015 Yemeni ranking evolution	Yemeni price	MENA price average	Yemeni price / MENA average
Mobile telephony	40 calls + 60 SMS	10		\$ 8.4	\$ 11.4	0.7
	30 calls + 100 SMS + 100Mb data	17		\$ 52.4	\$ 30.6	1.7
	100 calls + 140 SMS + 2Gb data	18		\$ 880.3	\$ 166.7	5.3
Fixed BB	2Mbps - 10Mbps connection	9		\$ 54.7	\$ 62.3	0.9
Leased lines	2Mbps circuit	13		\$ 3 228.0	\$ 2 699.0	1.2

Note: 20 markets are considered in the MENA region
Source: BTRA-ARENET, 2015

that was not conducive for competitive behavior among the operators. The price of telecommunications services remained high in Yemen as it ranked last or second to last among the 19 MENA countries in terms of price of phone calls, SMS, data packages, and fixed broadband internet services (see Table 2 and Annex A).

Conflict related impacts and challenges

5. As witnessed in Afghanistan, Iraq, Somalia the telecommunications market is one that adjusts to fragility and conflict situations and continues to provide communication services. There is no reason to assume that Yemen would be fundamentally different. Although with some limitations, all four mobile operators in Yemen and the state-owned fixed infrastructure telecommunications operator are continuing to provide services. This is despite direct attacks on their infrastructure. The resilience of the telecommunications sector can be attributed to the fact that it remains profitable for both, private and public operators even during conflict, and in certain instances more profitable as demand for communications increases.

6. The state-owned Public Telecommunication Corporation (PTC) in 2014, had 13,000km of fiber optic running across the country. This backbone infrastructure connects Yemen to the international submarine fiber network at the ports of Aden, Al Mukalla and Hodeidah and up runs up to Sa' dah at the border with Saudi Arabia. While the extent of the damage is yet to be determined², fiber optic networks are usually deployed above ground in Yemen which makes them visible and vulnerable. Furthermore, there were reports in April 2015 that phone lines in Aden had been severed following fighting. Further damage is expected to have occurred, and the full picture is not available at the moment.

² The telecommunications sector has been included in the Disaster Needs Assessment Phase II of the World Bank.

7. In December 2015, there were an estimated 16.88 million mobile customers in Yemen, down 4.2% from 17.62 million a year earlier and a recent peak of 18.36 million at the beginning of 2015³. The decline was due to the escalating violence in the region, in particular the start of an airstrike campaign in late March 2015, which has reportedly had a devastating impact on the nation's telecom infrastructure. While the impact of conflict on mobile penetration rates is almost immediate, so is the rebound during times of peace. The political crisis that started in 2011 crisis saw growth of mobile phone subscribers plummet to 7.9% in 2012 from more than 20% in each of the preceding two years. Yet, during the stability from late 2012 to early 2014 growth rebounded to 15.3% and 12.3% in 2013 and 2014 respectively. While a complete picture of damage to the telecom infrastructure is not available, it is likely that operators are falling behind in repairing their networks as many companies are said to have withdrawn their staff for the duration of the conflict.

8. The private operators need two things to ensure their operations and continued investments in their networks. First, they should be ensured fair access to PTC's nationwide backbone infrastructure. The path to liberalization and adherence to the telecommunications principles under the World Trade Organization requires open and transparent rules to accessing and interconnection of inter-operator networks. As there is no independent regulatory authority, transparent rules of the game are yet to be developed in Yemen. Second, as mentioned above, the three private operators are in need of license renewal in order to upgrade their networks for provision of 3G/4G services. The larger operators have been ready to upgrade their networks since 2012.

9. As the second largest government revenue source, the health of the tele-

³ Telegeography

communications also impacts government and the economy. While there is significant dominance of the state-owned operators⁴ in Yemen, private participation was introduced in 2000 which has led to the development of a robust mobile market (specifically for 2G/2.5G which does not allow for Internet access) and a relatively stable revenue stream for the government. Prior to 2015, government revenue from the telecommunications industry was said to be second largest after hydrocarbons. Moreover, telecommunications services brought in hard currencies into the economy, previously reported in the order of about USD300 million, annually.

10. Table 3 below lays out the key decisions and actions that would help the telecom sector in Yemen not only recover but to expand access, even with continued conflict. As aforementioned, mobile operators tend to be agile and continue to operate in difficult situations. And the expansion of higher capacity mobile broadband services (i.e. 3G/4G) will be critical if the Government and Donors are to provide assistance and services to the citizens using more modern and efficient technology platforms. In light of this, the upgrade of networks by all operators is important for three reasons. First, operators

Table 3. Actions for broadband infrastructure (3G and faster speeds)

	Action	Potential lead	Impact	Timeframe
.1	Allow more operators to invest in and provide 3G/4G services (i.e. license harmonization)	MoTIT/ or other entity with executive power	Operators have been seeking licenses to be able to upgrade their networks and are ready to deploy. Impact would lead to increased availability of mobile internet services	Immediate
.2	Spectrum management for mobile internet	MoTIT/ or other entity with executive power	Spectrum allocations will need to be re-evaluated in order to maximize network coverage and quality of mobile internet services	Immediate
.3	National fibre backbone infrastructure expansion	Public Works Project/Public Telecommunications Corporation	PTC had about 13,000 km of fibre running across the country. Damage to these assets will need to be examined	Reconstruction phase
.4	Allow deployment of fibre via linear infrastructure including electricity grids and roads/highways	Public Works Project/Multiple ministries	About 75% of the cost of laying fibre is in works and digging the trenches for the ducts. The global trend is for fibre ducts to be built alongside construction of electricity grids, highways among other utility infrastructure	Reconstruction phase

Source: World Bank

⁴ Public Telecommunications Corporation (PTC) owns Yemen Mobile and TeleYemen, the internet service provider and international gateway operator.

need to diversify their offerings to include the higher capacity services in order to

increase profits and subsequently to reinvest in their infrastructure and ensure service quality. Second, it is important to the citizens as the mobile phone, both basic and smartphones, could be used in a myriad of ways to maintain livelihoods, access information and public services etc. Third, it is important for the Government as the telecommunication sector is one segment of the economy that can be developed during conflict.

11. It would be important to determine the entity that would have the executive powers to issue licenses to the operators. Prior to the conflict and absent a regulatory authority, the Ministry of Telecommunications and Information Technology (MoTIT) had issued licenses as well as managed spectrum for the mobile broadband services. However, as the existing circumstances unclear, further examination of the legislation in place and in draft could be made to determine how the licenses could be renewed.

- Draft Telecommunications Act of 2008 (with amendments in 2014)
- Republican Decree on Law #38 of 1991 Pertaining to Wired and Wireless
- Telecommunications Law of 1991 (with amendments in 1996)

Key principles of re-engagement and reconstruction

12. Yemen is trapped in a vicious ‘cycle of conflict’ with chronically weak state institutions directly contributing to the current round of violence. This violence, in turn, has further undermined state institutions thereby portending even more violence for the future. The continued weakening of national institutions has also diminished chances of sustainable peace as any peace-agreement would be undermined without a strong institutional

foundation to safeguard its terms. Therefore, any recovery and reconstruction plan post-conflict would also have to mandatorily focus on reinforcing state institutions—while addressing urgent humanitarian needs—to prevent the slide back into conflict. Experiences from around are replete with instances where the singular focus on post-conflict humanitarian relief—without regard for institutional transformations—have ended up being costly missed opportunities for breaking the cycle of violence.

13. There is thus a clear need for new thinking on Yemen to support more sustainable and inclusive ways of service delivery during conflict and immediate post-conflict periods. In this context, the key challenge for Yemen’s development partners is to devise new and innovative ways to support the country, to not only recognize the fundamental causes and effects of conflict and fragility but also, importantly, enhance the resilience and coping capabilities of communities and households. Therefore, these notes on inclusive service delivery—including the current note on ICT—propose a new approach that focuses on attending to urgent service delivery needs in the most affected parts of Yemen while also incrementally enhancing inclusiveness, resilience and thus, the effectiveness of service delivery institutions.

14. ICT solutions can support efforts to curb conflict and facilitate access to a range of services. Communications and internet service options can be made available today at affordable prices, accessible also for low-income populations. The use of applications for mobile banking, credit and insurance are having unprecedented impact in terms of casting a wide net to provide services to the masses and to the traditionally marginalized communities. ICT applications can be designed for the illiterate and for people with sensory disabilities. Access to the internet can

be provided through handheld devices (i.e. smartphones, tablet computers) and through public computer labs located in universities and schools, health clinics and post offices. These technologies and applications have made successful contributions in various fragile or conflict country contexts (e.g. Afghanistan, Democratic Republic of Congo, Somalia).

15. ICTs are unlikely to be seen by either governments or international agencies as the most important factors in stabilization but they can play a significant part in helping to ensure it stays on track. There is therefore a need to build understanding among decision makers of the potential value as well as limitations of ICTs at different stages of post-conflict reconstruction. Broadly speaking, ICTs can contribute to countries in conflict in four ways:

a. **Conflict reducing.** Obtaining reliable information is always important but critical in times of breaking with conflict. Misinformation, propaganda, and rumor are the result in the absence of independent media and reliable telecommunications (which today includes digital media outlets). Misinformation, propaganda, and rumor are the opposite of what is needed when rebuilding trusts and stability. The situation does not change overnight when an armistice is signed. Donors and international intervention forces have learnt, from bitter experience, the importance of communicating directly and effectively with frightened and uncertain populations—providing reliable information to the community through officially sponsored radio stations, and public information offices. Civil society organizations

can also play an important part in building trustworthy information networks, while some communities have begun to organize their own using mobile phones and applications.

b. **Resilience enhancing.** The ability to communicate and share information across the country in a uniform and unified manner helps the government re-establish its government apparatus at the national, governorate or the district and village level. The deliberate use of communication and internet services for institution building could serve Yemen in the short-term as well as in the longer-term effort of nation building. Furthermore, availability of affordable communication services enables individuals to rebuild their livelihoods by solving the information problem about resources and inputs available at lower costs, social relationships that have been separated by conflict, within families and beyond, relationships between home and diaspora communities. People with mobile phones in the aftermath of violent conflict stress particular value in terms of personal security—increasing their ability to assess and avoid risks associated with travel, and to seek help when needed. A global survey study conducted by United Nations High Commissioner for Refugees (UNHCR) in 2014 found that after water and food, refugees and displaced people asked for somewhere to charge their mobile phones. The UNHCR then released a more in depth global study on the use of mobile

phones by refugees and internally displaced people including in Yemen⁵.

c. **Market solutions.** ICT applications have a catalytic role to play in transforming other economic and social sectors. Practically speaking, ICTs can be used to correct the asymmetry of information and communication flows, reduce the negative impact of distance and remoteness, and bring transparency to the movement of goods, funds and people as well as their mutual interaction. Mobile devices can increase access to finance by women and small businesses through mobile cash payments and transfers.

d. **Inclusiveness and equity.** ICT solutions can facilitate and accelerate inclusiveness. The test for inclusive service delivery in Yemen will be to ensure that more of the most vulnerable or disadvantaged, by geography or by social criteria, as well as displaced persons, are reached and being serviced, helping to improve livelihood conditions. Improved access to ICT services could be achieved through individual solutions (personal devices), or through various forms of collective solutions (banks, communities, companies) where access is provisioned against a fee (on top of the pure user fee). The principle would be a shared use of ICT capabilities, network effects as individual ownership of mobile devices could be costly for the average citizen or family (similar to models of using solar panel generated energy

as a product produced by private business).

Way forward: short to medium term

16.Key Considerations: Increasingly governments and donors are looking to new technologies to enhance and modernize their interventions in fragile and conflict states. As the thinking of how ICTs can benefit Yemen progresses, the following key considerations may provide as a useful guideline.

a. First, the impact ICTs can have as an end to itself includes fiscal impact as well as impact on private sector development and the economy itself.

b. Second, the impact ICTs can have as a tool or means to an end includes impact on a broad range of service delivery, whether through public or private interventions.

c. The development of the ICT sector therefore requires both supply-side and demand-side stimulation.

d. Interventions should follow the “do no harm” principle. While ICTs can spread access to beneficial information and services, it can be used as a vehicle to spread harmful information.

e. Through pragmatic approaches, leapfrogging with technology is a true possibility in Yemen as it has been in Afghanistan or the Democratic Republic of Congo.

17.While the mobile broadband market is not where it needs to be, nor where it could be, Yemen still has a mobile network

⁵ <http://www.unhcr.org/5770d43c4.pdf>

that can be used within the immediate conflict situation. It is therefore not premature to start thinking about how these communication tools and technologies could contribute to efforts in Yemen such as for re-establishing *trust and redefining the social contract*, improving *access to services* through the government as well as through enhancing community-driven development mechanisms; and in improving *access to markets and livelihoods*. The section below introduces four ways in which mobile phones and applications could be used in Yemen today.

Mobile money for cash transfers and financial inclusion

18. Mobile communication has opened the door to Mobile Money, expanding the payment system linking people to banking services without having a bank account. Mobile money has advanced the agenda for inclusion of the unbanked (citizen) starting in 2000 in the Philippines, Af-

ghanistan, Kenya and now in the Democratic Republic of Congo where demobilized ex-combatants are paid their salaries via the mobile phone as part of a World Bank program supporting ex-combatants reintegrate in civilian life. Mobile money allows for the direct transfer of credit to an individual's personal mobile phone at very low transaction costs. The person then can go to an establishment (i.e. kiosk, post office, market) that is part of the bank's network and where customers can cash-out at the receiving end or to use the credit there. Other services that can be offered include paying bills, transfer money amongst family or other's accounts and exchange currencies in their bank accounts. Furthermore, mobile money is particularly intensively used in currencies that are effectively dollarized or where inflation is high, such as in Somalia, Zimbabwe and South Sudan.

19. Mobile banking licenses can be obtained in Yemen since 2014. In 2014, the Central Bank of Yemen issued a Circular No. 11 of 2014 A.C allowing for mobile banking licenses to be awarded to banks. This is hoped

Table 4. Key partnerships using mobile money for cash transfers

Location	Date	Details
Mirebalais and Saut d'Eau, Haiti	Nov-Dec 2010	Mercy Corps transferred US\$40 to 5,000 Haitians displaced by the 2010 Haiti earthquake using Voil's T-Cash platform
Niamey, Niger	Feb-May 2013	Save the Children worked with UNHCR and Airtel to transfer mobile money to approximately 312 refugee households, each of which was provided with a .mobile phone and SIM card
Tacloban City, Leyte, Philippines	December 2013-present	Following Typhoon Haiyan in November 2013, UNDP partnered with the Land Bank of the Philippines and Smart Communications to provide mobile money transfers to those helping clear rubble and municipal waste from roads, public buildings, schools and hospitals, through the UNDP cash-for-work scheme. Beneficiaries are provided with a Samsung mobile phone, a SIM with PHP 30 in initial airtime, and a Landmark ATM cash card. The goal of the first phase to reach 5,000 beneficiaries and expand over time to reach a target group of 50,000 people, in areas such as Rzas City, Guiuan in Easter Samar, and Ormoc .City in Leyte throughout 2014
North Cebu and Leyte, Philippines	January 2014-present	Mercy Corps, in conjunction with innovation firm IDEO, has provided 20,000 people displaced by Typhoon Haiyan with SIM cards and approximately \$87 .transferred via BPI Globe BankO's mobile money service
Gihembe camp, Rwanda	January 2014-present	WFP is working with UNHCR, the Bank of Kigali, Visa, MIDIMAR, I&M Bank, World Vision, and Airtel to provide 3,500 families with mobile phones and .transfers \$10 a month to each of the camp's 14,600 refugees via m-Visa

Source: *Disaster Response Mobile Money for the Displaced, Groupe Spéciale Mobile Association (2014)*

Recommended Action #1

Action: Monitoring of ongoing mobile banking pilots in Yemen and expansion of service scope and scale, including household survey of mobile money usage targeting the poorest and most vulnerable segments of the population. Monitoring of number of users, number of transactions would gauge adoption and effectiveness. Quality of service indicators such as ease of use and reduced transaction costs can help gauge how services can be tailored more to the beneficiary or customer

By whom: Central Bank of Yemen, Ministry of Telecommunications and Information Technology, Yemen Chapter of Internet Society

Potential international support: CGAP, IFC, World Bank

Beneficiaries: Social Fund for Development, Yemen Post Authority

Impact: Improvement towards a tested, secured technology platform for money transfer to individuals, households and businesses

Timeframe: Action can be immediate. The effort to monitor and improve on the pilots can be made through with the cooperation of the microfinance banks and mobile operators

to be a game changer in terms of advancing the agenda for financial inclusion in Yemen. The country ranked the second worst country in the world in financial inclusion as measured by the Global Financial Inclusion Index 2014 (Global Findex). It is reported that the first license was awarded to Al-Kuraimi Microfinance Bank which is one of the micro finance institution that works with the Social Fund for Development. This is a significant advancement for the banking sector in Yemen which was made during the throes of this conflict.

20. The conflict and remaining regulatory weaknesses hinder the development of a mobile banking market.

Yemen has yet to reap the full benefits of mobile banking. There is a need to learn from the implementation of this new mobile money platform. Experience from other countries show adjustments are normally required for the platform to be scaled-up and to introduce or strengthen competition. For example, the Circular is not clear on the operational and revenue sharing arrangements between the banks and mobile operators. Clarity on this question could help further investment. Moreover, the offerings today are limited to the movement of money.

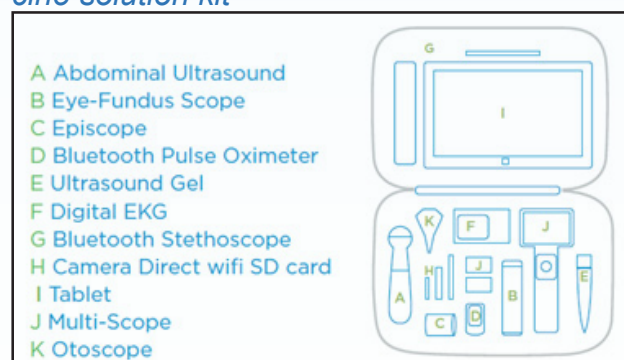
Value-added banking services such as access to credit and crop insurance for farmers are services taking meaningful traction in other countries, in particularly in East Africa. This platform could be further developed to be able to provide other forms of services that could be important inputs for reconstructing or improving livelihoods and impact positively eventual longer term development.

Health: telemedicine and crowd-sourcing data

21. Telemedicine could have significant impact on individual lives in Yemen for some time to come. The American Telemedicine Association, defines telemedicine as “the delivery of any healthcare service or transmission of wellness information using telecommunications technology.” Telemedicine services do not consist only of video interface between the doctor and nurse or patient. Mobile telemedicine solution kits include attachments to mobile devices for the healthcare worker to conduct first-line patient exams using for example a bluetooth-enabled stethoscope, eye fundus scope or ultrasound probe (Figure 6).

Telemedicine technology is fast-evolving⁶ providing completely new ways to deliver basic health services to people and communities who do not have access to a fully-equipped doctors or health clinics. Data gathered from the device attachments are then stored in a tablet or laptop computer and uploaded to a central digital repository when taken to an area where internet service is available. Back-end information technology (i.e. data bases, servers, cloud computing services) at the major hospitals and the Ministry of Public Health could allow for aggregation and analysis of the data and linkages to hospitals and university labs outside of Yemen when necessary. External or remote medical assistance is being brought directly to Aleppo in Syria through the use of Skype between hospitals in Aleppo and the UK⁷.

Figure 5. An example of a mobile telemedicine solution kit



Source: World Bank

22. The health crisis in Yemen being reported include large-scale child malnutrition rates and cholera outbreaks.

Although not born out of conflict but out of disaster, the six West African countries hit with the Ebola outbreak had some success in crowdsourcing data for its health surveillance programs. The Red Cross set-up a crowdsourcing platform that would be used by Doctors Without Borders, the World Health Organization and other humanitarian aid organizations to not only map out the locations of the Ebola outbreaks, but also clusters of households and nearby roads, including the condition of the

roads (Figure 5). This layering of crowdsourced data enabled the targeting and delivery of assistance and aid and in some instances led to the dispatch of health workers to prevent and limit the spread of Ebola in certain areas.

23. New technologies, including internet and mobile phone based tools (e.g. camera, video, sensors), were supplemented to the traditional approaches to infectious disease surveillance, public health data such as environmental, hospital, or census data. The new technologies were used to reduce some of the biases associated with traditional approaches to data collection, such as latency, high cost, contributor biases, and imprecise resolution. Crowdsourcing from mobile phones of individuals or use of tablets with pre-programmed survey software by health enumerators offer a real-time picture of disease by harnessing information as individuals are diagnosed or even before and could help better coordinate and target health awareness and service delivery programs.

Citizen feedback and participation mechanisms

24. While the truck with the goods may reach the target village, there is still a need to verify that the goods have reached the intended beneficiary individual or household. There is today substantial experience in the use of mobile phones for beneficiary verification for receipt of goods, services and cash transfers. Mobile phones and their applications can be used to verify receipt of water supply by the targeted beneficiary for example. The verification can then trigger timely payment to supplier's bank account. Furthermore, the same beneficiaries can be asked to complete surveys provided through the mobile phone at the time of verification. This provides a way to measure impact of the intervention and potentially gather other household level data. The use of tablets for conducting high-fre-

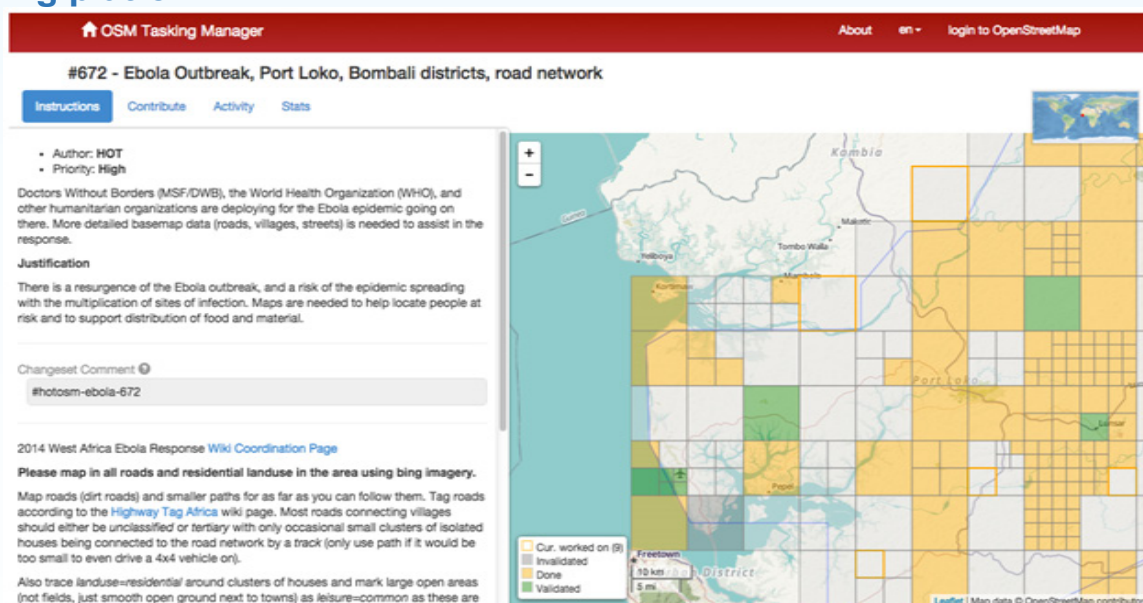
⁶ Countries such as the U.S. and Japan are investing
⁷ <http://www.bbc.com/news/world-middle-east-37349239>

quency household surveys of poverty assessment have been conducted in South Sudan, Somalia and elsewhere.

25. Many mobile handsets, including in Yemen are so-called basic or feature phones, based on the second-gen-

eration (2G) GSM (Global System for Mobile communications) standard, first introduced in 1991. GSM offers a number of different services embedded in the standard and therefore available on all GSM compatible devices, however basic. These include short message service (SMS) text messages of up to 160 characters, and instant messag-

Figure 6. Snapshot of website for Ebola multi-agency crowdsourcing platform



Source: Red Cross

Recommended Action #2

Action: Development of ICT and Telemedicine strategy and toolkit for health programs (for addressing malnutrition, maternal health, epidemic outbreaks and basic health services) to be applied in both Government and international agency programs

By whom: Ministry of Public Health and/or NGOs

Potential international support: Doctors Without Borders, Mercy Corps, WHO, Red Cross

Beneficiaries: Government, international agencies and NGOs with health programs

Impact: The Health ICT & Telemedicine Toolkit, which could be published online by the MoPH, could provide guidelines on (a) mobile data collection and storage in a central digital repository; (b) mapping and data analysis software; (c) transportation of medical goods (incl. clearances and documentation); and (d) provision of telemedicine services

Timeframe: Action could be immediate. Based on other country experiences, such a toolkit could be developed with involvement of ongoing government programs and international agencies/NGOs that are currently operating in Yemen

ing using the USSD (Unstructured Supplementary Service Data) protocol. Strictly speaking, however, these should be considered network services rather than applications (Table 1). Internet-enabled handsets, or feature phones, were introduced with the launching of data services over mobile networks in the early 2000s. These phones supported transmission of picture messages and the downloading of music and often included a built-in camera. Smartphones typically feature graphical interfaces and touchscreen capability, built-in Wi-Fi, and GPS (global positioning system) capability. Smartphones with memories and internet access are also able to download applications, or “apps,” pieces of software that sit on the phone’s memory and carry out specific functions.

26. The mobile survey tool would be designed based on the nature of the data being collected and type of device available.

If data is sought from individuals through their own phones, it may be assumed that the survey tool be designed with the instant messaging USSD service. Skip logic or conditional branching can be built into the design of the questionnaire in USSD and other more sophisticated formats. To reach the illiterate, integrated voice recording (IVR) services can be used. UNICEF has used USSD surveys not only to gather data but also to register pregnant women to their surveillance program in Uganda. USSD surveys are being used in African countries to take polls and for market research. For more involved surveys

Table 5. Mobile devices and their capabilities

Device	Capabilities	Device	Capabilities
Basic mobile phone	:Network services, including Voice telephony and voice mail (SMS (short message service) USSD (unstructured supplementary service data) SMS-based services, such as mobile money USSD services, such as instant messaging	Smartphone	:As Featurephone plus Video camera Web browser (GPS (global positioning system) 3G+ internet access Mobile operating “platform” (such as iOS, Android, Microsoft) Ability to download and manage applications VoIP (Voice over Internet Protocol) (Mobile TV (if available) Removing memory card
Featurephone	:As basic mobile phone plus Multimedia Messaging Service (MMS) Still picture camera MP3 music played 2.5G data access	Tablet	:As smartphone plus Front and rear-facing video cameras (for video calls) Larger screen and memory capability Faster processor, enabling video playback Touchscreen with virtual keyboard (USB (universal serial port
Note: The list of capabilities is not exhaustive, and not all devices have all features			

Source: Information and Communication for Development: Maximizing Mobile, World Bank. (2012)

Recommended Action #3

Action: ICT capacity building for the Central Statistical Office to obtain feedback from citizens (survey/polling capacity)

By whom: Central Statistical Office

Potential international support: UNICEF, World Bank

Beneficiaries: Government and international agencies, civil society organizations

Impact: ICT could aid in the collection, storage and analysis of data and statistics. Helping to transition to a digitized repository which is more accessible and accurate

Timeframe: Reconstruction phase

where enumerators would be available, surveys can be designed for tablet computers or smartphones. National statistical offices are starting to use tablet computers to administer census and household surveys.

Donor coordination

27. Donor coordination is often lacking in non-conflict contexts and yet both the challenges and need for coordination increases in conflict contexts.

Donors often pursue overlapping agendas based on priorities set in donor capitals rather than by beneficiary communities. And at a time when joined-up government is particularly valuable, it is often particularly absent. Computers and data communications, linking government departments, donors -- *but also directly the individuals of the government and donor agencies (in case there are no physical offices)* -- can do a good deal to improve this situation, if urgent coordinated action is taken to build data-sharing networks early in the reconstruction process, though this still needs to be accompanied by political will and administrative competence. An ICT platform could leverage the full range of devices as needed, from internet and mobile communications, SMS and digital applications and radio and television broadcasting, to more data intensive applications such as

citizen feedback dashboards, remote sensor data collection, software for data analytics, etc.

28. Efficiencies and accountability of aid could be promoted through digital platforms and to coordinate the disparate efforts of the government and international agencies providing relief aid and reconstruction support.

Such platforms⁸ could be designed around key short-term objectives for tackling immediate challenges such as malnutrition among children, shortage of medical supplies, access to credit by entrepreneurs and so on. Sharing, visualization or mapping of the disparate efforts could be a useful tool in answering some of the questions asked, in particular concerning support provided by international organizations, bilateral partners, and international non-governmental organization:

- *Are there duplicate efforts and wasted resources?*
- *Who is good at what?*
- *Are the right locations targeted?*
- *What was the impact of the intervention?*

⁸ An ICT platform could leverage the full range of devices as needed, from internet and mobile communications, SMS and digital applications and radio and television broadcasting, to more data intensive applications such as citizen feedback dashboards, remote sensor data collection, software for data analytics, among others.

ANNEX

Telecom service retail price analysis

The most comprehensive retail pricing benchmark for the MENA region is issued by the Telecom Regulatory Authority of the Kingdom of Bahrain (BTRA), which commissions and coordinates a yearly study on behalf of the Arab Regulators Network (AREGNET) based on the cost of purchasing “baskets” of telecommunications services (Purchasing Power Parity and VAT included). The latest study was published in December 2015 (BTRA-AREGNET, 2015), and benchmarked the retail prices as of June 2015. This study allows MENA countries to compare the price levels within and between countries.

For mobile services, Yemeni prices for voice calls and SMS services are in the average of the MENA region. A monthly basket of 40 calls per month and 60 SMS messages will cost an average of \$8.4/month, which is slightly lower than the average of \$11.4/month for

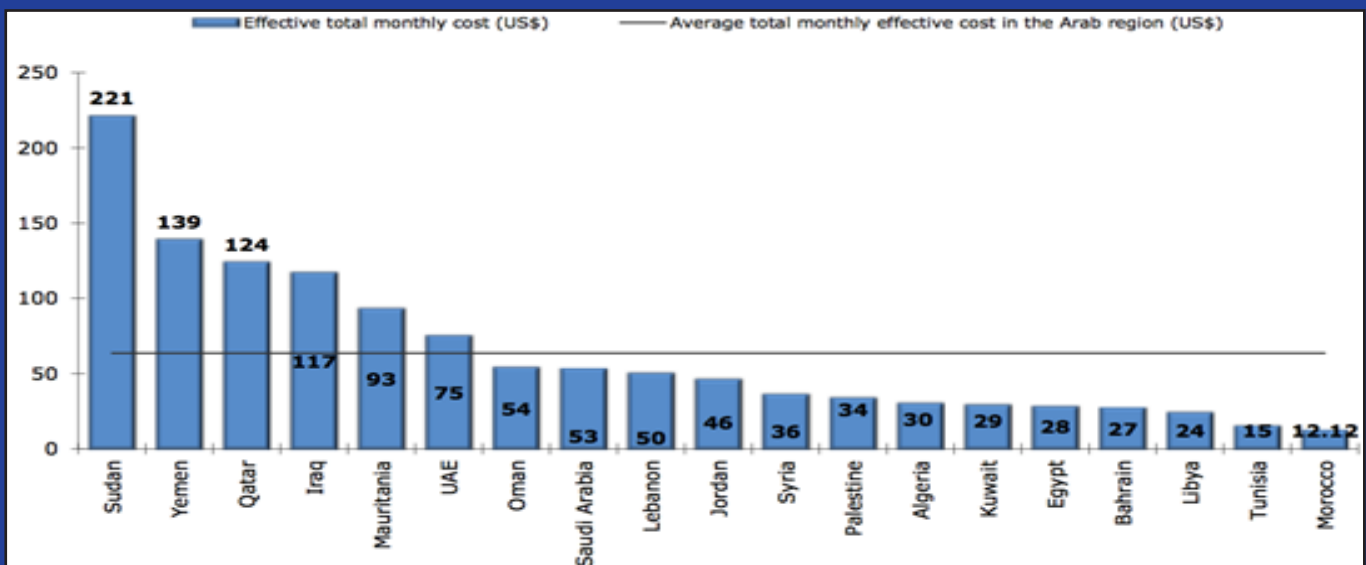
Table 2. Yemeni retail price ranking among 20 MENA markets and comparison with MENA average (June 2015, US\$/month PPP with VAT included, OECD methodology and baskets)

Service	Basket (monthly consumption)	2015 Yemeni ranking	2010-2015 Yemeni ranking evolution	Yemeni price	MENA price average	Yemeni price / MENA average
Mobile telephony	40 calls + 60 SMS	10		\$ 8.4	\$ 11.4	0.7
	30 calls + 100 SMS + 100Mb data	17		\$ 52.4	\$ 30.6	1.7
	100 calls + 140 SMS + 2Gb data	18		\$ 880.3	\$ 166.7	5.3
Fixed BB	2Mbps - 10Mbps connection	9		\$ 54.7	\$ 62.3	0.9
Leased lines	2Mbps circuit	13		\$ 3 228.0	\$ 2 699.0	1.2

Note: 20 markets are considered in the MENA region
Source: BTRA-AREGNET, 2015

the MENA region. However, when it comes to mobile broadband, the Yemeni market is by far the most expensive: (i) 30 calls per month and 100Mb of mobile data costs more than \$52.4/month, placing Yemen as the 17th most expensive place among the 20 MENA countries; (ii) 100 calls per month and 2Gb of mobile costs more than \$800/month, data which

Figure 1: Average price of a 4Mbps broadband connection (US\$, July 2015)



Source: Arab Advisors Group, 2015

is more than five times more than the MENA average and placing Yemen as the 18th most expensive place.

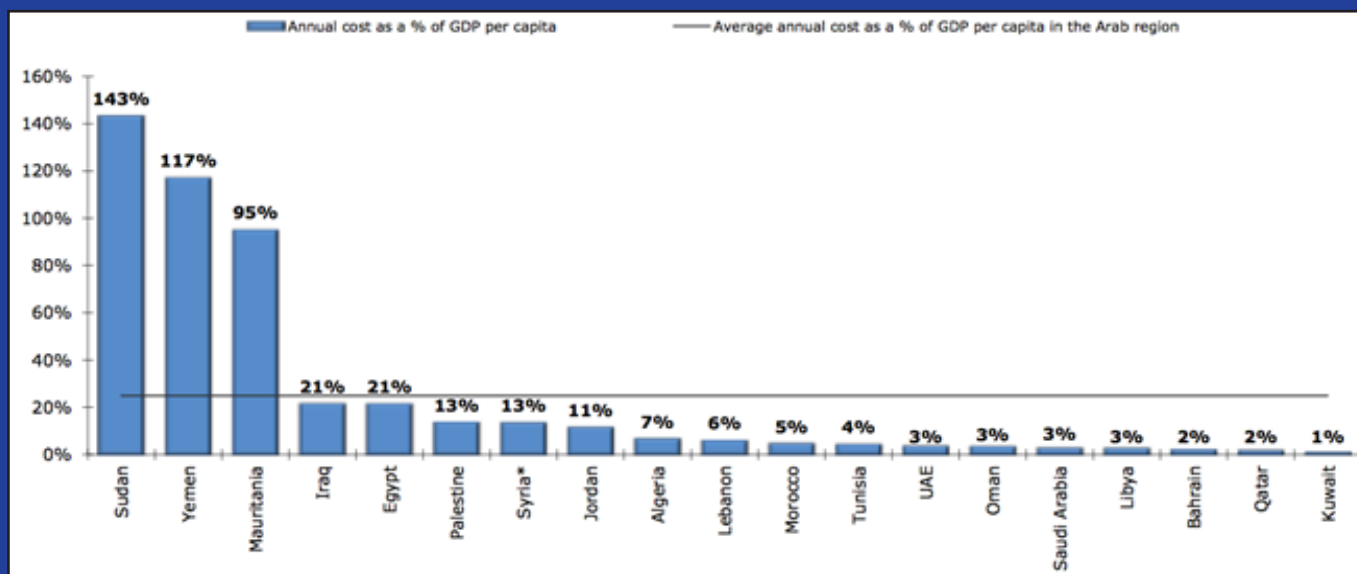
For fixed-broadband, a connection with a download speed of at least 2Mbps is similar to the MENA average. However, a connection speed of at least 4Mbps is much more expensive (see AAG benchmark below). Finally, the Yemeni price of a Leased Line (LL) is in the MENA average for a 2Mbps circuit.

Another retail benchmarking study is provided by the Arab Advisors Group (AAG, 2015). Based on the retail price of a 4Mbps connec-

tion in July 2015, the AAG study shows that the Yemeni broadband price is below the Arab region average (unlike the BTRA-AREGNET study, the AAG does not include the Purchasing Power Parities) and the Yemeni territories rank at the 18th place out of 19 countries.

The results are no different when the retail price of a broadband connection is compared to the GDP per capita; in that case, the annual fee for a broadband connection represents 117% of the annual Yemeni GDP per capita and Yemeni still ranks at the 18th place.

Figure 2: Average price of a 4Mbps broadband connection (% of GDP/cap., July 2015)



Source: Arab Advisors Group, 2015