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The use of Mobile Technology for Humanitarian Programming in Syria

Potential and Constraints

SIM
SYRIA
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Research & Management
مجموعة البحث والإدارة

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

TABLE OF FEATURE BOXES

Abbreviations

ADSL	Asymmetric digital subscriber line
CSO	Civil Society Organisation
DANIDA	Danish International Development Agency
DFID	Department for International Development
GBP	British Pound
GIS	Geographic Information System
GPRS	General Packet Radio Service
GPS	Global Positioning System
HR	Human Resources
ICU	Intensive Care Unit
IDP	Internally Displaced Person
IRC	International Rescue Committee
IRD	International Relief & Development
Kb/s	Kilobyte per second
KII	Key Informant Interview
LAC	Local Administrative Council
M&E	Monitoring and Evaluation
Mb/s	Megabyte per second
MoCT	Ministry of Communication and Technology
M-VAM	Mobile Vulnerability Analysis and Mapping
NGO	Non-Governmental Organisation
ODK	Open Data Kit
OS	Operating system
PR	Public relations
pw	per week
PYD	Democratic Union Party
RAIS	Refugee Assistance Information System
SAMS	Syrian American Medical Society
SIM	Syria Independent Monitoring project
STE	Syria Telecommunications Establishment
SYP	Syrian Pound
UN	United Nations
UNHCR	United National High Commission for Refugees
USD	United States Dollar
VfM	Value for Money
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network
WFP	United Nations World Food Programme

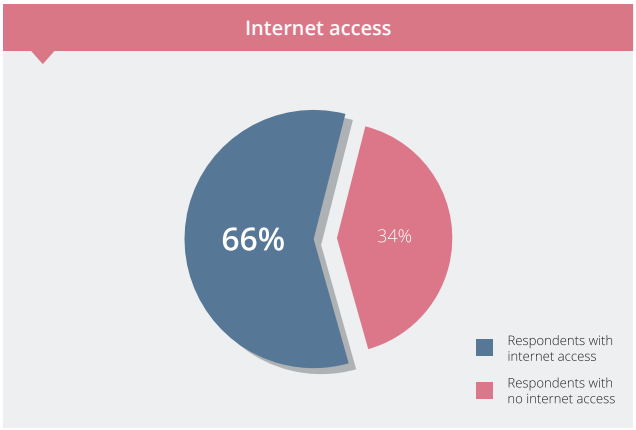
1 Executive Summary

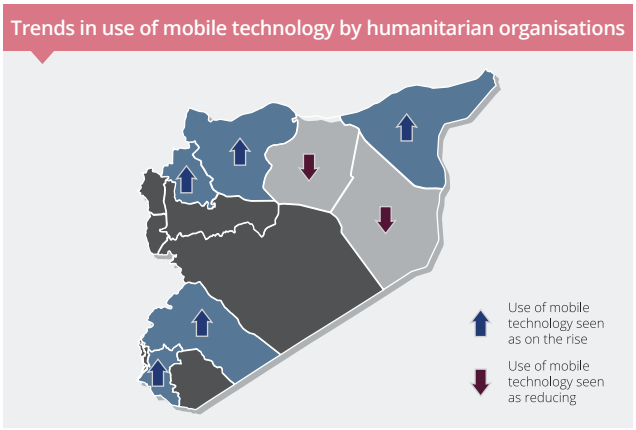
'WhatsApp is extensively used (in Syria) and is truly the humanitarian tool of the century'
(IRC interviewee)

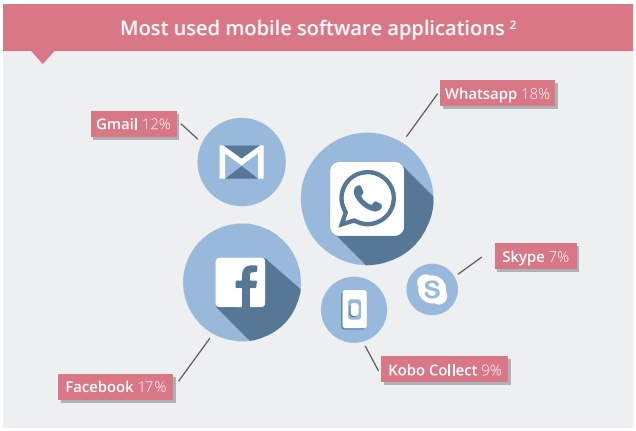
Policymakers, humanitarian professionals and scholars have increasingly acknowledged the 'game changing' potential of humanitarian technology.[1] In Syria, it is a clear feature of humanitarian service delivery. Smartphones, WhatsApp, Facebook and Gmail provide Syrians in country and Syrian refugees with a link to family, news of the conflict and humanitarian support. For humanitarians and their organisations, internet-capable mobile hardware and abundant applications provide critical communication, monitoring and data collection tools.

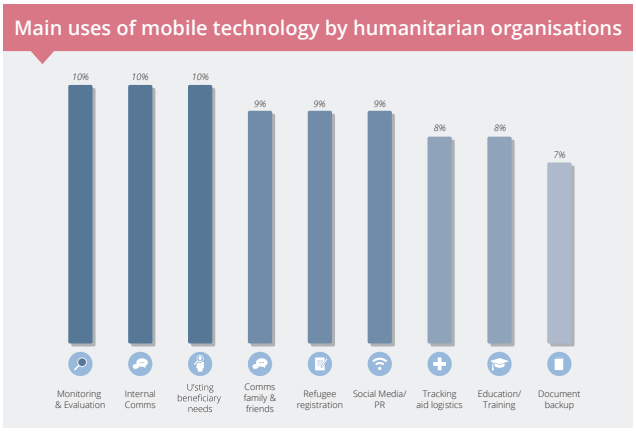
Mobile technology is likely to remain relevant irrespective of the evolution of the Syrian conflict. Research carried out for this report shows that smartphone ownership, internet access and mobile technology are widespread regardless of what armed group controls a particular area. Communities and business owners adapt and prioritise the rapid establishment of local internet connections, albeit often of poor quality. Internet access is offered for broader community use in most towns via Local Administrative Council (LAC) networks and internet café businesses. Syrians of all ages, outside of remote and rural areas, take advantage of internet access to talk with family and friends through WhatsApp and other communication applications ('apps'). They are also considerable patrons of social media, particularly Facebook.

Figure 1
Key facts and figures[1]









[1] Based on surveys with 48 respondents across Syria in November - December 2016.
[2] Percentage of respondents who quoted the application as one of the three they have used the most in the past 6 months.

'Everyone is reliant on mobile technology for communication … Even a grandmother in Syria might now be using applications such as WhatsApp … these tools have become central' (Field researcher interviewee)

Humanitarian organisations use mobile technology first and foremost as a communication tool. Organisations take advantage of the popular communication apps and have developed novel ways to optimise their field work and outreach to communities. For instance, WhatsApp communication networks allow humanitarian providers to rapidly notify registered beneficiaries of services and aid availability, and enable outreach to other potential beneficiary groups. It is clear that there are significant opportunities for mobile technology to continue to enhance humanitarian service delivery. The evidence review and interviews with technology developers have identified important lessons for adopters of mobile technology in Syria, drawn from successful case studies and project failures.

This report presents the findings from a qualitative research study commissioned by the United Kingdom's Department for International Development (DFID) about the current and potential use of mobile technology to improve the effectiveness and efficiency of humanitarian programming in Syria. The research involved two elements:

1. A desk-based review of existing evidence of mobile technology use; and
2. Findings from 58 interviews conducted in the fourth quarter of 2016, including with 48 Syria-based respondents and ten key informant interviewees outside Syria.

Interviewees in Syria included LAC representatives, non-governmental organisation (NGO) workers, technology providers and community respondents in Syrian Opposition, Kurdish, Government and Daesh-controlled areas. Syria-based respondents were asked about their personal use of mobile technology and how their community typically used it. Among them, respondents who worked for a humanitarian organisation were also asked about their organisation's experience with mobile technology. As such, the respondent sample was skewed towards mobile technology users so as to explore the scope for further employment of such technology in humanitarian programming. Therefore, statistical data presented in this report cannot be taken as representative of Syrians' overall mobile technology use.

Key findings - internet and phone connectivity *(for more detail see section 5)*

- Mobile device ownership is evenly spread across the country, with 81% of Syrians owning a cell phone and two-thirds or more having access to an internet-capable mobile device;[2]
- Smartphones, with an Apple iOS or Android operating system, are prevalent in all areas of Syria and are the devices most commonly used to connect to the internet;
- Respondents connected daily or weekly to the internet. These connections were made through local Wi-Fi or internet cafés and with cellular 2G/3G networks, the latter being a more costly secondary option. Satellite connections were purchased by Wi-Fi network operators and some humanitarian organisations;
- Internet speeds are sufficient in most places for voice communications, access to social media and news, text-based messaging and limited data transfers. The weakest internet is found in areas besieged by Government forces and Daesh-controlled areas. Nonetheless, access is often interrupted in all parts of the country;

- Government phone networks – namely MTN and SyriaTel – are widely available but are limited in Idleb, and especially in Daesh-controlled areas;
- Censoring and internet monitoring is common in Government-controlled areas, and Daesh often operates content control on internet café users. In other areas censoring or monitoring was not reported.

Key findings - mobile technology use *(for more detail see section 6)*

- In all areas except in Daesh-controlled locations, humanitarian organisations use mobile technology: in Amuda, Dar'a and Idleb, all of them do; in Azaz, Aleppo and Damascus, more than half of them are users. Media activists, journalists and field researchers are also significant users, including in Daesh-controlled areas;
- Individuals in all areas, including women, children and the elderly, use smartphones for communication, as internet-based calls are cheaper than using cellular networks. WhatsApp was the texting and voice call app of choice. The ranking of applications used is: (1) WhatsApp, (2) Facebook and Facebook Messenger, (3) Gmail, (4) Skype and (5) Kobo Collect. Use by organisations mirrored that of individual respondents but also reflected specific organisational priorities such as software for Telemedicine, monitoring and evaluation (M&E) and logistics tracking.

Key findings - challenges to the adoption of mobile technology *(for more detail see section 7)*

- Inconsistent internet availability and unreliable electricity supply are major challenges facing the further take-up of mobile technology by Syrians and humanitarian organisations;
- The fear of electronic surveillance and eavesdropping is a concern to humanitarian providers and technical professionals. However, it is less of a concern to ordinary users and local project staff inside Syria, who have a low awareness of information security risks;
- Areas remain where the internet is limited or non-existent. Over-reliance by humanitarian decision-makers on mobile technology information collection or service provision may lead to data blind spots, with the needs of vulnerable groups in such areas remaining under-serviced;
- As decisions are increasingly being informed by big data analytics, which correlates diverse and complex data sets in order to garner new insights, more attention needs to be paid to the validity of data collection methodologies and the veracity of input data.

Value for money of mobile technology *(for more detail see section 8)*

- Thorough needs assessment and field testing of the potential need for and use of a mobile technology product – with proposed users and beneficiaries – is essential to reduce the risk that the product will be under-used;
- Mobile technology products can be piloted to reduce costs, until a business case for usability is clearly established. At that point project investment can be scaled-up with less risk;
- There has a been proliferation of similar mobile technology products, in particular for M&E. Duplication can be avoided and overall investment costs reduced through smart procurement encouraging the use of open-source, off-the-shelf products, and product sharing by humanitarian organisations;

- The costs of mobile technology development and deployment can be offset through the establishment of more effective partnerships between donors, humanitarian agencies and the private sector, taking advantage of the shared interests of the different groups of stakeholders to promote its diffusion.

Key conclusions and recommendations *(for more detail see sections 9 and 10)*

1. **Continue to invest in mobile technology.** Smartphone and internet use is widespread in most areas of Syria. In non-Government-controlled areas, local internet providers are adept at establishing connections quickly irrespective of which armed group is in control of an area. Mobile technology is a critical tool for communication for all Syrians and for the effective work of humanitarian organisations. Outside of Daesh-controlled areas, organisations have been able to use mobile technology in their work. ***In light of its advantages, investments in mobile technology should be continued irrespective of the evolution of the conflict.***
2. **Adapt applications to meet the needs on the ground.** Google Android and Apple iOS smartphone operating systems are common in Syria. Internet access is generally intermittent due to power or internet outages. Most internet users prefer local Wi-Fi networks over Government services. ***Mobile technology applications used by humanitarian organisations should be designed for use with both Google Android and Apple iOS smartphones. Applications should allow offline use, with automated data transmission when an internet connection is available.***
3. **Ensure testing and provide incentives to share information.** Two challenges for effective technology development were identified: 1) insufficient testing of technology in field environments and 2) inefficient duplication of technology tools. ***Budgets for mobile technology development should be sufficient to include adequate testing. Products should not be funded without a needs assessment and robust testing. Technology duplication should be avoided by providing organisations with an incentive to share technology and by mandating them to use off-the-shelf or open-source[3] products.***
4. **Provide training on information security.** Few Syrians, including humanitarian field workers, properly appreciate the risks posed by information insecurity. **Additional training and information is recommended for LAC representatives and other civilians working with sensitive data. Only mobile technology with a robust level of information security should be used.**
5. **Pilot and adapt existing applications to the Syria context.** A range of humanitarian mobile technology tools and software applications are available. ***Donors should engage with humanitarian stakeholders to prepare a shortlist of mobile technology applications, with estimated pilot development costs that would benefit populations affected by the Syrian conflict.***
6. **Reduce costs through equipment and subsidies.** Challenges to the adoption of mobile technology include internet service interruption due to a lack of spare parts and network technicians. The high cost of internet access is also an issue. ***Subsidised or free internet equipment, electricity equipment and spare parts should be supported. Skills training for internet network technicians should be expanded to cover a wide geography.***

7. **Encourage regulatory bodies.** Stakeholders have taken an interest in how civilians access the internet. ***LACs and administrative bodies should be encouraged to establish a regulatory capability to maintain effective local internet service provision in Kurdish and Opposition-controlled areas.***
8. **Develop coverage map.** There is no authoritative source of information about internet coverage or phone networks. ***A comprehensive internet and telephony communication coverage map in Syria should be commissioned and updated.***
9. **Conduct further analysis.** Evaluation case studies about humanitarian technology use would help to inform future business cases and mobile technology investments. ***Impact evaluations of projects and initiatives funded for humanitarian programming should be undertaken.***

2 Introduction

DFID requested the Syria Independent Monitoring (SIM) team[4] to investigate the current and potential use of mobile technology for humanitarian programming in Syria and to contribute to wider discussion on the topic. Patrick Vinck's definition of humanitarian technology was adopted for the purpose of the research: ***'the use of technology to improve the quality of prevention, mitigation, preparedness, response, recovery and rebuilding efforts'.***[5] Relevant mobile hardware includes hand-held cell phones – in particular smartphones and tablets – that can connect wirelessly to the internet and can easily be carried and used in a variety of locations. Mobile software includes all applications for internet-capable hand-held devices. This definition excludes voice-only telephony technology, drone-based technology and wearables, which are all acknowledged as offering mobile options for enhanced humanitarian action.[6]

3 How to use this report

The report informs DFID decision-makers and humanitarian actors more generally about:

- The **situation in late December 2016,** with regard to phone and internet availability in Syria, essential for mobile technology to be effective (see section 5);
- Mobile technology **usage trends** by communities, and by humanitarian organisations working in Syria or with refugees in neighbouring countries (see section 6);
- The **value for money** of mobile technology investments, assessed through reference to DFID's 3E approach (economy, efficiency, effectiveness) (see section 7);
- **Conclusions** about the prevalence and future viability of mobile technology for humanitarian use given the evolution of the Syrian conflict (see section 8); and
- **Recommendations** for donors, technology developers and humanitarian stakeholders about the potential for mobile technology to improve the effectiveness and efficiency of humanitarian programming in the future (see section 9).

4 Methodology

4.1 Sources

The findings and conclusions presented in this report are based on two pieces of research:

1. A desk-based review of existing evidence and literature, and gaps in the evidence about the use of mobile technology by humanitarian stakeholders; and
2. Findings from qualitative field research conducted in the fourth quarter of 2016 with: (i) 48 Syria-based LAC representatives, NGO workers, technology providers and community respondents, either in, or with particular knowledge about mobile technology in Kurdish-controlled, Opposition-controlled, Government-controlled and Daesh-controlled areas;[7] (ii) ten key informants – technology providers or technology leads within humanitarian organisations – via phone, Skype or face-to-face, from Beirut, Lebanon.

4.2 Limitations

Research conducted for this study was limited in scope and in terms of sampling size. Quantitative research was not feasible due to budgetary constraints and the challenge of accessing respondents in besieged, Government-controlled and Daesh-controlled areas. Data presented is not statistically representative, but rather indicative of broad trends.

The sample interviewed was intentionally weighted towards technology-savvy respondents who were in a position to comment meaningfully about mobile technology use inside Syria. NGO and civil society organisation (CSO) workers, internet and phone network providers, technicians and media activists, were heavily represented in the sample. Findings should therefore not be interpreted as representing 'average' Syrian behaviour. Only four women were interviewed inside Syria and women's usage of and access to mobile technology was mostly reported by men.

Given the rapidly changing state of the conflict in Syria and in particular, the encroachment by Government forces into previously Opposition-controlled areas, the currency of information will quickly be out of date. Trends that will continue to be relevant are highlighted.

4.3 Building on the evidence review with field research

The purpose of the evidence review was to identify what information was available and where gaps in knowledge required answers that would shape the focus of the field research.[8] Key findings concluded that:

Field research showed that Syrians have more access to the internet than the evidence review suggested.

- Mobile device ownership is evenly spread across the country, with 81% of Syrians owning a cell phone and two-thirds or more having access to an internet-capable mobile device such as a smartphone;
- Smartphones are available and affordable in most parts of Syria, and knowledge about mobile technology software and applications is high;
- Internet access is slow and often interrupted across different parts of the country;

Figure 2
Locations of interviewees

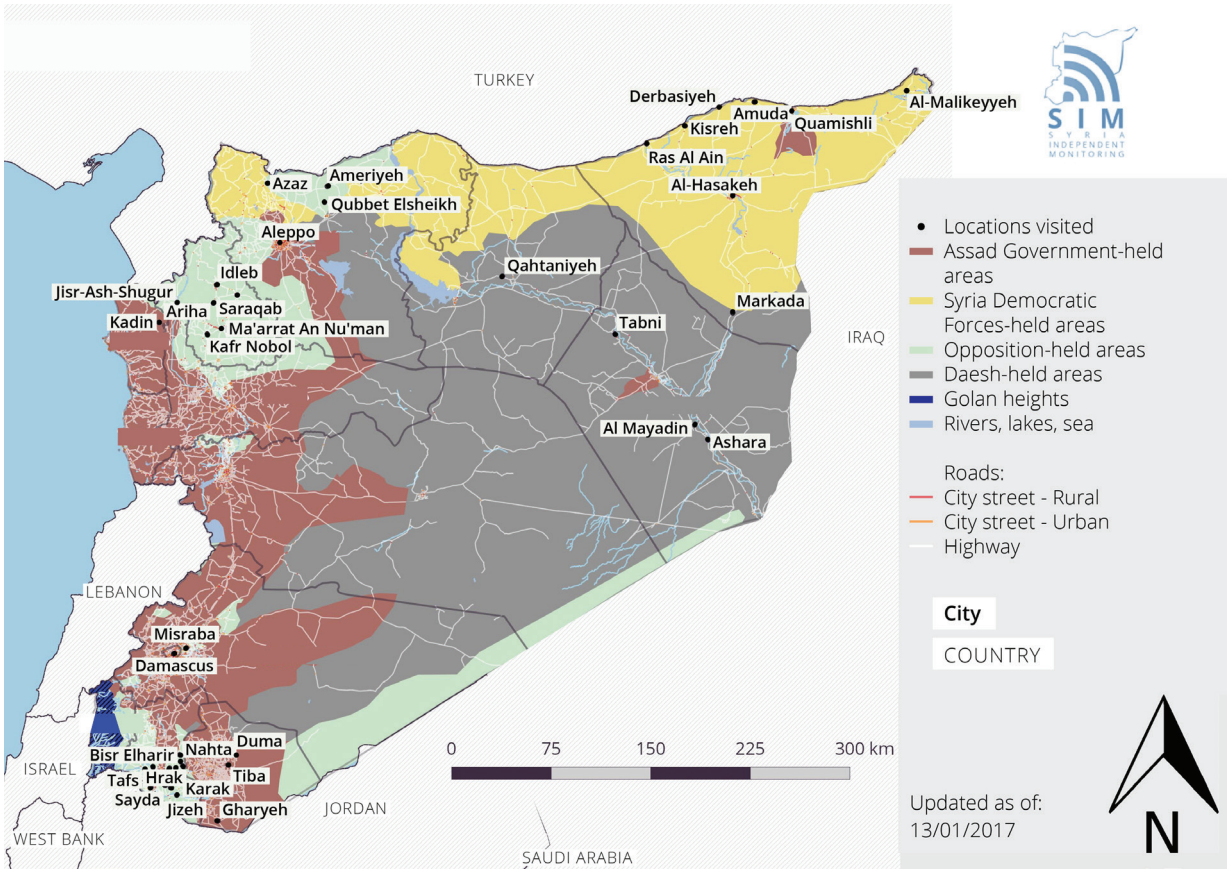


Table 1
Distribution of key informant interviews

Field research was conducted with 58 interviewees – including 48 Syria-based respondents

		Outside Syria	Kurdish-controlled areas	Opposition-controlled areas			Beseiged areas		Gov't controlled areas	Daesh-controlled areas		
			Amuda	Idleb	Azaz	Dar'a	Duma	Aleppo	Damascus	Deir Ez Zor	Ar Raqqa (Hatla)	**Total**
Survey 1	Opposition / Kurdish cont'd		2	2	2	2						**8**
Survey 2	Gov't cont'd							2	1			**3**
Survey 3	Daesh-cont'd						2			2		**4**
Survey 4	LCC / Gov't reps		1	2	1	1	1			1		**7**
Survey 5	Network operators		2	2	2	2	1		1	2		**12**
Survey 6	Tech users / providers		2	2	2	2	2	2		1	1	**14**
KIIs outside of Syria		10										**10**
		10	**7**	**8**	**7**	**7**	**6**	**4**	**2**	**6**	**1**	**58**

- 30% of Syrians have personal access to the internet;
- Government phone networks, MTN and SyriaTel, offer 2G/3G phone internet connections in their coverage areas, but internet provision is widely censored and monitored;
- In Daesh-controlled areas, internet connection is only available via satellite internet links shared with the community through Daesh-licensed internet cafés. Government phone networks are not available;
- Mobile technology use by humanitarian organisations is increasing, particularly for M&E, community needs analysis, crisis tracking, logistics, remote education/learning and remote programme management;
- Project failure rates in technology are high due to insufficient time to absorb new technology and insufficient testing;
- Weak up-take of some technology products is caused by concerns about information security and eavesdropping; and
- A risk is the possibility of bias in humanitarian action towards groups and areas where data is available. Data 'blind spots' risk being overlooked or inadequately serviced.

Field research conducted after the evidence review aimed to confirm, deny or nuance the findings of the review, and to capture any significant geographic or community variations in internet coverage and mobile technology usage trends.

For the most-part, the findings of the evidence review were supported by the field research. Two noteworthy exceptions included that internet access is available to more Syrians than expected (see section 5); and that distrust in mobile technology due to fear of eavesdropping or electronic surveillance is more of a concern for humanitarian organisations than for field teams in Syria and the general population (see section 7.1).

5 Key findings – Internet and phone availability in Syria

This section sets out the key findings from the qualitative field research about the current situation in Syria with regard to phone and internet availability. Findings are presented in relation to: 1) Syrians' access to mobile technology; 2) the availability and quality of internet connections; and 3) the availability of the cellular phone network.

5.1 Access to mobile technology in Syria

'Typically a Syrian family would have two or three smartphones - mostly Samsung. They are more available and cheaper.'
(Field researcher interviewee)

Almost six years of conflict have witnessed significant damage to power, telephone and internet infrastructure in large parts of the country. Nonetheless, field research findings indicate that Syrians in all urban settings, apart from Daesh-controlled and besieged areas, have access to *'much higher internet connectivity than before [the war]'*.[9] In addition, internet network quality is reportedly adequate to meet the needs of most Syrians. Nevertheless, as mentioned in the evidence review, electricity problems have been confirmed by the field research as a major reason why Syrians are unable to connect to the internet.

A consistent finding from the field research, was that access to the internet was important for Syrians. Individual Syrians and their families often have higher priorities than internet access, but after basic survival requirements, internet is a critical demand. LACs, CSOs and private businesses operating outside of Government-controlled areas have been quick to adapt to the conflict and to secure satellite or microwave internet links that are shared through local Wi-Fi networks or in internet cafés. The pervasiveness of internet providers demonstrates a clear community demand.

5.1.1 Mobile hardware devices and operating systems

Table 2
Mobile technology statistics (2015)[1]

2015 statistics	
Whole of Syria data / estimates	
Mobile phone ownership	81%
Internet-capable device ownership	60 - 70%*
Percentage of total internet users	30%*
Government-controlled areas	
Mobile phone subscribers	61.5%
Fixed-line telephony subscribers	18%
Fixed-broadband subscribers	3%
Mobile broadband subscribers	10%
International internet bandwidth (Mb/s)	21%

Field research inside Syria confirms the findings of the evidence review: internet-capable mobile devices are ubiquitous across Syria – including in Daesh-controlled areas. The ownership rate of internet-capable devices is only 10-20% lower than overall mobile phone ownership rates (Table 2). This indicates that the majority of mobile phones are smartphones, consistent with the finding that the first choice of mobile technology for average Syrian consumers is a smartphone, as opposed to more costly laptops or tablets. The reliance on smartphones by Syrians fleeing the conflict has also been widely reported.[10]

Reflecting international smartphone market statistics,[11] Google Android is the most commonly reported operating system on phones, followed by Apple iOS.[12]

Field research demonstrated that a variety of handset types are available. Samsung handsets, costing less than GBP 50 were noted

[1] *BuddeComm, 'Syria – Telecoms, Mobile and Broadband – Statistics and Analyses', Executive Summary, 16 October 2016.*

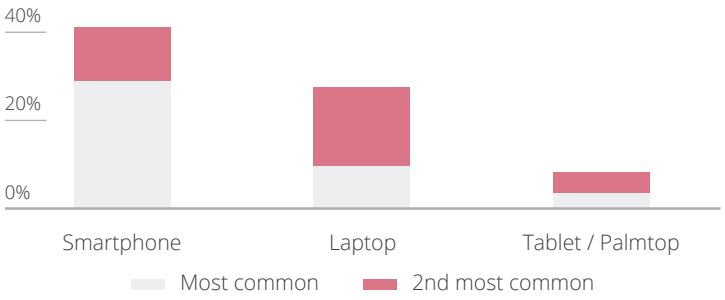
Field research found that two-thirds of respondents had accessed the internet through their personal phone in the last six months.

by a number of interviewees to be common. *'Smartphones made in China similar to iPhones',* were also reported as widely available and to cost less than GBP 25.[13]

Figure 3 shows the reported prevalence of the type of device respondents use to connect to the internet: 67% noted that smartphones were the preferred device used for internet connection, while 23% preferred to use laptops.[14] After smartphones and laptops, the third-choice of device was a tablet/palmtop.[15]

Research organisations involved in M&E and data collection inside Syria, or with refugee communities outside Syria, reported a much higher use of tablets.[16] Field research also confirmed that smartphones were commonly issued by humanitarian organisations to communicate with their field teams working in Syria.

Figure 3
Devices used to access the internet
Respondent responses to which type of device they most-commonly used, and second most-commonly used to connect to the internet over the past six months (n = 77 total responses to two questions about first and second preference)



5.1.2 Connecting to the internet

The specialist technology research firm BuddeComm estimates that 30% of Syrians had access to the internet in 2015 (see Table 2). This is an estimate extrapolated from pre-2012 internet use trends. Across all areas in Syria this study found that around two-thirds of respondents regularly accessed the internet through their personal phone.[17]

As Table 3 indicates, of the interviewees who reported having accessed the internet in the last six months, the primary reported means of connecting was via satellite internet (mentioned in 26% of responses).[18] This was particularly the case for Daesh-controlled areas where it was reported to be the only option. As reported by interviewees:

'The internet coffee [shop] owners buy satellite packages from Turkey and sold them in retail to local residents.' (Network operator, Deir Ez Zor)

'I am not sure to what extent the Daesh network can be considered a proper network - most of it is satellite internet. At some points in Daesh-held areas there was internet in the streets. This has changed since the coalition has led airstrikes.' (Field Researcher interviewee)

Table 3
Internet connection methods
Overall, the most-often reported internet connection method was satellite connection, followed by local Wi-Fi services and 2G/3G cellular phone network data connections (n = 88 connection methods)

	Kurdish-cont'd areas	Opposition-controlled areas			Beseiged areas		Gov't-cont'd areas	Daesh-cont'd areas	
	Amuda	Idleb	Azaz	Dar'a	Duma	Aleppo	Damascus	Deir Ez Zor	**Total**
Satellite	24%	20%	9%	19%	38%	25%	17%	100%	**26%**
Wi-Fi service	12%	33%	36%	24%	38%		17%		**23%**
2G / 3G network	29%	20%	9%	24%		50%	33%		**20%**
Mobile broadband	18%	13%		19%			33%		**13%**
Microwave links	18%		27%	10%	13%				**10%**
Fixed ADSL / net		13%	18%	5%	13%	25%			**8%**

Along with satellite connections, Wi-Fi networks in local areas were reported to be a preferred connection option (mentioned in 23% of responses).[19] Local Wi-Fi networks are often linked to satellite connections, or to microwave links. Cellular phone network 2G/3G data connections are used in all parts of Syria apart from Duma and Daesh-controlled areas, but are not preferred. In all areas where cellular data services were available, they were regarded as more costly than local Wi-Fi networks or other internet connection options.

'These [Wi-Fi] networks are considered as a major alternative to the online services provided by Syria Tel and MTN companies. They are considered financially less costly to consumers with wider coverage and longer [availability] times as [they are] not controlled by the military nor security situations.' (Network technician, Dar'a)

ADSL and fixed-line internet connections are available in Government-controlled areas, including Aleppo and Damascus (although ADSL was not reported in Damascus through our field research), and in areas bordering Turkey. In Azaz, a network technician from Hawa Net reported that an ADSL service had very recently been connected 'through a phone cable connected to houses' (last quarter of 2016).

Feature box 1: Do women really have the same access to the internet as men in Syria?

In Government-controlled areas, field research interviewees reported that men and women had equal access.[20] This finding was consistent with that of the evidence review. In other areas in Syria, no major challenges were indicated about women's access to the internet.

'Gender to a certain extent can play a role. If anyone in the family is able to afford a phone it would be the male but the phone would be for the family.'
(Female field researcher interviewee)

Typical answers to this question by male respondents included that *'anyone can access the internet, whether it is a woman or a child'*,[21] or that *'women use the internet [and] have a presence in the coffee net [shops]'*[22] and that *'the Wi-Fi service is available everywhere so women can easily access the internet'*.[23] Male interviewees in Duma and Deir Ez Zor noted that there were *'special lounges for women'*[24] or separate women's sections of internet coffee shops.[25] From these responses, even in Daesh-controlled areas, women appear equally able to access the internet. However, with only four women interviewed inside Syria, further research on this point, from women themselves, would be beneficial.

It is pertinent that two of the female interviewees, both in Aleppo, noted that women may not have as unfettered access to the internet as men had claimed – possibly this was due to restrictions on the movement of women in areas of Eastern Aleppo that, at the time of research, were under the control of conservative Islamic opposition forces.

Eight-year-old Bana al Abed gained international recognition by tweeting the deterioration of living conditions in besieged Eastern Aleppo. (Source: Thaer Mohammed/AFP/Getty Images)

Youth and the elderly are also reportedly active users of internet devices and applications. A number of interviewees, across all areas of Syria, noted that age was no barrier to the desire to communicate with family members and friends – a principal use of smartphone applications such as WhatsApp:

'Everyone is reliant on mobile technology for communication… Even a grandmother in Syria might now be using applications such as WhatsApp' (Field researcher interviewee).

'All ages and both sexes, especially women [use internet calls] to check on their parents outside of ISIS-controlled areas' (Former LAC representative, Deir Ez Zor).

Two research respondents in Kurdish and Opposition-controlled areas noted that some internet coffee shops discouraged or restricted children from using the internet – for example in Idleb, 'some factions don't allow us to sell [internet] to anyone under 18' (Network technician, Idleb). In most areas, however, Wi-Fi access was

only noted to be restricted by children's supervisors. As for the rest of Syria, it was also noted that the 'elderly may have challenges to use them [smartphones and applications] because the technology is new to them'.[26]

5.1.3 Cost of the internet

'The (internet) costs a lot compared to the monthly income of most families' (Community member, Azaz)

A majority of field research respondents indicated that cost was sometimes responsible for preventing access to the internet.[27] Across all areas, the relatively high cost of the internet compared to available income limited the resources Syrians could dedicate to the internet. Hence, the internet is used mainly for urgent family communication:

'The internet costs a lot under the circumstances in Syria, so most people [only] use it to communicate urgent issues with their friends and families' (Local NGO worker, Ma'arat An Nu'man).

Interviewees noted the cost of equipment, such as routers, prevented some Syrians from connecting to the internet: *'It is not the internet cost, but the internet equipment. A nano station router costs USD 90'.*[28] In Idleb, some villages such as Jabal Alzawie have reportedly installed routers so that residents can more easily access the internet at lower cost.[29] In Kafr Nobol a similar project was described; however, a resident not living sufficiently near one of the Council-installed routers would need to *'buy his own repeater for USD 30-80'.*[30]

Table 4
Cost of internet data in Syria[31]

Cost of internet data in Syria		Wi-Fi / coffee lounge data	SyriaTel / MTN data
Kurdish-cont'd areas	Amuda	100MB / monthly = 250-300 SYP (approx. GBP 1-1.15)	100MB = 400 SYP (approx. GBP 1.50) + monthly fee 1,200 SYP (approx. GBP 7.5)
Opposition -controlled areas	Idleb	100MB / monthly = 100-200 SYP (approx. GBP 0.4-0.75)	n/a - not widely available
	Azaz	100MB / monthly = 250-300 SYP (approx. GBP 1-1.15)	100MB = 150-190 SYP (approx. GBP 0.60-0.76) + monthly fee 4,000 SYP (approx. GBP 60)
	Dar'a	100MB / monthly = 250-400 SYP (approx. GBP 1.15-1.50)	n/a - not widely available
Beseiged areas	Duma	100MB / monthly = 150 SYP (approx. GBP 0.55)	100MB = 150-190 SYP (approx. GBP 0.60-0.76) + monthly fee 4,000 SYP (approx. GBP 60)
	Aleppo	No information	100MB = 150-190 SYP (approx. GBP 0.60-0.76) + monthly fee 4,000 SYP (approx. GBP 60)
Gov't-cont'd areas	Damascus	(See note 1)*	100MB = 150-190 SYP (approx. GBP 0.60-0.76) + monthly fee 4,000 SYP (approx. GBP 60)
Daesh-cont'd areas	Deir Ez Zor	100MB / monthly = 400 SYP (approx. GBP 1.50)	n/a - not widely available

***Note 1:** The Ministry of Communication and Technology (MoCT) states on its website that a 1Mb/s internet connection is SYP 1,400 per month. No field research was collected to support or refute this. Social media sources question the MoCT's published connection speeds and costs.

In Daesh-controlled areas, both the high cost of internet compared to incomes, and the cost and difficulty of travel to towns where internet coffee lounges are present limit internet access.[32] Internet lounges in Daesh-controlled areas charge relatively consistent fees for internet access, specified by the Daesh communications department: USD 2 per week (GBP 1.60) for 10 hours.[33] The evidence review identified that Wi-Fi controlled by Daesh cost SYP 5,000 (approximately GBP 19) for a 64Kbps connection with data charged at SYP 400 (GBP 1.50) per 100 MB (see Table 4 above).

In Kurdish and Opposition areas, internet access costs were reported to vary depending on user preferences for cost, speed and download consumption.

Standard internet connection costs were also reported for Duma (SYP 1,500 [GBP 5.70] for a 1 GB monthly package).[34] In Kurdish and Opposition-controlled areas that were not besieged (i.e. Amuda, Azaz, Idleb and Dar'a) no standard costs were reported for local Wi-Fi internet connections.[35] Most respondents advised that different packages were available depending on user preferences for cost, consumption and network connection speed:

'There are packages with fast connections but they are too expensive, therefore people [generally] use the cheaper packages (i.e. 256-512 Kb)' (Network technician, Amuda).

In Dar'a, one interviewee stated that the cost of an internet connection differed between villages: *'The prices are different from village to village. For example, in one village people pay for 1 GB, SYP 1,000 and in other one people pay SYP 2,500'* (Network technician, Dar'a).

Table 5
Internet package renewal rate
n=16 respondents

How often interviewees in Syria reported renewing their phone internet packages	
More than once per week	0%
Once per week	6%
A few times a month	13%
Once per month	56%
Less often than once a month	6%
According to use	19%

Cellular phone network data packages with the Government networks MTN and SyriaTel, or in Azaz (bordering Turkey) with the Turkcell and Avea networks, were reported to be pre-paid with recharge codes obtained from street sellers and local shops.[36] Phone data costs were variable, with packages ranging from SYP 1,200 (GBP 4.55) monthly, plus SYP 400 (GBP 1.50) per 100 MB of data to SYP 8,000 SYP (GBP 30.30) for a 6 GB monthly package.

Some interviewees stated that they asked friends, presumably living in Turkey, to obtain recharge vouchers on Turkish networks on their behalf.[37] No difficulties in accessing MTN or SyriaTel recharge opportunities were reported in areas outside of the Government's control. A key informant from the office of the United Nations High Commissioner for Refugees (UNHCR) reported that most of the available phone network companies offered promotions for new sim card purchases and therefore *'people would rather buy a new sim card than renew their subscription.'* As Table 5 shows, the majority of in-Syria community interviewees using phone internet packages renewed their phone data approximately once per month (56%).

5.1.4 Organisations connecting to the internet

The main differences in accessing the internet highlighted by field research respondents, between individuals and humanitarian organisations, was that organisations would typically have access to a satellite connection either as a backup or as their primary internet link, whereas individuals did not:[38]

'Most organisations install satellite internet equipment... so they always have internet in their offices. The donors [and organisations] activate the packages for the employees inside Syria free of charge' (Local NGO worker, Ma'arat An Nu'man).

'Organisations have the ability to get satellite internet... which guarantees easy internet access.' (Community member, Dar'a)

'Organisations get satellite internet, in case the Turkish internet is disconnected' (Community member, Azaz).

In Azaz and Duma, network technicians reported that some humanitarian organisations, LAC service providers, clinics and health providers, were able to obtain lower-cost or free internet access.[39] In Amuda and Idleb, all field research interviewees agreed that humanitarian organisations generally were expected to pay more than individual subscribers, and/or to pay in USD for their internet connections.[40]

5.1.5 Rules and regulations concerning internet use

The Government phone and internet networks are regulated by the Ministry of Communication and Technology (MoCT) and the Syria Telecommunications Establishment (STE). They have licensed SyriaTel (majority state-owned) and MTN (privately-contracted operator) to provide internet and phone services across the country. The Government controls internet use and content is censored and monitored.[41] In June 2016, the MoCT announced that smartphone handsets not 'authorised' or 'provided' through Government channels would be deemed illegal and would be disconnected from Government-operated networks.[42] In Damascus, one respondent indicated that *'encrypting services, IP masks and VPN services [were] blocked'*.[43] WhatsApp is also occasionally blocked for short periods. In January 2017, the Government signed a deal with the Islamic Republic of Iran, to establish a new mobile phone network inside Syria.[44]

Table 6
Internet blocks/censorship
The most extensive regulation, filtering and censorship of internet use/ content is reportedly in Government-controlled areas

		Internet blocks / censorship
Kurdish -controlled areas	Amuda	Turkish internet content filters and occasional WhatsApp blocks (on SyriaTel, MTN and Turkish phone internet networks)
Opposition -controlled areas	Idleb	No blocks or filtering reported
	Azaz	Turkish internet content filters
	Dar'a	Jordanian internet content filters and WhatsApp video calls not supported by the network
Beseiged areas	Duma	No blocks or filtering reported
	Aleppo	No blocks or filtering reported
Government -controlled areas	Damascus	Extensive monitoring and censorship of internet and blocks of encryption and VPN services as well as WhatsApp periodically
Daesh -controlled areas	Deir Ez Zor	No blocks or filtering reported – but users must declare their use and who they are communicating with to Daesh agents

Where internet access is obtained from Turkey (such as in Kurdish-controlled border areas or in Azaz), the relevant Turkish network operator and government departments are responsible for network regulation and website blocks and usage controls.[45] Field research respondents in Amuda stated that the Turkish Government also occasionally blocked the use of WhatsApp.

In other parts of Syria, regulations concerning the use of the internet are reportedly limited. As one key informant stated, *'Whoever controls the area, controls the regulations, security of communication and the overall feasibility of mobile technology use'.*[46] Interviewees in Daesh-controlled areas noted that 'all clients should be registered [to use the internet]'[47] and that information was collected on whom internet café users communicated with.[48] When rules or requirements for internet use are stipulated, such as in Idleb, they are shared with internet users via the network providers' social media platforms. In Azaz, network providers use start up internet login screens to provide public information. In Damascus, SMS and email communication are used; in other areas, posters and verbal instructions from internet café owners are the main way to notify clients of changes in rules and regulations.

5.1.6 Internet network availability and disruptions

Field research found that internet connections were available to nearly all interviewees in all areas apart from Duma (which is besieged), most days of the week, for most hours of the day (see figure 4).

Recently established internet coverage in Quamishli and Ras al Ain was noted as having improved internet access for communities in Al Hasakeh (see Feature Box 2 below). A number of towns in Daesh-controlled areas were reportedly without local internet access.[49] The maps in Figure 5 illustrate where internet dead spots might be located in Syria, based on the limited field research undertaken for this study.

Figure 4
Internet availability in locations across Syria
In all areas of Syria, apart from Duma (which is besieged), interviewees indicated that their internet connections were available most days, for most hours each day. There were no reports of significantly curtailed internet access (n=22)

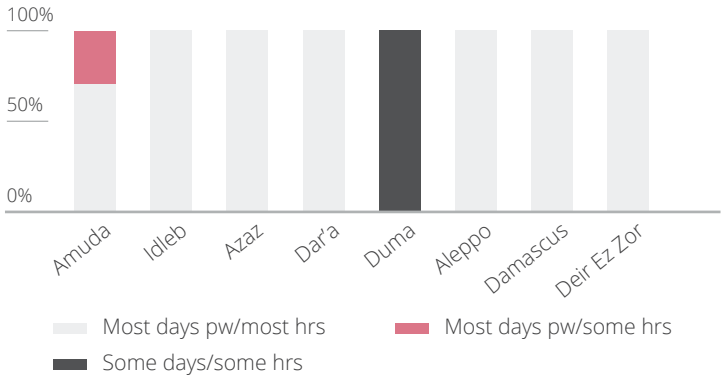
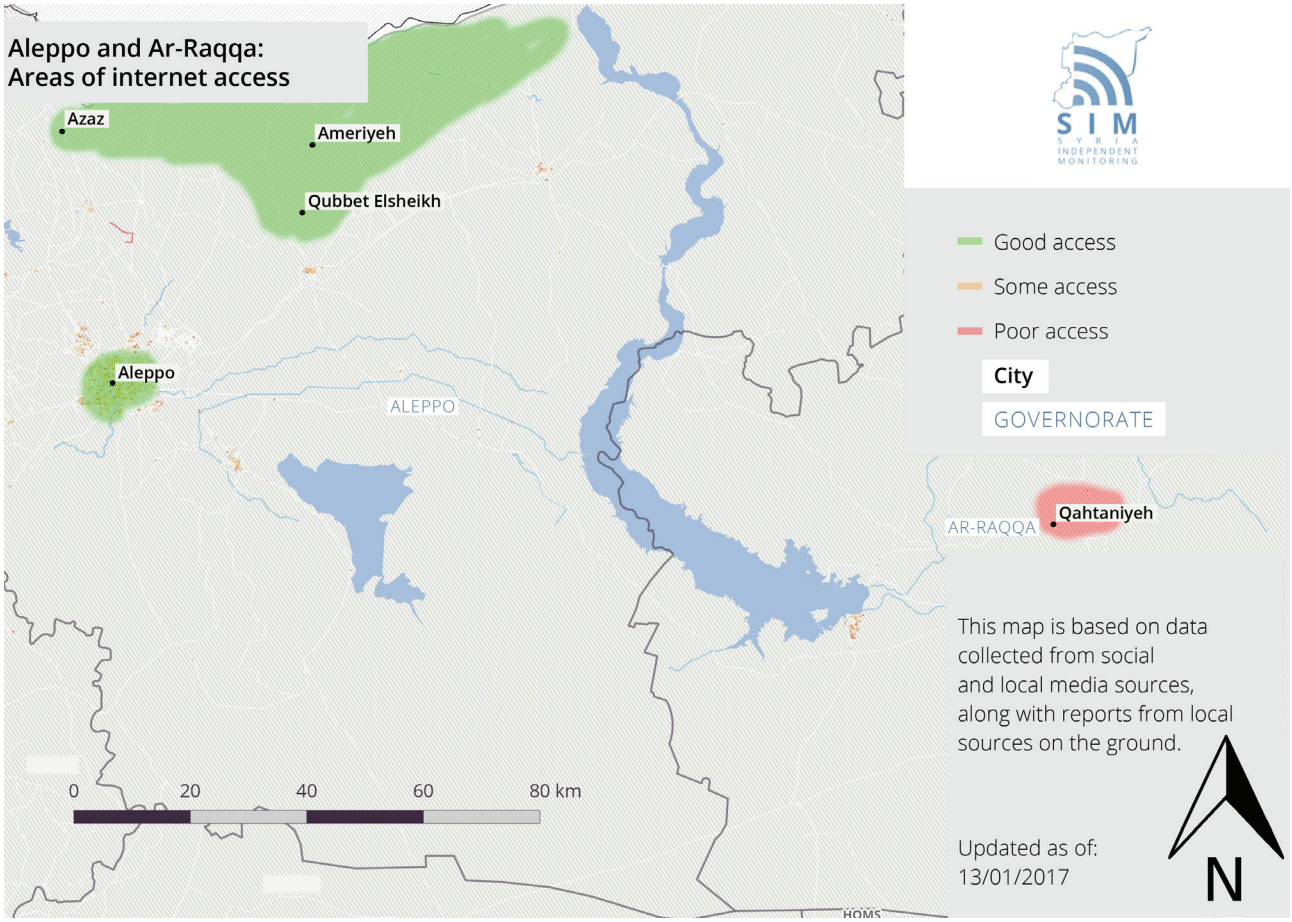
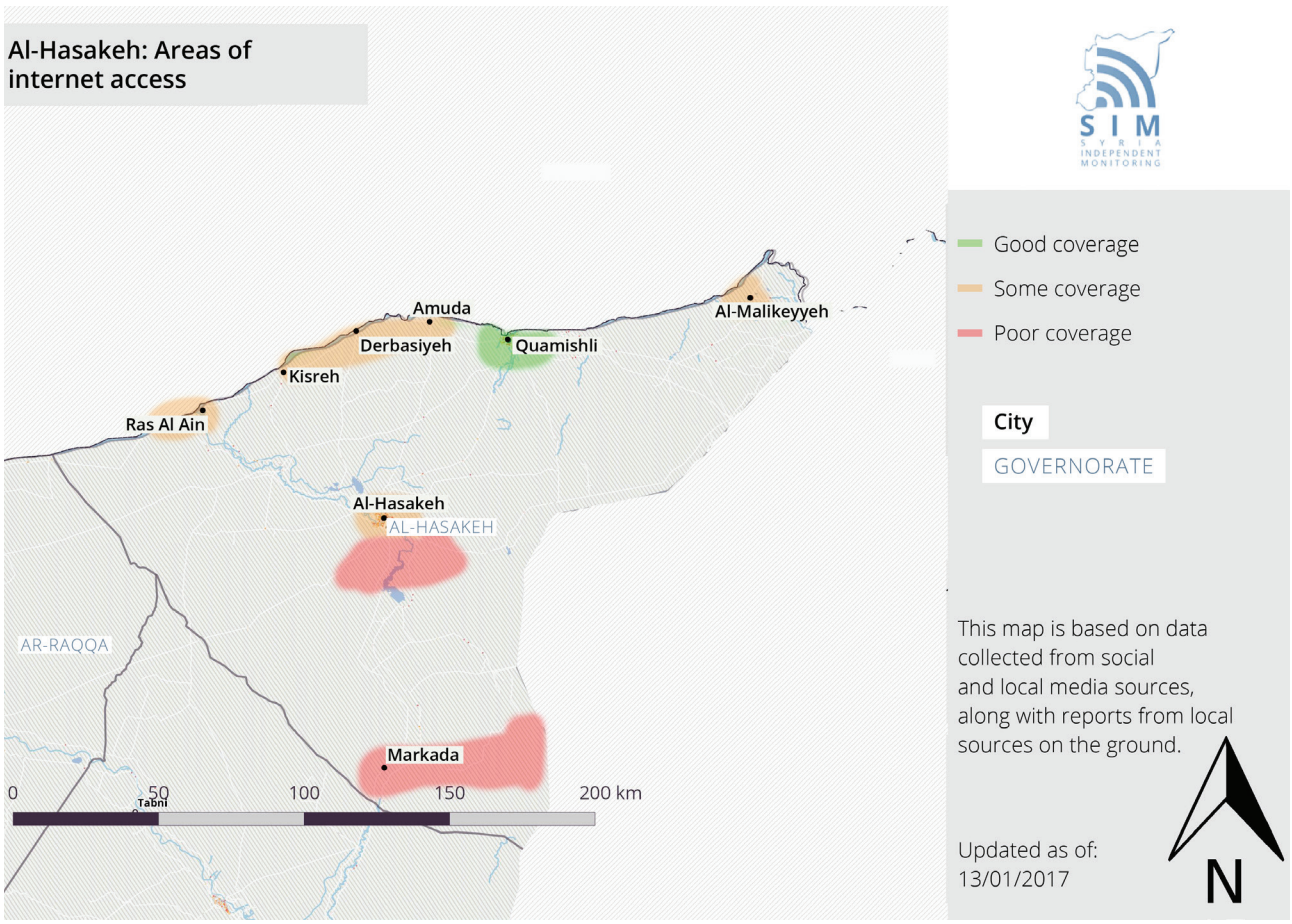
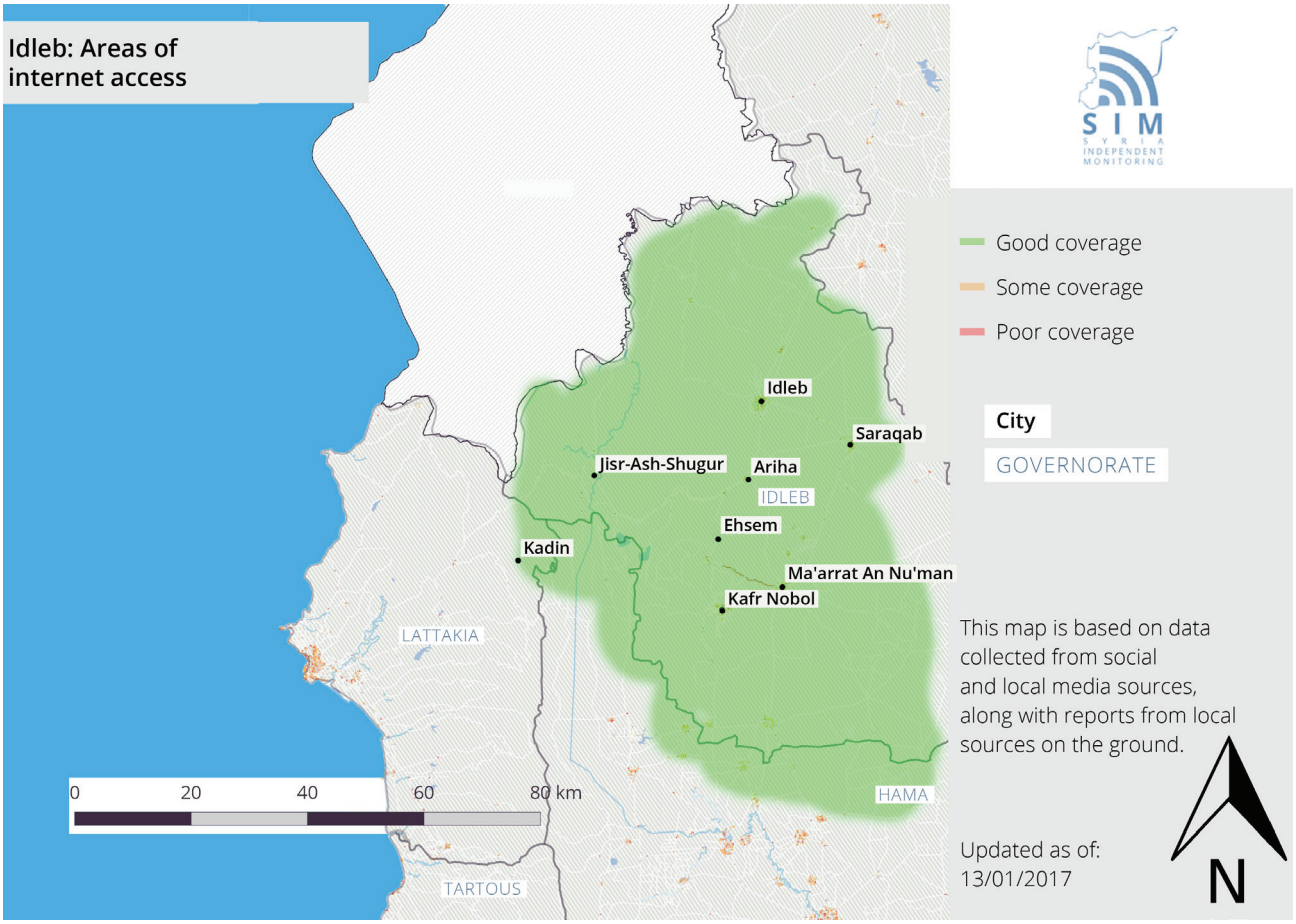
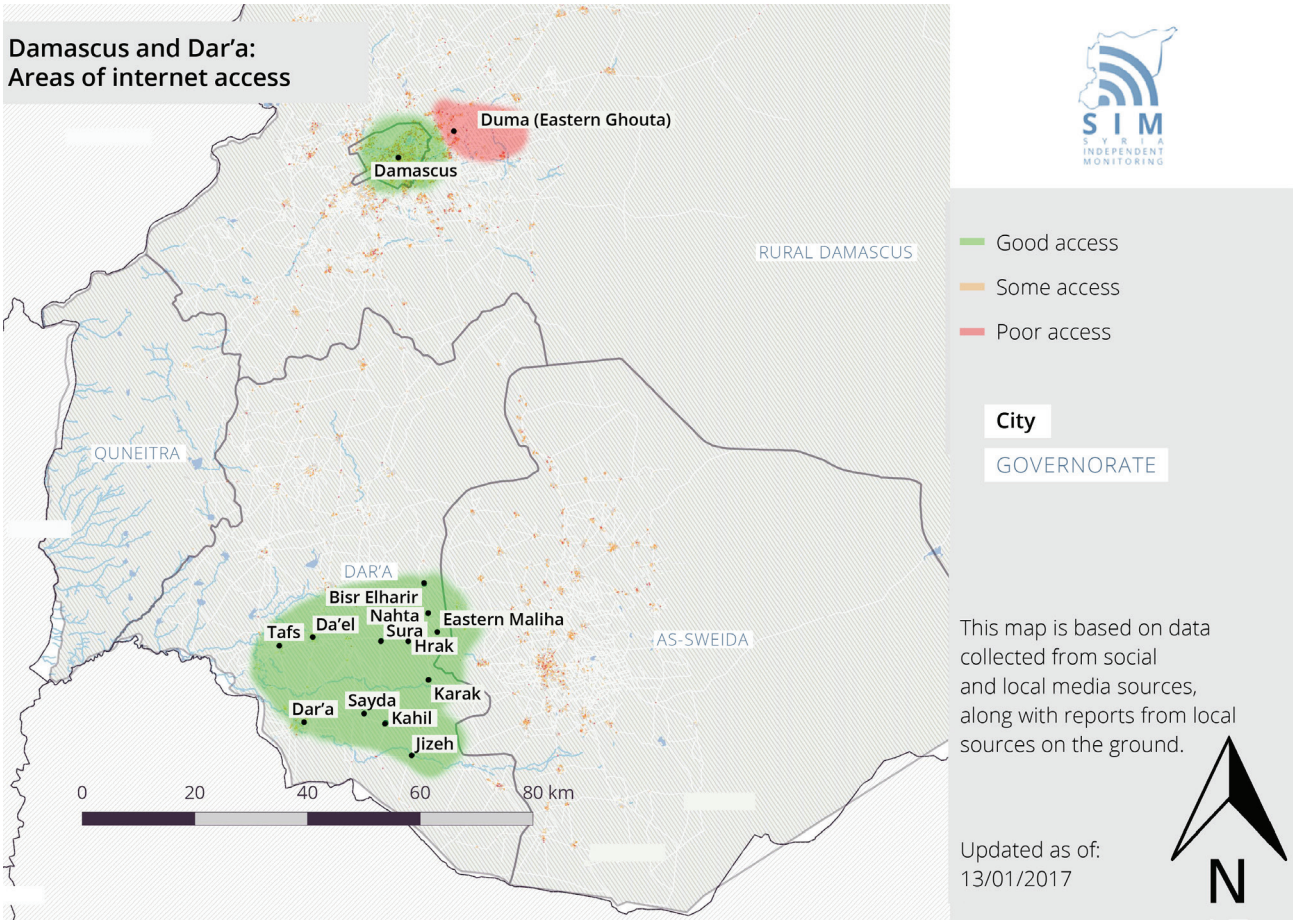


Figure 5
Internet coverage by area






Idleb: Areas of internet access
Good coverage
Some coverage
Poor coverage
City
GOVERNORATE
Idleb
Saraqab
Jisr-Ash-Shugur
Ariha
IDLEB
Ehsem
Kadin
Ma'arrat An Nu'man
Kafr Nobol
LATTAKIA
HAMA
TARTOUS
0
20
40
60
80 km
This map is based on data collected from social and local media sources, along with reports from local sources on the ground.
Updated as of: 13/01/2017
N


Damascus and Dar'a: Areas of internet access
Good access
Some access
Poor access
City
GOVERNORATE
Duma (Eastern Ghouta)
Damascus
RURAL DAMASCUS
QUNEITRA
DAR'A
Bisr Elharir
Nahta
Eastern Maliha
Tafs
Da'el
Sura
Hrak
AS-SWEIDA
Karak
Dar'a
Sayda
Kahil
Jizeh
0
20
40
60
80 km
This map is based on data collected from social and local media sources, along with reports from local sources on the ground.
Updated as of: 13/01/2017
N

Feature box 2: Establishing internet for Quamishli, Al Qusoor and Ras El Ein

'Starting nearly six months ago, [we] established a network to broadcast internet through Wi-Fi access points in Quamishli and Ras El Ein because there [was] no internet available there' (Network administrator, Amuda)

MaxNET is an internet provider working in the Al Hasakeh governorate (Kurdish-controlled area) to provide internet in areas recovered from Daesh and that did not have internet access due to the conflict.

'We started first covering the North area of Bank Audi neighbourhood in Quamishli, then we expanded our cover to Al Qusoor and Hanza. Finally, we covered parts of Ras al Ain' (Al Kanes, Al Souq, and Alook)' (Network technician, Al-Hasakeh)

Daesh flag flies above a telecommunication tower in Jarablus. Internet and phone infrastructure is often targeted by airstrikes and destroyed, making it a priority during reconstruction. (Source: Joshua Landis blog)

MaxNET established an unwired area coverage service for mobile clients, with electricity provided by generators and fixed-line power cables where available. Batteries were installed as a backup system. The internet service established is described as suitable for web-browsing, VoIP, email and basic data sharing. Download/ upload speeds of 12Mb/s have been achieved and they offer customers a variety of connection packages: 256 Kb/s, 512 Kb/s, 1 Mb/s & 2 Mb/s.

Local customers pay for the upkeep and maintenance of the service, which is ultimately routed into Syria from a Turkish internet provider.

'The [internet] service is not available all the time, due to the electricity shortages – it is expensive too' (CSO worker, Al-Hasakeh)

As presented in Table 7, the most-often mentioned cause of internet disruption, apart from in Amuda, Azaz and Damascus, was aerial bombardment and the effects of the conflict. Other significant reasons included a lack of spare parts (including batteries) and electricity supply problems. In Daesh-controlled areas, the problem of Daesh authorities shutting-down internet lounges for not following regulations was also a major cause of internet disruption (31% of mentioned reasons).

Having reliable access to electricity is essential for mobile technology. In Kurdish and Opposition-controlled areas, electricity is provided via subscriptions to commercial generators. As Figure 6 shows, electricity in all areas of Syria was available most days per week for a few hours per day in late 2016.

Table 7
Causes of internet disruption

As reported by respondents (n=133 total mentions of causes of internet disruption by 48 interviewees).

	Kurdish cont'd areas	Opposition-controlled areas			Beseiged areas		Gov't-cont'd areas	Daesh-cont'd-areas	
	Amuda	Idleb	Azaz	Dar'a	Duma	Aleppo	Damascus	Deir Ez Zor	**Total**
Bombardment / conflict		16%		29%	29%	100%		31%	**17%**
Lack of parts	33%	10%	25%	24%					**17%**
Electricity problems	30%	3%	19%	19%	7%			6%	**14%**
Vandalism / stealing	7%	10%	6%	10%				19%	**8%**
High cost for users	3%	13%		10%	14%			6%	**8%**
Weather (snow, fog)		19%	6%		7%				**6%**
Disconnection by provider	10%	3%	13%		7%		100%		**8%**
Turkish Gov't disconnection	7%	3%	25%						**5%**
Lack of qualified workers	3%	10%	6%	5%					**5%**
Gov't forces disconn-ects / prevents access		3%		5%	21%			6%	**5%**
Other reasons	7%	10%			14%			31%	**9%**

Figure 6
Availability of electricity (December 2016)

Electricity in most areas in Syria was reported to be available most days of the week, for some hours per day. No information was available for Aleppo (n= 20)

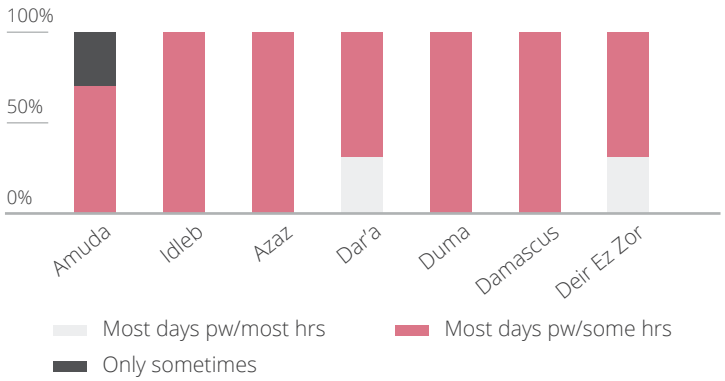


Table 8
Power supply in locations across Syria (December 2016)
Electricity for internet networks is provided in a variety of ways to minimise disruptions n=16 respondents

	How electricity is provided to internet networks in Syria			
	Fixed-line	Generator	Solar	Batteries
Amuda	√	√	√	√
Idleb		√	√	√
Azaz	√	√	√	
Dar'a		√	√	
Duma			√	√
Damascus	√		√	
Deir Ez Zor		√		

Power was provided to networks in a variety of ways. Where fixed-line power was available (i.e. in Damascus, Amuda and Azaz), it was backed-up by alternative equipment, including generators and solar panels. In areas without fixed-line power supply, generators and solar panels were used. Batteries were widely used in conjunction with solar panels, to enable power at night.

In Dar'a and Duma, daily interruptions to the internet were reported by interviewees. In Dar'a however it was also noted that MTN towers had been recently *'rehabilitated and provided with generators and solar panels to work for a longer period [each day]'*.[50] In Damascus the service was interrupted for a few hours every week. In Daesh-controlled areas internet was generally unavailable for a few days each month, depending on bombardment and power supply availability. In Amuda, Idleb and Azaz the situation was reportedly better, with more consistent internet service: interruptions only occurred for a few hours each month.[51] According to a network technician from Amuda:

'...in each village there is more than one party responsible for [the] internet and this is [one of the] main challenges to establishing, maintaining, managing or providing [the] network' (Network technician, Kafrnobl)

'The [internet] service used to interrupt for different periods – hours or full days – because of the network provider [in Turkey]. Since the internet service started to be broadcast through access points, it was interrupted only twice for technical and security reasons'.

Network technicians working to deliver internet service in Idleb and Azaz expressed concern about the lack of coordination between providers and local authorities responsible to manage or maintain the internet network, resulting in price inconsistency and risks of disruption in internet services.

5.2 Internet connection quality: internet speed and download limits

Cellular phone data networks are reportedly better-quality in high areas, near the Turkish and Jordanian borders (when using data networks from those countries) and near Government-controlled areas, where cellular phone network towers are more likely to be operational.[52] In general however, many interviewees suggested that *'society depends on the Wi-Fi internet connection because it is cheaper and faster than the internet provided by SyriaTel and MTN'*[53] and *'[SyriaTel/MTN] internet is only used for WhatsApp and Viber written messages. The Wi-Fi is faster and better and used to send emails and to watch videos'*.[54] In Kurdish and Opposition-controlled areas, a number of respondents indicated that speeds fluctuated depending on time of day and how many users were utilising the local network:

'The quality fluctuates and is not consistent. It depends a lot on traffic. Sometimes people prefer to speak at night because traffic will be better. It sounds better and can connect faster. When a lot of people start using the network at night then people will switch to speak in the morning' (Field researcher key informant).

'The quality fluctuates and is not consistent. It depends a lot on the traffic.'
(Field Researcher interviewee)

In Daesh-controlled areas, all respondents complained that the speed of the internet was insufficient for most internet uses due to limits on licenses to open internet cafés and authorisations to install routers or internet connection equipment.[55] As a community member in Deir Ez Zor testified:

'The [number of] internet networks is too little compared to the residents in each village. Daesh only gives one license to open an internet lounge in each major village. [This means] the internet connection is too slow because it depends on the number of the users in the internet café. The owner reduces the speed to [spread] the connection and to make the best out of the customers' money'.

Table 9 below provides an approximate indication of internet connection speeds and quality in the different research areas, generated from responses from interviewees about how easily they have been able to carry out a variety of different uses of the internet over the last six months.

Table 9
Internet connection speed and quality across Syria
Based on field interviewee responses about how easy or difficult it has been for them over the past six months to undertake different types of tasks using the internet connection in their area (n=48)

	Kurdish-cont'd areas	Opposition-controlled areas			Beseiged areas		Gov't-cont'd areas	Daesh-cont'd areas
	Amuda	Idleb	Azaz	Dar'a	Duma	Aleppo	Damascus	Deir Ez Zor
Send / receive email	Good	Good	Good	Good	Weak	Weak	Good	Weak
Send / receive photos / images	Good	Good	Good	Good	Good	Weak	Good	Weak
Send / receive videos	Good	Good	Good	Weak	Poor	Weak	Good	Poor
Send / receive text-based messages	Good	Good	Good	Good	Good	Good	Good	Good
VoIP calls	Good	Good	Good	Good	Weak	Weak	Good	Poor
News websites	Good	Good	Good	Good	Good	Good	Good	Good
Facebook	Good	Good	Good	Good	Good	Good	Good	Good
YouTube, etc	Good	Good	Good	Poor	Poor	Poor	Good	Poor
Watch TV / films	Poor	Good	Good	Poor	Poor	Poor	Weak	Poor
(Number of responses)	**(45)**	**(60)**	**(50)**	**(41)**	**(28)**	**(24)**	**(26)**	**(20)**

5.3 Cellular phone network availability

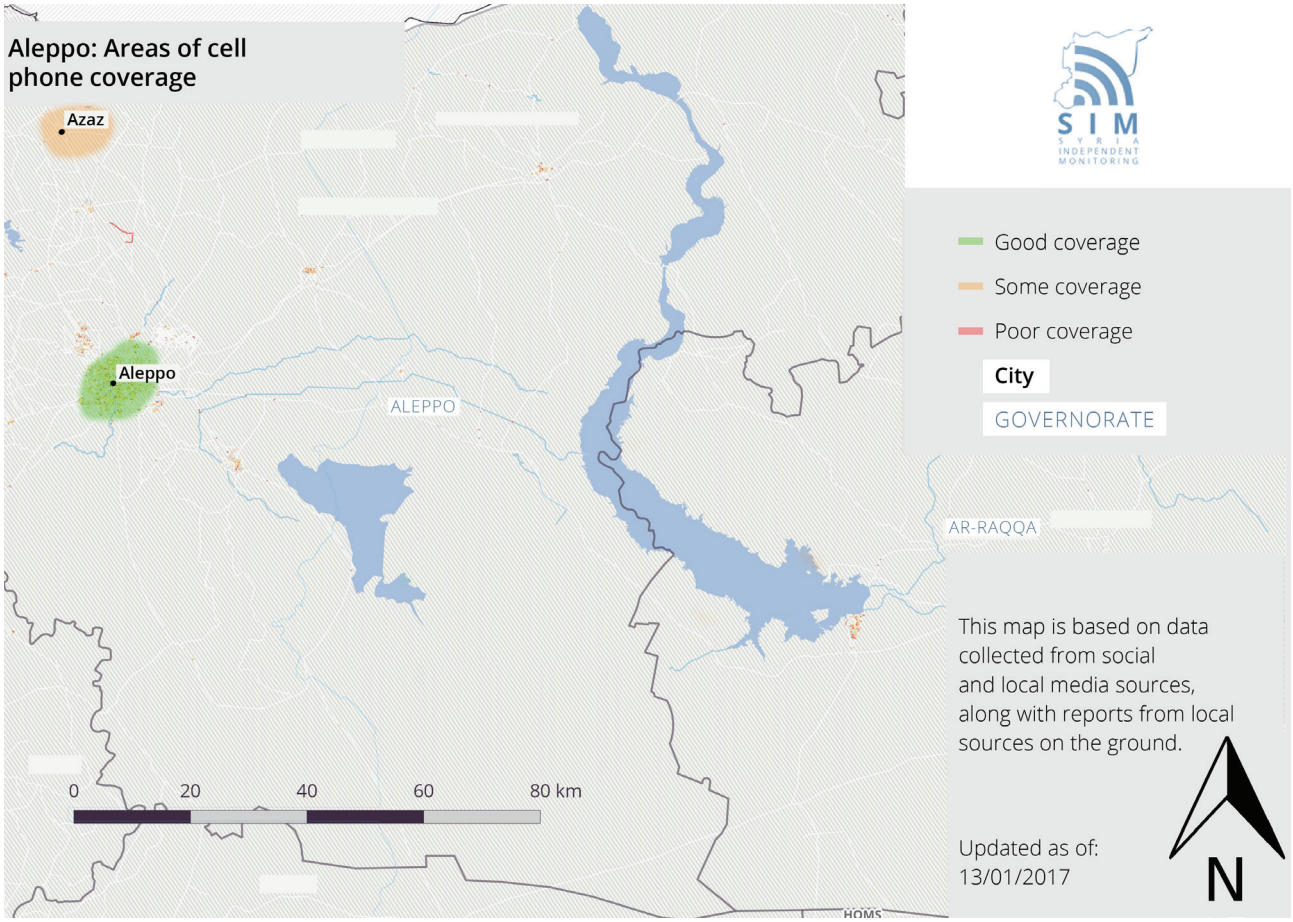
Government telephone networks for voice telephony and internet data are available through SyriaTel and MTN in all areas of Syria where research was conducted, but were absent or only available in very limited parts of Daesh-controlled Deir Ez Zor and Ar Raqqa. They remain the only Syria-based networks.[56] Other networks are provided by neighbouring countries in border areas – in particular Turkcell, Avea and Vodaphone (provided from Turkey), and Zain (Zain is a regional network that enters Syria from Jordan as well as Iraq).[57] No interviewees indicated that it was feasible to connect to Lebanese or Iraqi mobile networks. One UNHCR informant mentioned that refugees in Lebanon's Bekaa Valley, close to the Syrian border, retained and used their Syrian SIM cards due to the lower prices.

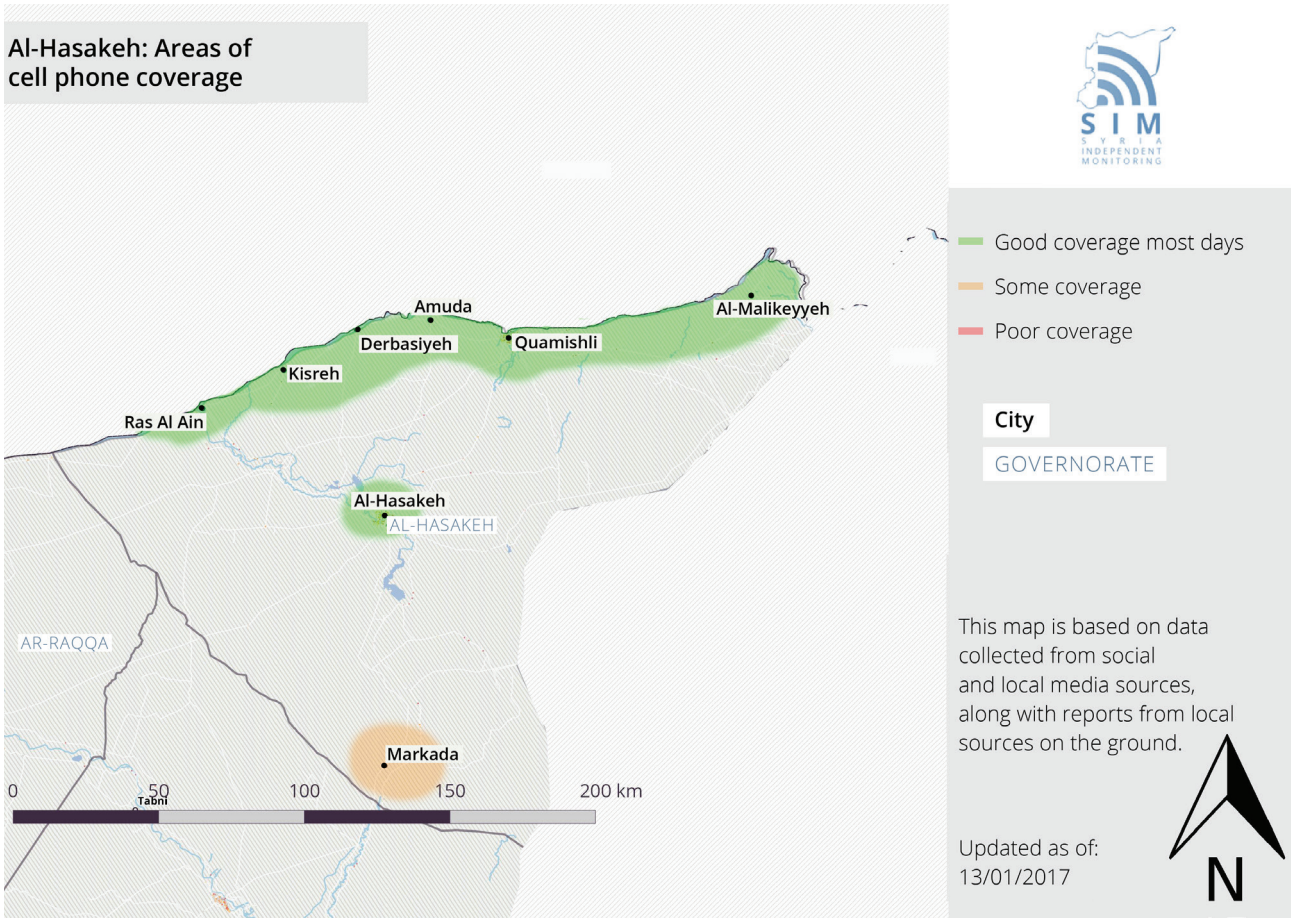
Maps with an approximation of where telephone networks may be available in Syria, based on responses to the field research carried out by this study, are provided in Figure 7.

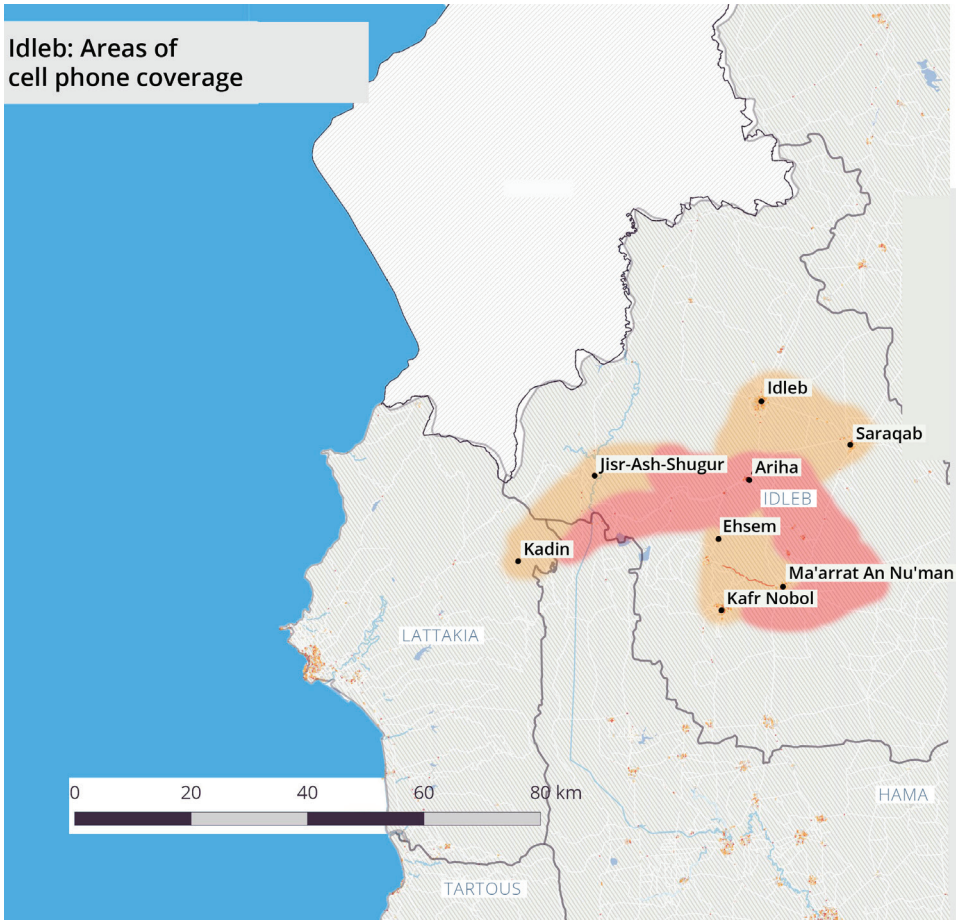
Table 10
Phone networks available in Syria (December 2016)
Government-controlled phone/ data networks SyriaTel and MTN are available to almost all areas of Syria, apart from Daesh-controlled areas. Border areas with Turkey and Jordan have access to phone networks provided by operators in those countries (n = 48)

	Phone networks reported to be available in Syria over the past six months							
	Assad Government networks			Daesh network	Turkish networks			Jordanian network
	Landline	SyriaTel	MTN	Landline	Turkcell	Avea	Vodaphone	Zain
Amuda	√	√	√		√			
Idleb		High areas	High areas					
Azaz		High areas	High areas		High areas	√	√	
Dar'a		√	√					√
Duma		√	√					
Aleppo	√	√	√					
Damascus	√	√	√					
Deir Ez Zor Ar Raqqa			Limited	√				
(No. of mentions)	**(8)**	**(21)**	**(12)**	**(5)**	**(3)**	**(1)**	**(1)**	**(2)**

Figure 7
Cell phone coverage
Field research indications of mobile phone network provider coverage available in different areas in Syria (on the basis of 58 interviews)







Good coverage
Some coverage
Poor coverage

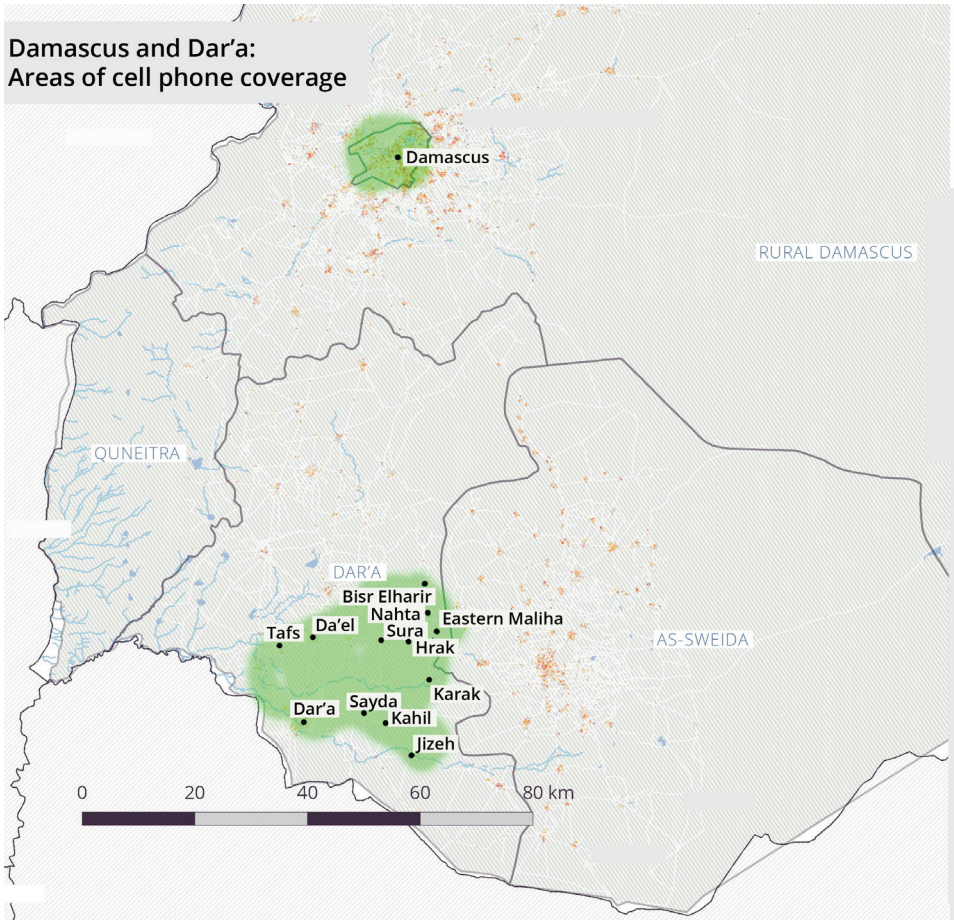
City

GOVERNORATE

This map is based on data collected from social and local media sources, along with reports from local sources on the ground.

Updated as of:
13/01/2017

N



Good coverage
Some coverage
Poor coverage

City

GOVERNORATE

This map is based on data collected from social and local media sources, along with reports from local sources on the ground.

Updated as of:
13/01/2017

N

'The people depend on Viber and WhatsApp [through] the Jordanian phone internet, because it is cheaper than regular mobile phone calls' (Community member, Sayda)

Interviewees from all research areas indicated that they used SyriaTel and MTN networks from time to time. Respondents indicated that they would switch between mobile phone networks based on their availability and the strength of coverage within a particular area, for example: *'Sometimes there is a SyriaTel network coverage and at other times there [is] MTN coverage'*[58] *and 'the people switch between the networks according to the coverage of each network'.*[59]

As discussed in section 5.1.3 above, a principal reason for people choosing to use non-cellular internet connections for communications, or landline connections where they are available, is that cellular phone networks are more expensive.[60]

In all parts of Syria where field research was conducted, respondents indicated that they had a local landline or cellular phone network available either for 'most days per week/ most hours of the day' (79%, 19/24) or for 'most days per week/ some hours of each day' (21%, 5/24). Nobody indicated less regular telephony access.

The suggestion included in the evidence review, that private networks may have been established in Idleb and by Daesh, was clarified through the field research:

- Daesh has established a private landline telephone network, available to residents for a monthly fee,[61] but no mobile phone network is available;[62]
- In Idleb, the LAC has established a private internet-based network that is routinely used by residents in that area to communicate with their friends and family via VoIP such as WhatsApp, Viber and Skype.

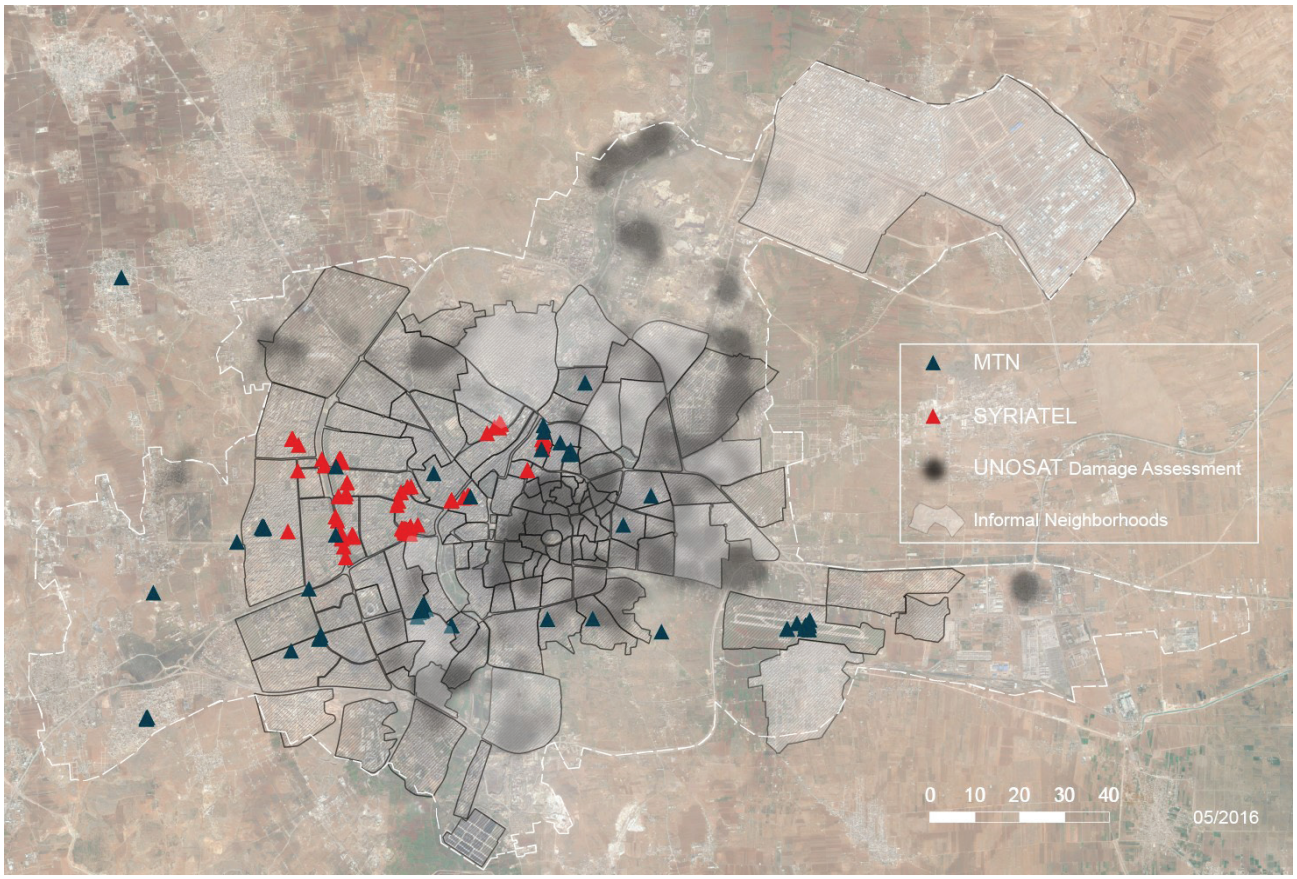
Feature box 3: Extending MTN phone network availability from Government-controlled to Opposition-controlled areas in Idleb

The Al Nour network in Idleb governorate established a tower to relay the MTN network in Kafr Nobol. It provides coverage for parts of Kafr Nobol and the surrounding countryside, using a receiver for ease of communications.

'The mobile/cellular telephone network is related to the Syrian regime and it is working in Idleb villages and cities and its cover is either from Lattakia or Hama or Aleppo.'

Electricity for the relay tower is provided through batteries, recharged with a combination of solar panels and generators. This enables 24-hour service. The service is reportedly weak and there is frequent interruption. This has prompted the Al Nour network to also establish an internet network from Turkey via microwave receivers that can be broadcast in Idleb (Al Nour network technicians, Idleb).

Figure 8
Telecommunication map of Aleppo
The map shows clear discrepancies between Assad Government-held western neighbourhoods and Opposition-held eastern neighbourhoods regarding the presence of telecommunication towers. MTN still operates in the latter when SyriaTel is inexistent (Source: Conflict Urbanism Aleppo Seminar)



Cellular phone network costs

As for internet connections via the SyriaTel and MTN networks, a wide variety of telephone access packages are available to consumers. Packages include a monthly or bimonthly fee and additional recharges, the cost of which depends largely on personal consumption. Costs reported are summarised in Table 11 below:

Table 11
Cellular phone network costs

	Monthly fee (SYR)	Monthly fee (GBP)	Recharge value (SYR)	Recharge value (SYR)
Ma'arat an Nu'man [63]	3,000 - 4,000	11.30 - 15.10	50 - 1,000	0.20 - 3.80
Amuda	1,000 [64]	3.8	3,000 - 3,650 [65]	11.30 - 13.70
Daesh-controlled area [66]	2,700	10.25		
Damascus [67]	6,000	22.75		

6 Key findings - Use of mobile technology software applications

'As a [humanitarian] sector, there has been a choice to move towards mobile technology'
(Key informant, IRC)

This section presents findings on the use of mobile technology software applications by: 1) Syrian communities, and 2) humanitarian organisations working in Syria and with Syrian refugees in neighbouring countries.

6.1 Use of mobile software applications by Syrians

Many of the non-professional software applications used by Syrians are the same as in other countries (Table 12).

Table 12
Top 15 commonly mentioned apps used by respondents
n=227 responses from 48 interviewees

Top 10 commonly-mentioned apps used by Syrians	
Text-based messenger apps (including: WhatsApp, Facebook Messenger Telegram, EMO etc)	26%*
Social media sites (including: Facebook, Twitter, Instagram, YouTube etc)	23%*
WhatsApp	18%
Facebook / Facebook Messenger	16%
Gmail	12%
Kobo Collect / ODK / ONA	9%
Skype	7%
Other organisation apps (including: Souktel apps, Comm Care apps, HR apps, etc)	5%*
Viber	4%
Microsoft Office / Mail	4%
Cloud storage apps (including: Google Drive, Dropbox, etc)	4%*
Twitter	3%
YouTube	3%
Google Earth / Maps / Arc GIS	3%
Google Drive	2%
All other apps	11%

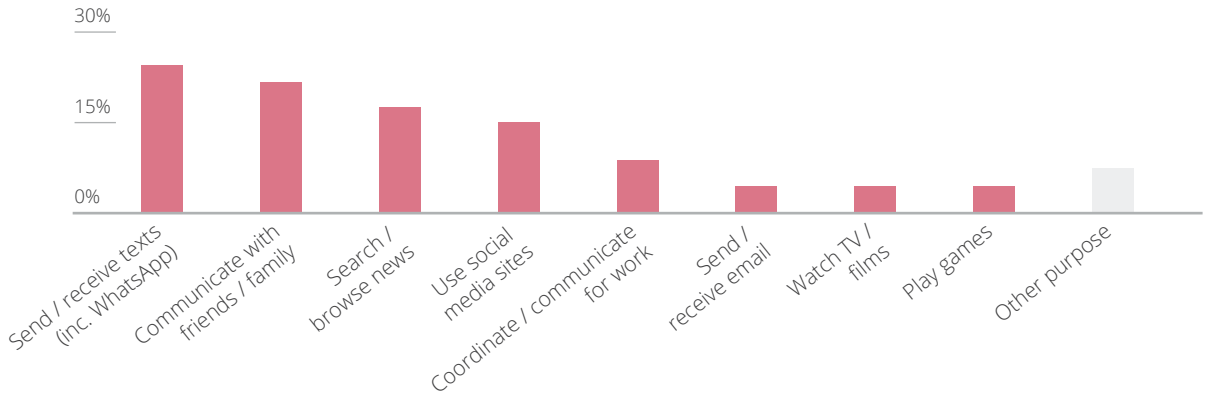
** Aggregated categories.*

Figure 9 presents the main purposes that field research respondents reported using the internet for over the past six months. Respondents did not distinguish professional and personal use of general software apps. 24% of interviewees used it primarily to 'send/receive text-based messages', including through WhatsApp (11% of mentions on its own), Facebook Messenger and Telegram. 20% of interviewees used it to 'communicate with family and friends'. The 9% of research respondents indicating use of the specialised data collection and research applications Kobo Collect/ Open Data Kit (ODK)/ ONA, reflects the research sample.[68] 'Coordinating and communicating for work – with an office or team based outside of Syria' – came in 5th position, with 7% of respondents mentioning such use. These findings were similar for all areas of Syria where field research was conducted.

The field research confirms the findings suggested in the evidence review that mobile technology applications provide many Syrians with a preferred method for communication – with their friends and family all parts of Syria, including in Daesh-controlled areas, and with their colleagues and organisations in all areas except those controlled by Daesh.

Two journalist/media activist interviewees also noted the importance of Facebook for their work, given that it allowed rapid and simple dissemination of news content and information to a wide audience, and increasingly, with good credibility enabled by the Facebook Live feature.[69]

Figure 9
Main purpose of internet use
Research respondents (n = 45) used the internet primarily for communication, reflecting their use of mobile technology in general



6.2 Use of mobile software applications by humanitarian organisations

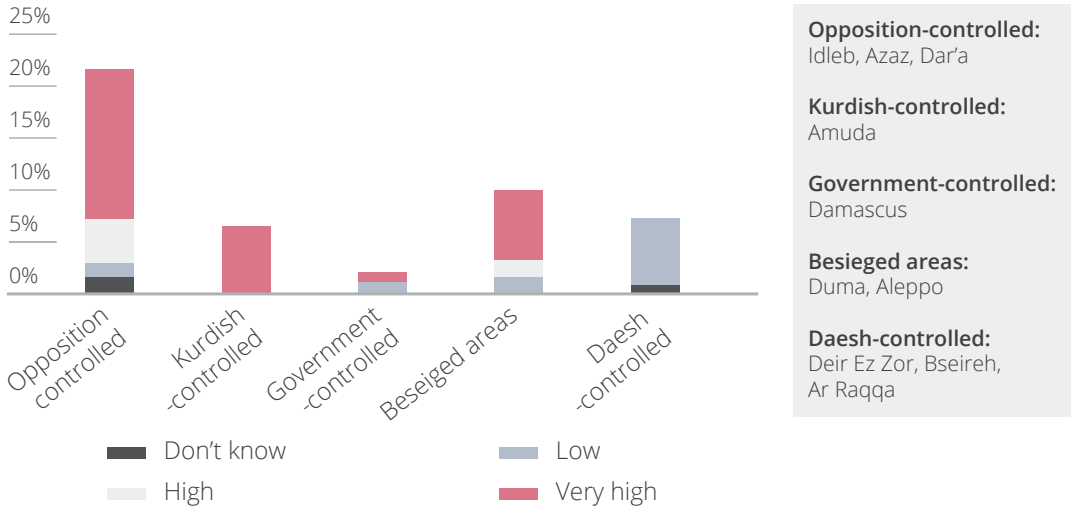
'Facebook, WhatsApp, Viber – these three applications have been used by the residents to communicate with friends and families and to share the news that helps the organisations'
(Community member, Deir Ez Zor)

Field research respondents confirmed that mobile technology was increasingly being adopted by humanitarian organisations working in or for Syria. As interviewees put it, *'mobile technology for Syria is a growing field'*.[70] 68% of interviewees believed that more organisations had been using mobile technology in their work over the past six months across all governorates covered by the research, apart from in Deir Ez Zor and Ar Raqqa where organisations were prevented from operating by Daesh.[71]

The main reasons given for the increasing use of mobile technology by humanitarian organisations included:

- There were more organisations working inside Syria;[72]
- Organisations were increasingly adopting mobile technology to be more efficient;[73] and
- There was an increasing need to conduct M&E and to report on project status and results to meet donor and funding agency requirements.[74]

Figure 10
Mobile technology uptake by humanitarian organisations
In Kurdish and Opposition-controlled areas other than Azaz, most field research respondents considered the professional use of mobile technology by organisations to be very high. In Azaz, just under half of respondents considered this use to be high. In Deir Ez Zor and Ar Raqqa, all respondents said the level of use of mobile technology by organisations was low (n = 48)



The top five types of users of mobile technology for work purposes as reported by the field research sample are:

- Humanitarian aid organisations;
- M&E and research organisations;
- Media activists, journalists and news organisations;
- Other community NGOs/ CSOs; and
- LAC and local authority organisations.

Table 13
Top ten main uses of mobile technology by humanitarian organisations reported by respondents

Main uses by humanitarian organisations for mobile technology	
M&E data collection	1
Communications - within organisation	2
Understanding beneficiary needs	3
Communications - family / friends	4
Refugee / IDP registration	5
Media / Social Media / PR	6
Tracking aid delivery logistics	7
Education / training	8
Documentation / copying-backup	9
Reporting abuses / violence	10

The use of technology for *'mobile money'* [75] that would enable Syrians to receive transfers of cash or digital food vouchers via their smartphones or feature phones, was not reported by respondents. The evidence review uncovered a number of examples of how mobile money and digital food transfers to refugee communities have been piloted in Egypt and Lebanon.[76] However the approach has not been attempted to date in Syria. This is reportedly due to the instability of the local economy, the scarcity of resources and the unreliable availability of telephony, internet and remote financial transfer options.[77] Nonetheless it is relevant that the informal *hawala* money transfer system, upon which many families and humanitarian organisations rely on to send cash transfers into Syria, is also a significant user of mobile technology applications such as Whatsapp.[78] Interviewees from the International Rescue Committee (IRC) and the World Food Programme (WFP) suggested that while their organisations had considered expanding mobile money to Syria, attempts had not yet been made to pilot this.

While 'health and medical organisations' were only mentioned by one respondent, an interview with a health professional key informant revealed an important use of mobile technology for e-surgery and e-medicine, which is included in Feature Box 4 below.

Feature box 4: Syrian American Medical Society (SAMS) e-surgery and e-medicine custom applications

'Where doctors are unavailable, nurses do the rounds [in the clinics] with smart phones. If patients are unstable, the remote on-call doctor will try to handle the case via the mobile link to nurses [in Syria]' (SAMS key informant interviewee)

SAMS has successfully implemented e-surgery ('Tele-ICU') in Opposition-controlled Syria as well as secretly in Homs and Damascus. It has been estimated that the Tele-ICU technology product has helped health professionals provide services to 12,000 patients in Syria for an initial cost of USD 70,000 for application development.

Consultation in an Intensive Care Unit of an Aleppo hospital is observed by a SAMS doctor through a camera installed in the room (Source: The Observers and France 24)

Local medical workers are connected via smartphones and a custom-developed app, linked with cameras, audio, video and a data transfer service, to remote professional surgical support in the USA and the UK.

The application has been developed to integrate with WhatsApp and Viber to allow data transfer via these apps, which is sometimes easier. Where feasible, Web Ex video conferencing applications may also be used in conjunction with the SAMS smartphone app. Internet networks using two-way satellite connections were also trialled but were found not to be sufficiently reliable. Standard Government cellular phone data networks are also used from time to time. There is a concern about data interception by the Government, however it was noted that *'[the doctors] don't care if the regime gets access to this information as it is not labelled with personal information'.* In an interview with a field researcher key informant, however, it was noted that there was a real concern about software that might alert the Government or its allies to locations of doctors and clinics, as this information could be used to target health facilities in Opposition-controlled areas.[79]

SAMS is currently working on introducing an e-medicine application that works like an interactive textbook.[80] They also hope to expand their mobile technology to: track and diagnose pathologies in Syria; support doctors to more effectively provide dermatology services; provide remote capacity building for health workers; and start a remote psychological clinic for patients, including with a fixed video facility to be established in Bab al-Hawak (Idleb Kurdish-controlled area).

The major challenges facing the SAMS mobile technology project is to *'secure a reliable [internet] connection, especially in areas under siege [with] power also being a big issue'* (SAMS key informant interviewee).

'[We use] a program to gather information … to count the number of refugees here. [I've used it] more than five times in the last six months' (Local NGO worker, Ma'arat al-Numan)

All respondents working with an aid organisation (n=45) confirmed that they had personally used some form of mobile technology in their work in the past six months. Three-quarters of these respondents stated that they had used it for a humanitarian or related purposes. For example, *'[We have used] Kobo Collect … to gather questionnaires about agriculture needs assessments – twice [in the last six months]'*.[81]

Like individuals, humanitarian organisations use mobile technology applications for communication purposes (Table 12). As testified by some of their representatives:

'For communication WhatsApp is extensively used and is truly the humanitarian tool of the century. We use Skype internally but not in the field as it requires too much broadband. For data collection we use ODK collect, ONA and KOBO, as well as Comcare for case management' (Key informant, International Rescue Committee).

'WhatsApp is certainly the most used. Generally speaking, WhatsApp or maybe Viber are the most used. Skype not so much, Telegram not so much. Telegram is an exception where, when it is used, it is most often linked to work but this might be a bias of mine since I use Telegram for work' (Field researcher interviewee).

Communication was the main purpose of use of mobile technology by NGOs and CSOs inside Syria. Mobile technology was employed to coordinate field work and to communicate between offices and team members:

'When an organization wants to distribute relief baskets, the communication is done through a group on WhatsApp application' (Local Council representative, Idleb)

'Most organisations depend on the WhatsApp application in communicating with their members and Gmail in sending the files between them' (Local NGO worker, Ma'arat An Nu'man)

Nevertheless, nearly all field research respondents agreed that organisations used mobile technology and software differently from general community users.[82]

Key informant interviewees based outside Syria stated that organisations mainly used mobile technology to enable rapid communication of beneficiary needs from the field, and to improve efficiency and effectiveness of Internally Displaced Person (IDP) and refugee registration. This reflected the findings of the evidence review.[83]

LAC representatives also noted that communication software applications such as WhatsApp had been particularly useful in helping to coordinate activities implemented by organisations in partnership with the councils. As explained by a LAC representative from Alhrak:

'The staff [of humanitarian organisations] communicate with the LAC through WhatsApp even personally or through groups or by e-mail. The staff gather the information and statistics they need and save [it] on their mobile phones and send [it] over the internet'.

Particular software applications used by organisations include Kobo Collect and ODK for M&E.[84]

Feature box 5: Kobo Collect and ODK

International Humanitarian Relief M&E officer using a Samsung tablet during a food basket distribution in Rastan, Homs. (Source: RMTeam)

'The primary beneficiary [of UNHCR using ODK] is the target beneficiary groups identified through [needs] assessments and post-distribution monitoring' (UNHCR key informant)

Kobo Collect, based on ODK is a data collection and research software application used by a number of humanitarian organisations in Syria, including Care, IRD, Mercy Corps, Oxfam, the UNHCR and World Vision, as well as by LACs (i.e. Dar'a), independent activists and researchers. It is easily downloaded from Google Play, easy to use, including while offline[85] and works well with smartphones.[86]

Given the centrality of data collection to results-based management and M&E, Kobo Collect and ODK have been adopted by a number of organisations to consistently collect, manage and analyse field data. As explained by a LAC statistics office, *'using Kobo adds value by saving time and effort and insuring [we know] the exact time and location [of a project], now we do not have to print papers or send emails'.*

World Vision has used Kobo Collect in Syria to conduct household surveys and shelter needs assessment. A field researcher who worked with them commented:

'It is an open source app. You can fill information directly on the mobile and you cannot skip questions because automatically you have to fill answers to move on. In addition, it saves all surveys and shares it when there is internet. We don't have to hold papers anymore. [This] increases personal security ... especially if there is a checkpoint' (Field Researcher, Azaz).

The UNHCR noted that they started using ODK in 2012 'to serve as a replacement for paper data collection methods' and that it is now used by all UNHCR-supported humanitarian actors in Lebanon working with Syrian refugees. A key benefit was reported to be its ability to work offline, to pin-point locations and to record data.[87] While it is open source, one interviewee noted that it would not be cost-efficient to deploy it for small-scale collection (i.e. for 100 people). The UNHCR have a dedicated programming team able to adapt Kobo to their needs.[88]

Technology developer interviewees noted that mobile technology adopted by organisations they had worked with over the past six months had most often been for the benefit of field monitors/ researchers or for journalists and media activists.[89] Needs assessments and post-distribution surveys were particularly important purposes.

All of the examples of mobile technology software identified in the evidence review as being used in Syria or in relation to refugee support in neighbouring countries were confirmed through the field research. These included mobile technology enabling:

Humanitarian remote access (i.e. needs assessment and logistics tracking)	The IRC *'use mobile technology to conduct remote management',* for example, they have a cross-border programme in Turkey, Iraq and Jordan that uses mobile technology to track packages using barcodes. Monitors use their smartphones and ODK Collect to store photos, in the cloud, of each location.[90]
Real time monitoring	See Feature Box 5 above. Other than Kobo Collect/ ODK, other research organisations conducting M&E and real-time field feedback have developed their own encrypted mobile technology solutions – such as RMTeam.[91] The WFP M-VAM mobile technology application used with refugees in Iraq, enables real-time vulnerability analysis and mapping and has an integrated mobile phone messaging system and voice technology to monitor 'tone of voice' satisfaction.
Information coordination between donors, implementers, beneficiaries, stakeholders	OCHA, the UNHCR and the WFP report sharing data for inter-agency coordination to efficiently carry out needs assessments and the dissemination of information about who does what to beneficiaries in the field.[92]
Tracking and communicating with people on the move	The UNHCR has piloted an open-source based Refugee Assistance Information System (RAIS), incorporating Iris scanning technology and linked to implementing partners that agree to data sharing. It provides an ODK server to link smartphone-input refugee assessments to donor funding. Iris-scanning is also facilitated to enable the tracking of registered beneficiaries as they move from place to place. Statistics models are built-in to predict vulnerability.[93]
Digital food	The WFP has adopted e-based vouchers in their humanitarian response, *'moving towards a multi-purpose cash approach… for the coordination of food security and cash-based interventions'* (WFP key informant interviewee)
Health	See Feature Box 4 above. It was reported through field research that an *'English doctor in a SAMS-supported hospital in Aleppo… had done tele-surgery'.*[94]
Remote learning	RMTeam have developed a software application called Blue Training to provide group training inside Syria from trainers/ teachers based remotely.[95]

7 Key findings - Challenges to the adoption of mobile technology in Syria

Table 14
Top challenges to the adoption of mobile technology

Main challenges preventing adoption of mobile technology	
Inconsistent internet access	1
Unreliable electricity supply	2
Inadequate phone/net availability - neighbour countries	3
Conflict / bombardment	4
Inadequate phone network coverage in Syria	5
Devices not available in the community	6
Price / cost of internet access	7
Fear of information security risk	8

Consistent with the findings reported in Table 7, Table 13 shows that field research respondents stated the primary challenge was inconsistent internet access.[96] The next challenges included unreliable electricity supply, inadequate coverage by cellular phone networks from neighbouring countries (i.e. Turkey and Jordan), the effects of bombardment and the conflict, and inadequate phone network coverage.97 This applied to all research areas, apart from Dar'a and Damascus. In Dar'a, the primary challenge was reportedly the effects of bombardment.

Other challenges identified were:

- Variable levels of technical knowledge; however, specialised applications require users to receive adequate training.[98] Older Syrians were reported to possibly have adopted essential software such as WhatsApp – due to it providing one of the only ways to communicate with family[99] – but other technology use presented challenges. As one ONA key informant stated, *'It depends on the context... younger people are more fluent, older people less so... there is no blanket answer';*
- Resistance from some organisations to the investigative potential of mobile technology. This is true in Idleb where there is competition between LAC service providers, CSOs, NGOs and armed groups. For example: *'LACs might not be keen on mobile tech that connects beneficiaries directly [to aid providers]. They [the Councils] have control over the list of beneficiaries in their area. What would be their reaction if mobile tech takes over their control? NGOs want to use it but LACs might block anything that reduces their control' (Research provider key informant);*
- The fear of surveillance and eavesdropping;
- The risk of data blind spots;
- Risks posed by reliance on big data aggregation.

'If the app fails somewhere, there is a huge issue around protection. Everybody can hack anything. We are all about protection at the end of the day' (UNHCR key knowledge holder)

The latter three warrant further elaboration, to be found below. The former – surveillance – was mentioned both by the literature and field respondents, whereas the latter two – data blind spots, big data aggregation – are mentioned in specialised literature, but were not perceptible by the field respondents interviewed.

7.1 Fear of surveillance and eavesdropping

The evidence review mentioned the 'fear of surveillance' as a challenge that may limit the openness of Syrians to use mobile technology and this was reiterated by a number of key informant interviewees:

'In general people are very wary of anything that records. Security-minded people would be wary of anything that records your voice or your picture. Any organisation can devise an app with all the security in the world - people will still be uncomfortable' (Field researcher key informant interviewee).

Surveillance or eavesdropping concerns were more commonly cited by research participants who worked as journalists, for NGOs, research organisations or for LACs. For example:

'Some apps can be hacked so organisations have fear for their data' (Network technician, Idleb).

'Mobiles are subject to various forms of hacking, including data theft. Also it [can] cause a major security concern for users if their data has [been] caught by strangers' (Journalist, Dar'a).

'One time we were told to fill a questionnaire that contained the location of the beneficiaries through GPS. People may have used it innocently in the past but the amount of infrastructure and in particular hospitals that have been hit by airstrikes has led to suspicion' (LAC representative, Duma).

'There is a lack of knowledge ... they don't know how to securely use technology'
(Activist, Dier Ezzor)

In Daesh-controlled areas, nearly all respondents noted the fear of inspections by Daesh overseers. A community member in Deir Ez Zor testified, 'there are sudden inspections performed by members of Daesh, they force the users to open the conversations they had'.[100] Only two interviewees noted a fear of Government monitoring, despite recognition that this is routine in Government-controlled areas:

'Yes, this fear exists. Not to use technology, but concerns about what can be said or not. Sensitive information or some opinions cannot be conveyed through some media. I don't say my name if I am voicing some argumentative opinions. On Facebook, I would change my name or hack my own account' (EmpowerHACK key informant interviewee).

Despite such concern about security and fear of data surveillance by key informants,[101] only 58% of the interviewees inside Syria who responded to this question (22/38) reported having this concern, with no major differences between armed-group control areas. According to a LAC representative (Dar'a), *'individuals have [lower] levels of concern due to their different perception and knowledge'.* Organisations advised their Syrian staff to *'be careful about their data',*[102] provided training about information security,[103] or provided encryption services or equipment.[104] As one network technician in Dar'a noted, *'[Organisations] have security concerns about their data, but most people don't have experience in this kind of issue.'*

7.2 The risk of data blind spots

An examination of the literature relevant to mobile technology adoption in Syria raised a caution about the risk inherent in humanitarians switching too readily to the use of such technology. Areas remain where the internet is limited or non-existent and some minority population segments have limited internet access. Exclusive reliance on mobile technology may lead to overlooking the needs of vulnerable groups relevant to those areas or population segments. Effective remote management and needs analysis may require humanitarians to mitigate such risks by using additional tools to collect data or access beneficiaries.

7.3 Risks posed by big data aggregation

As decisions are increasingly being informed by big data analytics, more attention needs to be paid to the validity of data collection methodologies and the veracity of input data. Big data may be collected from a

variety of sources relevant to a conflict-affected area, but there is a particular risk for data collected by survey instruments, where there is an inescapable potential for collection error or misreporting. Where only limited data is available, and potentially significant and urgent decisions are being made about humanitarian service delivery, the risks are even greater.

Decisions regarding the target areas of humanitarian services and what types of services are to be provided to particular groups of beneficiaries or a particular area should ideally be based on a combination of data analytics, quantitative survey data and qualitative field sources of information. Where decisions are based primarily on surveys, special care should be put on the definition of the collection methodology and its actual implementation, and precautions taken to ensure the validity of the data collected and compiled. Where data collection has been carried out by a third party, the benefits of separation of data collection from programme delivery can be further enhanced by ensuring that data verification is also undertaken.

8 Value for money of mobile technology in Syria

This section examines value for money (VfM) considerations for donors and technology developers in relation to mobile technology initiatives for Syria. The VfM of mobile technology can be defined as 'how much impact on the humanitarian situation does a mobile technology intervention achieve, relative to the inputs invested in it'.[105] The DFID '3Es Framework' provides a mechanism to assess VfM, through: **Economy** (cost of inputs), **Efficiency** (amount of input required to produce planned output) and **Effectiveness** (results and sustainability achieved according to expectations). Findings in relation to each of these 3Es are presented below.

8.1 Economy of mobile technology

Respondents volunteered four recommendations for economy and cost saving: (1) needs analysis and testing, (2) scaling-up, (3) smart procurement, and (4) offsetting costs through partnerships.

Assessing the economy of mobile technology involves consideration of the total lifecycle costs of a product, comparing those to other similar products. Savings should be made to cost outlay wherever reasonable. Budgets need to accurately forecast costs associated with development, testing, maintenance, training and equipment. This a challenge when the proposed technology may be novel and untested in field environments like Syria.

When prompted to consider the value to humanitarian organisations of using mobile technology in Syria, 41% (11/27) of respondents who answered this question suggested that it saved money or resources. Mobile technology apps allow cheaper communication, data collection and archiving, saving programme administration and management costs.[106] Key informant interviewees agreed that technology could ultimately save humanitarian organisations money, and described those savings in terms of the programmatic efficiencies that could be achieved (see section 8.2).

Humanitarian organisation representatives formulated several useful recommendations, in terms of budgeting for mobile technology initiatives and protecting the economy of an investment: 1) conducting thorough initial needs analysis and testing user and beneficiary feedback; 2) scaling-up once a user case has been proven; 3) being smart with procurement decisions; and 4) offsetting development costs through partnerships.

8.1.1 Needs analysis and testing

Needs analysis and iterative development of technology is critical to a successful VfM approach. In the words of one key informant interviewee, *'If you know which technology [will be helpful] and do not make it too complex, it is useful'*.[107] Understanding what sort of tool will be useful, and what technology features are essential to avoid unnecessary complexity, is accomplished by a rigorous needs analysis. The UNHCR confirmed the importance of such needs analysis to enable accurate budgeting for a mobile technology project. Without it, costs may inflate due to over-design, or the designed product may not be used due to misalignment with what users and beneficiaries really desire. As argued by one of its representatives:

'Innovation is not just ideas – the need must be [tested] through engagement of the community … If the app is not related to essential assistance, beneficiaries don't care. We need to push forward this mind-set of [needs] testing before development' (UNHCR J key informant interviewee).

The same interviewee cited a counter-example, indicating that a BBC Media Action software application intended to support media activists and journalists inside Syria had been abandoned due to lack of field testing about the need for such an application prior to its development.

8.1.2 Scaling-up

'We need to know when to resort to mobile technology... we should not use this for the sake of it. We need to pilot at low cost and then decide later on whether or not there is a need to scale up' (UNHCR key knowledge holder)

Needs and user testing must continue throughout development and field testing. This allows feedback to be integrated into the technology, helping absorb user needs into the design, and helping to keep costs low. Scaling-up involves starting with the minimum viable product (MVP), collecting evidence on the users' needs, and only then investing further in the product as necessary. Risks are then reduced that significant costs will be outlaid for a product that will not be used as intended or at all. The IRC noted this risk in their response to the field research:

'Initially there was a version of the app [which was difficult to introduce] where the enumerators had never seen anything like it; that was back in 2012. Once we had a better understanding of the field requirements, we trained enumerators in Turkey or Iraq and they trained others afterwards and the app was successful' (IRC key informant interviewee).

Responding to this risk, scaling-up was an approach recommended by a number of the key informants.

8.1.3 Smart procurement

To avoid duplication and proliferation of mobile technology products that fulfil similar objectives, the procurement and adaptation of off-the-shelf or open source technology solutions should be promoted wherever possible. Custom technology development should not be encouraged as a default, as it is slower and more expensive. As one UNHCR interviewee noted, *'it depends on what you are using [the technology] for but a fully new solution would cost a fortune'*.[108] The widespread use of Kobo Collect and ODK provides an example of how M&E and research technology applications can be used by different organisations to meet a similar requirement without onerous custom development.

Two reasons for possible custom development of applications raised by technology developers interviewed included: 1) security features on existing applications may not provide adequate protection to users, beneficiaries or stakeholders; and 2) the level of complexity embedded in the intended function is beyond the features of an existing product or tool and adaptation of existing products would exceed the cost of new development:

'Organisations can go out and do it (app development) on their own - with a basic product. Open Source is cheaper, but it doesn't deal with the complex situations. It might be better to go with a [custom] approach. It isn't just about money. Focus on the value. The balance must be based on what donors want to do, and the level of complexity [in the product]' (Souktel key informant interviewee).

8.1.4 Offsetting costs through partnerships

Further engagement by humanitarian organisations and donors with private sector technology leaders, and with each other, was also recommended. Humanitarian technology for Syria has typically been funded by donor agencies, rather than by private sector developers or through partnerships with private sector actors.[109] As one UNHCR research respondent noted, *'there is definitely an interest [by the private sector] in humanitarian technology, which is growing'*, adding however that *'there is a difference between interest and engagement.'*[110] The same respondent suggested that more partnerships were needed between the private sector and humanitarian actors, as this helps offset development, testing, maintenance and equipment deployment costs. The UNHCR, for example, is hoping to achieve cost savings by engaging more closely with Microsoft in Lebanon, to help equip Syrian refugee communities with internet and application software that could then be leveraged for humanitarian activity:

'There is a strategy to develop [products] with Microsoft. The... partnership is looking... to ensure that more refugees have [internet] connectivity (plus Facebook). Practically, it means providing phones, tablets and support' (UNHCR key informant interviewee).

8.2 Efficiency flowing from mobile technology

Table 15
Top benefits of the use of mobile technology
The top two benefits of mobile technology use in Syria by organisations are related to 'efficiency', in terms of speedier and simpler communications between field workers and remote offices and management

Ease / speed of reporting to management	1
Ease / speed of comms with workers	2
Sampling people's views is easier	3
Understanding beneficiary needs	4
Not losing information / documents	5
Saving time / money	6
Remote training = Skilled worker base	7
Contact with outside world / share news	8

As a component of any VfM assessment, efficiency achievements are simplest to identify where repeated, routine activities need to be undertaken. Technology is well-suited to such tasks. Efficiency relates to the relative level of input required from the developer, user or beneficiary of a mobile technology product, compared with the output obtained.

Research respondents frequently mentioned efficiency savings introduced through the use of mobile technology.

When asked whether anything new was possible using mobile technology, compared to before they had used it, a quarter of interviewees confirmed that 'communicating was easier' and that time was saved in their work. Communication between organisations' teams, their management and their offices was the foremost efficiency benefit attributed to the use of mobile technology in Syria (Table 15).

When they were prompted to consider specifically whether or not mobile technology provided 'value for money', 37% (10/27) of field research respondents stated that it saved time in their work. As a LAC representative from Kafr Nobol put forward:

'[We] save time and money through fast comms with the LAC and coordinating with them in case of distributing relief baskets.'

'Telling beneficiaries to receive relief baskets by SMS, saved on waste and optimised who received them based on the needs assessment' (CSO worker, Damascus)

A small number of research respondents also noted that technology use had reduced their security risk, for example by enabling them to avoid carrying hard copies of survey documents which might raise suspicion at checkpoints.

Technology professionals were somewhat more guarded, pointing to potential constraints affecting the adoption and use of mobile technology. For example, a researcher in Kahil noted that *'technology facilitates work – [it is] better than paper-based [research] – but [the organisation still] needs to increase the number of workers in the field and [to provide] training in the use of the application.'*

Comparative assessment of efficiency vis-à-vis other means of achieving the same objective should be considered. After having spent money on deploying an M&E and research software application in Lebanon, the WFP noted for example that *'phoning people ended up being much less time consuming, especially [when] rapid work was required'.*[111]

Implicit in this statement is the tension between the time it takes to deploy successfully a new mobile technology and the urgency of the needs on the ground. Whenever possible, a technology-driven approach to humanitarian action should go in parallel with the testing of a rapidly-deployable existing system or approach, while new technology is being analysed, developed and field tested. Pilot testing is highly recommended.[112]

8.3 Effectiveness of using mobile technology

Effectiveness is all about results and whether the intended objective of a mobile technology project is achieved as planned. Ahead of any investment, practitioners should establish a clear theory of change to underpin the need for, and use of mobile technology. Sustainability potential and the prospect for replicating and leveraging the success of a mobile technology product elsewhere, is also a relevant consideration.

Most technology developers and organisations using mobile technology in Syria reported that their products were effective in achieving their desired results. However, no benchmarks for comparative effectiveness exist at present as no comparative evaluation has been carried out so far.

'We will never give up tele-medicine – there is a very high rate of return due to a shortage of physicians in Syria' (SAMS key knowledge holder)

What is clear is that mobile technology is enhancing how humanitarian agencies, and their funders, collect and analyse data about programme implementation. M&E is today one of the main uses of mobile technology in Syria (section 6.2). M&E tools such as Kobo Collect and ODK, and other logistics tracking and needs analysis applications, all help humanitarian organisations to *'close the feedback loop'* between activity on the ground and result reporting to head offices. Numerous examples were provided by interviewees of how technology is supporting better quality and faster data collection and reporting.

Qualitative aspects also have to be considered. Most of the literature notes that humanitarian technology offers significant opportunity for services to be more effective through local beneficiary involvement in, and ownership of, humanitarian action.[113] The feedback loop between humanitarian programmers and their beneficiaries becomes shorter because communities can be more directly engaged

'Mobile technology is used to … close the feedback loop.' (WFP key knowledge holder)

in the process of needs assessments and humanitarian response. For example, the WFP has noted that mobile technology adoption *'is […] good for empowering individuals and allowing [them] not to play a passive role. It is more participatory and dynamic'*.[114]

'We want to measure impact appropriately and [that] work is now more accurate.' (IRC key knowledge holder)

A similar finding was noted in the evidence review, that technology may be acting as a vehicle for increased humanitarian self-reliance by communities, encouraging them *'to quickly transform themselves into first responders'*.[115] The White Helmet Syrian Civil Defence groups were mentioned as an example: rather than international humanitarian agencies fulfilling an emergency response role, an internationally-supported but locally-led, organised and managed team took the lead, with advice and management of the programme often remotely handled through Skype and smartphone-based internet connectivity.[116]

A final element of effectiveness is sustainability. Sustainability for mobile technology projects will be enhanced where the case for a user needing a technology tool has been clearly established, and where some form of partnership is in place with an implementer, technology provider or local community, to encourage continued use of a developed product. One UNHCR respondent noted that there could also be a psychological element to the tool take-up and therefore, to its sustainability, for example:

'There are also psychosocial benefits for beneficiaries and local communities [by using a mobile-money application] – because of the shame associated with standing in a distribution queue' (UNHCR key informant interviewee).

Such psychological elements could also, more simply, be linked to users' subjective enjoyment in employing the tool.

9 Conclusion

Mobile technology enabled through the internet will continue to be a viable tool for humanitarian work in Syria

Mobile technology is used across Syria by humanitarian organisations and communities. After basic survival requirements are met by Syrians, internet access is a high priority.

Irrespective of which armed group is in control of a particular area, internet-capable devices are widely owned and internet connections are shared in most towns via satellite or microwave-enabled local Wi-Fi networks or at internet cafés. Communities and business owners demonstrate an ability to readily adapt to their local situation, prioritising the establishment of local internet. Where Government phone networks, SyriaTel or MTN, are available, these provide reliable, though somewhat costly 2G/3G phone internet; they are used as backup to cheaper, alternative internet connections regardless of the pattern of territorial control.

This trend is likely to continue and is a key finding of the research: mobile technology enabled through the internet will continue to be a viable tool for humanitarian work in Syria.

Technology building on common software apps offers the best chance for return on investment

Syrians of almost all ages, men and women, in all areas in Syria as well as Syrian refugees, take advantage of the internet for simple, cheap communication. Humanitarian organisations do likewise. There are few limitations on how the internet can be used, although censoring and internet monitoring is common in Government-controlled areas, with controls also periodically in place in Daesh-controlled areas. WhatsApp, Facebook and Gmail are the software apps of choice, typically accessed through a Samsung Android or Apple smartphone. Humanitarian organisations, media activists and LACs, amongst others, have all become adept at leveraging these typical applications to support their work.

That both humanitarian organisations and their Syrian beneficiaries and field teams rely on a few key applications for their day to day communications – WhatsApp and Facebook in particular – is a key finding of the research. Mobile technology tools, or programmatic approaches that build from these applications, will enjoy lower entry barriers to effective use than new technologies. Numerous examples already exist of how humanitarian services take advantage of the ubiquity of these applications and further innovations are likely to be feasible.

For organisations working in Syria, other applications in widespread use include M&E and data collection tools facilitated through Kobo Collect and ODK. Few organisations have attempted to develop their own custom applications, although examples were put forward – most impressively by SAMS but also by the IRC, RMTeam, Souktel, the UNHCR and the WFP (section 6.2). Looking forward, applications used by international agencies able to operate both in Government- and Opposition-controlled areas (such as the UN) are more likely to continue to be useful as the conflict evolves. Applications used by organisations that cannot currently work in Government-controlled areas may see their utility reduce.

Opportunities exist to mitigate some of the common obstacles facing further adoption of mobile technology by Syrians

Apart from the ongoing conflict, challenges to mobile technology adoption inside Syria include the cost of internet and interruptions to internet and electricity. A lack of spare parts and skilled internet network technicians exacerbates these challenges. The fear of electronic surveillance and eavesdropping is also a concern noted by humanitarian providers and technical professionals. However, it appears to be less of a concern to ordinary Syrian technology users.

With increasing reliance by humanitarian decision-makers on data analytics to focus and prioritise service delivery, there is an increased risk that data blind spots may limit access by some beneficiaries to humanitarian support. This risk is pertinent in newly liberated areas from Daesh. The increasing role of data in humanitarian programming also increases the importance of investment in robust data collection verification and methodology validation processes.

Value for money from investments in mobile technology for Syria can be improved through careful needs assessment, field testing of products and smart procurement

Risks to new mobile technology development and lessons that may aid economic, efficient and effective future implementation include:

- Needs assessment and robust testing of planned tools with proposed users and beneficiaries is essential, scaling-up initially lower-cost tools once a user case is proven;
- Duplication and proliferation of similar tools can be avoided through donor-facilitated leadership amongst implementers, encouraging technology sharing, the establishment of partnerships across stakeholders and with the private sector, and possibly through mandating the use of existing products, or at least open source or off-the-shelf options; and
- More impact evaluations of mobile technology effectiveness should be commissioned to inform comparative analysis of proposed new technology investments.

10 Recommendations

The conclusions set out in section 9 above support the following recommendations:

1. Smartphone and internet use is widespread in all areas of Syria. Local town internet providers are adept at establishing connections quickly irrespective of which armed group is in control of a local area. Mobile technology is a critical tool for communication for all Syrians and for the effective work of humanitarian organisations. Outside of Daesh-controlled areas, organisations have been able to use mobile technology for their work.

Recommendation 1
Investments in mobile technology should be continued, irrespective of the evolution of the conflict. However, humanitarian organisations need to consider that the political and military control of each particular area will determine the scope of usage of such technologies.

2. Google Android and Apple iOS smartphone operating systems are common in Syria but internet access is intermittent due to power outages or other disruptions. Most internet users prefer local Wi-Fi networks over Government services.

Recommendation 2
Mobile technology applications used by humanitarian organisations should be designed for use with both Google Android and Apple iOS smartphones. Applications should allow offline use, and with settings allowing for automated data transmission and preferred internet network when a connection is available (for example to allow a preference to be nominated for local Wi-Fi before a 2G/3G connection).

3. Two challenges for effective technology development have been identified: 1) insufficient testing of technology in field environments, and 2) the potential for inefficient duplication of technology tools.

Recommendation 3A
Budgets for mobile technology development should be sufficient to include adequate testing. Products should not be funded without a needs assessment and robust testing of procedures.

The mobile technology type with the greatest risk of duplication and proliferation are M&E applications. Data collection by humanitarian organisations is often managed through Kobo Collect software (based on Open Data Kit). However, other M&E providers and users are developing or have developed alternative custom-designed software for reasons related to the need for improved data security or donor-requested complexity.

Recommendation 3B

Technology duplication should be avoided by providing organisations with an incentive to share technology, or by inserting in programmes a preference for open-source and existing technology products.

For example, Kobo Collect is a widely-used tool in Syria. When no strong rationale in favour of an alternative product exists, cost and efficiency could be increased, and product duplication risk decreased, by encouraging current and future implementers to standardise their M&E data collection through this tool. Future investments proposed in M&E data collection software should be rigorously tested for value for money against the established Kobo use/value case.

4. Few Syrians, including humanitarian field workers, properly appreciate the risks posed by information insecurity. Better information security is particularly relevant where vulnerable people are affected by conflict and displacement. In Syria, inadvertent disclosure of information or electronic surveillance can place communities and service providers at risk, should armed actors seek to identify high value targets such as health clinics or media centres.

Recommendation 4

Additional training and information is recommended for humanitarian field workers, LAC representatives and other civilians working with sensitive data. Only mobile technology with a robust level of information security should be used.

5. A range of humanitarian mobile technology tools and software applications are available that may benefit Syrians and be worthy of investment by donors and organisations.

Examples of mobile technology that have apparent merit for further engagement by DFID and donors include:

- Working closely with private technology developers to enhance humanitarian service delivery by leveraging existing high usage by Syrians of WhatsApp, Facebook and Facebook Messenger in particular, to better track aggregated, anonymised usage data across Syria, and to enable humanitarian needs reporting, distribution tracking, human rights violation reporting, emergency situation notification and simplified participatory M&E;

- Expanding existing support to e-surgery and e-medicine technology, such as that provided or intended by SAMS, given the potentially high impact of this technology and the critical need to augment the local availability of doctors and nurses;
- Exploring options for broader engagement with 'mobile-money' and 'digital food' technology that have been successfully used by the UNHCR and the WFP in other countries, to empower refugees in neighbouring countries and potentially IDPs inside Syria;
- Considering how mobile technology could be developed to support Syrian refugees and IDPs to engage in recovery and reintegration in new locations through skills training and capacity building; and
- Learning from the WFP's M-VAM mobile technology application used in Iraq and in parts of Africa, which conducts vulnerability analysis and mapping and has an integrated mobile phone messaging system and 'tone of voice' satisfaction capability.

Recommendation 5
Donors should proactively engage with humanitarian stakeholders to prepare a shortlist of mobile technology applications, with estimated pilot development costs, that would benefit populations affected by the Syrian conflict, considering the humanitarian scenarios possible for Syria in 2017 and beyond.

6. Challenges to adoption of mobile technology by Syrians and humanitarian organisations include internet service interruption due to a lack of spare parts and network technicians. The high cost of internet access is also a considerable issue.

Recommendation 6
Subsidised or free internet equipment, electricity equipment and spare parts should be supported in all parts of Syria. Skills training for internet network technicians should be expanded to cover a wide geography.

7. Many stakeholders have taken an interest in promoting the use of internet. This can interfere with efficient internet service provision to the community.

Recommendation 7
LACs and administrative bodies should be encouraged to establish a regulatory capability to maintain effective local internet service provision in Kurdish and Opposition-controlled areas.

Note: This recommendation is dependent on alternative governance continuing to apply in Syria – i.e. in Kurdish- and Opposition-controlled areas.

8. There is no authoritative source of information about internet coverage or phone networks in Syria. Such a map, regularly updated, would be of significant benefit to donors and humanitarian organisations seeking to provide mobile technology services in the country.

Recommendation 8

A comprehensive internet and telephony communication coverage map for Syria should be commissioned and regularly updated. Once established, it could be maintained through weekly updates without significant time, cost or effort.

Note: Data may be available from software application providers such as Microsoft (Skype) and Facebook, and these organisations could be engaged with, via the support of DFID, to enable the aggregation of data about application use. Such data aggregation may be sufficient to produce a useful map without further need to engage in field research.

9. DFID emphasises that value for money is not about finding the cheapest option; rather it involves understanding what drives cost and performance. Impact evaluations of the effectiveness of mobile humanitarian technology in Syria do not exist. Such evaluations would help to inform future business cases and mobile technology investment analysis.

Recommendation 9

Impact evaluations of projects and initiatives relevant to mobile technology investments funded for humanitarian programming in Syria should be undertaken.

11 Endnotes

[1] Sandvik et al, 'Humanitarian technology: a critical research agenda', *International Review of the Red Cross*, Volume 96, Issue 893, March 2014, 219-242, 220.
[2] BuddeComm, 'Syria – Telecoms, Mobile and Broadband – Statistics and Analyses', *Executive Summary*, <https://www.budde.com.au/Research/Syria-Telecoms-Mobile-and-Broadband-Statistics-and-Analyses> (16 October 2016)
[3] Open source' is software for which the original source code is made freely available and may be redistributed and modified.
[4] The SIM Consortium (Transtec, Aktis, RMTeam, ONA, Garda World) performs field monitoring of DFID humanitarian assistance projects in Syria and assessments of DFID's humanitarian assistance implementing partners' M&E systems, and occasionally carries out research studies such as this report.
[5] P. Vinck, 'Humanitarian Technology', *World Disasters Report 2013*, International Federation of Red Cross and Red Crescent Societies, 2013, 20 <www.ifrc.org/PageFiles/134658/WDR%202013%20complete.pdf> (16 October 2016).
[6] See generally, Humanitarian Technology <http://www.humanitariantechnology.org/> (16 October 2016); Madhavan et al, 'Robotics and Automation Technologies for Humanitarians: Where we are and where we can be', 2015 and A. Forrest, 'Wearables for Good: UNICEF Challenges the Tech Industry', 26 May 2015.
[7] 46 of the 48 interviews with Syria-based individuals were conducted in Syria (4 women, 42 men) and two with Syrians who were temporarily outside the country.
[8] The findings of the evidence review are available upon request.
[9] UNHCR G key informant interviewee.
[10] P. Witty, 'See How Smartphones Have Become a Lifeline for Refugees', *Time*, 8 October 2015, <http://time.com/4062120/see-how-smartphones-have-become-a-lifeline-for-refugees/> (16 October 2016).
[11] See generally, IDC, 'Smartphone OS Market Share, 2016' http://www.idc.com/promo/smartphone-market-share/os;jsessionid=5F440309F290FD8AC0F0B2243B932DB9 (1 January 2016).
[12] 86% of respondents (36/42) noted Google Android as the most-common phone operating system, with 7% each of respondents (3/42) stating the most-common operating system was Apple iOS and Microsoft OS. 79% of respondents (27/34) reported that Apple iOS was the second-most common phone operating system in use in Syria.
[13] EmpowerHACK key informant interviewee.
[14] 29/43 respondents noted they most commonly used smartphones to connect to the internet, 10/43 noting laptops.
[15] 17/34 noted they second most commonly used laptops to connect to the internet, 12/34 noting smartphones.
[16] For example, 'We use almost exclusively tablets, because prices are very low in any country around Syria. In Iraq they are very affordable. We use Wi-Fi-enabled tablets rather than 3G enabled, as they are even cheaper. Populations [in Syria] use almost exclusively smartphones' (IRC key informant interviewee).
[17] 16/24 respondents who answered this question reported having accessed the internet with their personal phone in the last six months.
[18] 23/88 responses indicated satellite internet as a means of connection to the internet in the last six months. Note that some interviewees noted more than one internet connection method, others did not.
[19] 20/88 responses indicated Wi-Fi networks were the means of connection to the internet in the last six months.
[20] 'It depends on the area. In the regime areas, the chances of men and women to access the internet are equal' (Female community member, East Aleppo).

[21] Local NGO worker interviewee, Ma'arat An Nu'man.
[22] CSO worker interviewee, Al-Hasakeh.
[23] Community member interviewee, Duma.
[24] Community member interviewees (two similar responses), Deir Ez Zor.
[25] 'There are special sections in the internet lounges for women', NGO worker interviewee, Duma.
[26] EmpowerHACK key knowledge interviewee.
[27] 18/22 (82%) of respondents who answered this question agreed that cost prevented some people from accessing the internet. In Idleb 1/4 agreed.
[28] Community member interviewee, Azaz.
[29] Two network technician interviewees referred to this 'free network' in Jabal Alzawie.
[30] LAC representative interviewee, Kafr Nobol.
[31] Data collected during field research and through discussions with RMTeam.
[32] 'The [small] number of internet lounges, the difficulty in getting to them increases the high cost of the internet packages' (Former LAC representative, Deir Ez Zor).
[33] Reported by two respondents from Deir Ez Zor with no other cost options described.
[34] Reported by three respondents from Duma with no other cost options described.
[35] '[There are] no unified prices for the internet packages' (Technician, Idleb) and 'There are different packages that start with 100 SYP and end by 1,000 SYP (LAC representative, Kafranobl) and 'The price depends on the consumption' (LAC representative, Amuda).
[36] '[I recharge] by a prepaid card for my Avea account and for MTN through a delegate' (Community member, Azaz).
[37] '[I recharge] SyriaTel through a street delegate to buy units, and Turkcell through friends to pay the charges' (Community member, Azaz).
[38] This point was raised by six out of 15 interviewees asked about differences between how humanitarian organisations and individuals in Syria were able to access the internet.
[39] 'For hospitals and services providers like LAC it [the internet] is for free and there are sales for the employees of those [organisations]' (Network technician, Azaz), '[There is] free service for organisations' (Network technician, Duma).
[40] 19/19 research respondents in Amuda (6), Idleb (9) and Azaz (4) volunteered information in support of this common view.
[41] Freedom House 2016 Report, <https://freedomhouse.org/report/freedom-net/2016/syria> (16 October 2016).
[42] MoCT, 'Service Update' [in Arabic], June 2016, <http://www.moct.gov.sy/moct/?q=ar/archive/2016/06> (16 October 2016).
[43] Network technician, Damascus.
[44] For more: http://www.reuters.com/article/us-mideast-crisis-syria-iran-idUSKBN1531TO
[45] 6/16 respondents in Amuda and Azaz (and nowhere else) reported that Turkish network content filters and politically-inspired service take-downs prevented access to some internet news sites and content.
[46] Researcher key informant interviewee.
[47] Private internet café owner, Deir Ez Zor.
[48] 'When you want to use the internet in the lounge, they take your name, age, account number and [information about] the person you are going to communicate with' (Former LAC representative, Deir Ez Zor).
[49] For example, 'there are many areas in Deir Ez Zor that have no internet coffee [shops] which make people go a long distance and pay a lot of money to access the internet' (Telephone network operator, Deir Ez Zor).

[50] Network technician interviewee, Dar'a.
[51] In Amuda and Azaz, interruptions were also attributed to Turkish network providers shutting down the internet on occasion.
[52] 'I have had cases where the [person I'm speaking to] tries to be as close as possible to the frontline [with the Government forces] to pick up the Syrian network and get better data access' (Field researcher key informant interviewee).
[53] Community member interviewee, Sayda. Another example from Amuda, 'People use internet provided by Turkish routers because it is cheaper and faster than the internet provided by the two mobile companies' (LAC representative, Amuda).
[54] Researcher interviewee, Dar'a.
[55] 'The speed is medium and decreases when [there is] high consumption vs. load. Low speeds problem is due to [Daesh] forbidding additional routers or access points' (Internet Café Owner, Deir Ez Zor).
[56] 'The mobile networks in Syria are still the government's networks. We haven't heard of any alternative networks' (Souktel key knowledge interviewee).
[57] 'The network is very simple; it transfers Zain telecom coverage through signal repeaters to Tafas city [in Dar'a]' and 'The connection depends on the location to the border and is also affected by factors like weather and the weakness of the Jordan Zain network' (Private internet café owner, Dar'a).
[58] Local NGO worker interviewee, Ma'arat An Nu'man.
[59] Community member interviewee, Sayda.
[60] 'The people prefer using the landline network because it is cheaper than the mobile' (CSO worker interviewee, Al-Hasakeh).
[61] 'The network serves all the villages in Deir Ez Zor and allows the people to communicate between each other in the villages but they can't reach other cities and of course they have to pay Daesh for providing them with it on a monthly basis' (Telephone network operator, Deir Ez Zor).
[62] 'There is no mobile network coverage in Daesh-controlled areas, especially in Deir Ez Zor, so people depend on the landline network which functions under ISIS control' (Telephone network operator, Deir Ez Zor).
[63] 'There are many packages that start with 50 SYP and end with 1,000 SYP' (CSO worker, Ma'arat An Nu'man).
[64] 'The price depends on the consumption - in addition to the monthly fees, the average residents pay 3,000 – 3,650 SYP to recharge every month or two months' (LAC representative, Amuda).
[65] Reported by LAC representative interviewee, Amuda.
[66] Reported by two community members, Deir Ez Zor.
[67] Reported by CSO worker, Damascus.
[68] See limitations of the research sample in section 4.2.
[69] 'Facebook Live videos feature is new and we use it instead of uploading [content], this feature provides high credibility' (Journalist activist interviewee, Azaz). A similar finding was reported by a media activist from Deir Ez Zor.
[70] Health professional key informant interviewee.
[71] All respondents from Deir Ez Zor (5) and Ar Raqqa (1) stated that fewer organisations were using mobile technology in their work over the past six months, 'due to the restrictions imposed by Daesh' (LAC representative, Deir Ez Zor).
[72] 'A lot of organisations have started to work in the area lately' (Community member, Duma), 'The number of organisations [here] has increased because the areas are safe compared to other areas inside Syria' (CSO worker, Al-Hasakeh) and '[There is] an increase in [the] number of organisations and companies working in this area' (Field Monitor interviewee, Azaz).

[73] 'As per my experience I worked with World Vision and RMTeam and both are shifting toward mobile technology in their work' (Field Monitor interviewee, Azaz).
[74] '[There is a] growing need to document the work and making reports' (Oxfam Engineer interviewee, Aleppo) and '[there is] an increase in [the] number of organisations … where M&E work is highly required' (Field Monitor interviewee, Azaz).
[75] Mobile Money is an electronic wallet service, available in many countries, that lets users store, send and receive money using their mobile phone. See World Remit for more information (https://www.worldremit.com).
[76] See eg, 'How Technology is Helping Deliver Aid to Syrian Refugees in the Middle East' <http://www.computerweekly.com/feature/How-technology-is-helping-deliver-aid-to-Syrian-refugees-in-the-Middle-East> (16 October 2016) and E. M. El-Huni, 'WFP e-voucher programme in Lebanon', <http://www.ennonline.net/fex/48/wfpevoucher> (16 October 2016)
[77] In areas such as Aleppo, the only viable way to transfer money is via 'cash mules' who physically carry money from Turkey. E.g. Z. Al Shimale, 'Aleppo's money mules grounded by surge in Syria fighting', *Middle East Eye,* September 2016
[78] See Caelainn Hogan, 'Syria war: Money transfer "a matter of life or death"' 24 August 2016.
[79] For example, 'Organisations are using [mobile technology] less, at least that involves GPS tagging, because of the amount of infrastructure and in particular hospitals that have been hit by airstrikes by the regime' (Field researcher key informant interviewee).
[80] See e.g. <http://www.epocrates.com/>, SAMS key informant interviewee.
[81] Researcher interviewee, Duma.
[82] 79% (11/14) respondents who answered this question agreed with this view.
[83] 'Mobile technology is being used for: assessments, distribution, looking up information [and] for Refugee Status Determination (RSD) in Egypt and in Turkey' (UNHCR G key informant).
[84] 'Social communication apps are used by everyone, while specific apps like KOBO are used by organisations only' (Journalist interviewee, Azaz).
[85] For example, 'Kobo collect is the most important programme for the organisations due to the easiness of using the application and saving large amounts of data without being connected to the internet' (Community member, Deir Ez Zor) and 'the app is very easy to use. You only need a simple training' (Media Activist, Deir Ez Zor).
[86] For example, 'it works very well with smart phones using Android … downloaded from Google Play' (Media Activist, Deir Ez Zor).
[87] UNHCR Information Management Working Group key informant interviewee.
[88] UNHCR Information Management Working Group key informant interviewee.
[89] 22% of respondents (5/23) noted each of these user groups as the prime beneficiaries of the mobile technology adopted by the organisations they had worked with in the last six months.
[90] IRC key informant interviewee.
[91] RMTeam key informant interviewee noted that 'We created Blue Data for collection inside Syria … for both smartphone and tablet, on Android. What pushed us to create our own app was that the security on other apps was not [sufficient]. Everything [on our app] is conducted with end to end encryption.
[92] UNHCR Information Management Working Group key informant interviewee.
[93] UNHCR Information Management Working Group key informant interviewee.
[94] SAMS key informant interviewee.
[95] RMTeam key informant interviewee.

[96] Mentioned 24 times by 48 interviewees.
[97] Mentioned in turn 20, 17, and 15/ times by 48 interviewees.
[98] *'[The knowledge] is quite different between organisations and individuals. There is a lack of knowledge regarding specialised software and apps'* (Journalist, Deir Ez Zor).
[99] 'Everyone is reliant on mobile technology for communication … Even a grandmother in Syria might now be using applications such as WhatsApp' (Field researcher key informant interviewee).
[100] Another example, 'The internet is the only way to communicate with the outside world. People minimize their use of the internet due to constant surveillance and restrictions imposed by Daesh' (Former LAC representative, Deir Ez Zor).
[101] Stated to be a concern or major challenge by 8/10 key informant interviewees.
[102] Network technician interviewee, Amuda.
[103] CSO worker, Al-Hasakeh.
[104] Network technician interviewee, Amuda.
[105] Adapted from DFID, *DFID's Approach to Value for Money* (VfM) (July 2011).
[106] 'Using the application saved us money for not printing the questionnaires' (Researcher interviewee, Dar'a) and 'It is cheaper than communicating through landline or mobile networks' (CSO worker, Al-Hasakeh).
[107] EmpowerHACK key informant interviewee.
[108] UNHCR G key informant interviewee
[109] In this case, 'partnerships' refers to situations where a private sector actor would take on some of the budgetary risk of developing an example of mobile technology, probably in return for some potentially profitable end result with users, for enhanced reputational benefits, or as part of a Corporate Social Responsibility endeavour.
[110] UNHCR J key informant interviewee.
[111] WFP key informant interviewee.
[112] 'We need to pilot at low cost and then decide later on whether or not there is a need to scale up' (UNHCR G key informant).
[113] E.g. Harvard Humanitarian Initiative, 'Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies', UN Foundation and Vodafone Foundation Technology Partnership, 2011 and F. Mancini (ed.), 'New Technology and the Prevention of Violence and Conflict', International Peace Institute, April 2013.
[114] WFP key informant interviewee.
[115] M. Duffield, 'Disaster-Resilience in the Network Age: Access-Denial and the Rise of Cyber-Humanitarianism', DIIS Working Paper No. 23, 2013, <http://en.diis.dk/files/publications/WP2013/WP2013-33_Disaster-resilience-cyber-age_Duffield_web.pdf> (16 October 2016).
[116] DANIDA Annual Review of funding to Syria, copy with author.