REMOTE DATA COLLECTION FOR FOOD SECURITY AND ECONOMIC VULNERABILITY

PART 1 – DESK REVIEW

ICRC

DESK REVIEW

This is Part 1 of a review of remote data collection carried out to assess food security and economic vulnerability. The review – commissioned by the Economic Security Unit of the International Committee of the Red Cross – is divided into two complementary parts that are meant to be read together: there are numerous cross-references. Both parts of the review contain key practical recommendations. A general understanding of the background is needed for any exercise in collecting data remotely.

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ABBREVIATIONS

CATI	Computer-assisted telephone interview
EcoSec	Economic Security Unit
FCS	Food consumption score
FGM	Female genital mutilation
GIS	Geographic information system
GPS	Global Positioning System
ICRC	International Committee of the Red Cross
ICT	Information and communication technologies
IoT	Internet of Things
IVR	Interactive voice response
MAD	Minimum acceptable diet
MDD-W	Minimum dietary diversity for women
mVAM	Mobile Vulnerability Analysis and Mapping
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
RCSI	Reduced coping strategy index
RDC	Remote data collection
RDD	Random digit dialling
SIM	Subscriber identity module
SMS	Short Messaging Service
SoP	Standard operating procedures
SWOT	Strengths, Weaknesses, Opportunities, and Threats
UAV	Unmanned aerial vehicle
UID	Unique identifiers
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
WFP	United Nations World Food Programme

EXECUTIVE SUMMARY

Remote data collection (RDC) is a process by which information from a target population or area – or pertaining to an object or condition (environmental, biological, physical, etc.) – is collected without the data collector being physically present in the area of interest. RDC tools are generally able to collect data at a high frequency in a cost-effective manner. Telecommunications and the internet are the most important enablers for the use of RDC tools.

In the humanitarian and development context, the main RDC tools used are mobile phone-bases, such as telephone interviews and SMSs. Satellite and drone imagery are also used, for purposes ranging from disaster response to crop monitoring. Various agencies and organizations also use internet-based messaging applications customized for their specific purposes. The use of crowdsourcing services is on the rise: volunteers across the world offer their expertise in analysing disaster maps, the people affected send messages about what is needed and where during disasters, etc. In addition, devices connected to the internet are increasingly being used to get real-time information in connection with floods and pollution, for instance; to track population movement; to get data on malfunctioning community hand pumps and mills; and so on.

The increased appetite for data collection among humanitarian and development agencies has had a positive impact on the whole: organizations are now keen to make evidence-based decisions supported by interactive visualizations, analytics, and even machine learning. However, it has also been argued that **this enthusiasm for data in the humanitarian sector is vastly greater than the sector's capacity to analyse data meaningfully**. Humanitarian and development agencies are now more aware of the risks arising from data collection. They are also more interested in – or more committed to – complying with data-protection regulations: to that end, they carry out the privacy- and risk-impact assessments necessary to safeguard the privacy, dignity, and security of the people and communities whose information they collect and process.

The ICRC does not have much experience in using RDC tools to assess a particular situation or monitor its projects. It does, however, use computer-assisted telephone interviews (CATIs) in several countries to monitor project outputs and to cross-check beneficiary lists before delivering assistance. And plans are under way to use drones to conduct crop monitoring. Hence, even though RDC tools are not used extensively at present, awareness of these tools and interest in using them already exist within the organization.

The use of institutionally approved tools such as Device Magic and Red Rose to collect and manage data helps ensure that the entire RDC life cycle follows the 'privacy-by-design' approach. It is recommended that these tools become a standard for managing field data, whenever possible and even if the actual data collection is carried out by third-party service providers.

Building successful and sustainable systems for remote data collection requires the following: i) a genuine need for the system to fill gaps in information ii) partnerships with institutions having the same kinds of expertise; iii) develop tools in line with an organization's strategic objectives and expertise; and iv) investment in developing organizational capacities.

Before deciding whether or not to use RDC it is necessary to assess the characteristics of the target population, analyse the operational environment, and ascertain the availability of funding. All this can be done by means of a formative study prior to tool selection: the study should include technical, social, geographical, and risk analyses. The activities implemented to collect data remotely – stakeholder engagement, sampling, tool verification, training, data management, analysis, and reporting – must be carried out properly to ensure the success of a data-collection project.

OBJECTIVES AND METHODOLOGY

The experiences of ICRC delegations in several different countries – Libya, Yemen, the Democratic Republic of the Congo, and Somalia – were studied as part of a review exercise to understand the organization's use of RDC tools. The review was conducted via telephone interviews with ICRC staff based in delegations and regional offices, and at headquarters in Geneva. Relevant ICRC documents were also included in the review.

Internet searches for documents related to RDC were also undertaken, to understand the current RDC practices of various agencies in the humanitarian and development sectors; and a few relevant persons from other organizations were also contacted and interviewed. The primary purpose of all this was to leverage best practices and lessons learnt to develop a list of RDC tools and general guidelines on their implementation. The following activities were conducted as part of the review:

- reviewing ICRC practices in RDC and highlighting the lessons learnt
- evaluating achievements and identifying practices and success stories within EcoSec and other units at the ICRC
- analysing the tools used to collect data remotely, in the humanitarian and development sectors
- assessing tools used by other organizations that may be suitable for testing in ICRC contexts, identifying risks associated with their use, and formulating measures to mitigate these risks
- consulting with the ICRC Data Protection Office to ensure that RDC activities undertaken in the future comply with internal rules and policies.

REMOTE DATA COLLECTION: AN INTRODUCTION

BACKGROUND

The challenges faced by the humanitarian sector in delivering critical assistance to people affected by humanitarian crises are becoming bigger, and their main characteristics are a complex operational environment and expanding needs among the people affected. Around 1.8 billion people are estimated to be living in fragile contexts. This number is expected to reach 2.3 billion by 2030; these fragile contexts are also where around 80 per cent of the poorest people in the world could be living by 2030.[1] The scale of assistance needed by some of the most vulnerable people in the world puts even more pressure on a humanitarian sector struggling with resource constraints. The development sector is also waking up to the challenges of implementing development projects in insecure settings: it now recognizes "fragility" as an operational reality.[2]

Delivering the right assistance to the right people at the right time requires knowledge of the population affected and their immediate and long-term needs, and of the social, political, and ecological context in which they live; it also requires continual monitoring of the impact or effectiveness of any assistance project that is undertaken. Such information is needed now more than ever, as the number of people in need of assistance continues to grow, and as humanitarian and development organizations seek to make more efficient use of their limited funds. Traditional methods of gathering information – such as face-to-face interviews and monitoring visits – are becoming ever more difficult to implement because of the growing complexity of humanitarian crises, which often gives rise to concerns about security and leads to the people affected becoming less accessible. Field visits are also costly and time-consuming: they require weeks if not months to plan and carry out. As a consequence of these various constraints, humanitarian and development organizations and agencies have been exploring alternatives to traditional methods of data collection and seeking means to maintain some degree of field presence in areas inaccessible to their staff.

RDC

Rapid digitization – made possible by major advances in electronics and information technology – has opened up new ways to deliver assistance, by transforming the business processes of humanitarian and development actors. From digital identities that guarantee rights and entitlements to the use of 3-D printing to provide much-needed equipment, technology has revolutionized the way assistance is delivered to people in need. In the past decade, internet and telecommunication networks have significantly changed the way people and communities all over the world connect with each other and share information. As a result, organizations are, increasingly, seeking to use the internet, and mobile- and satellite-based services, to gather information that would be too costly, time-consuming or difficult to gather by traditional means. A major innovation in this regard is the use of RDC tools to gather information from the field.

RDC is a process by which information from a target population or area – or pertaining to an object or condition (environmental, biological, physical, etc.) – is collected or monitored without the data collectors or monitors being physically present in the area of interest. There are numerous devices and

1 OECD Development Co-operation Directorate, *States of Fragility 2018: Highlights*: https://www.oecd.org/dac/conflict-fragility-resilience/docs/OECD%20Highlights%20documents_web.pdf

2 *Ibid.*

technologies that facilitate RDC, but internet-based technologies and telecommunication services are the most important ones. They have allowed people that are worlds apart to remain connected and to communicate via mobile phones and computers. The RDC tools most commonly used by humanitarian and development organizations can be classified broadly, into the following categories (but there will be some overlap as the enabling technologies are the same in some cases):

- mobile-based tools
- internet-based tools
- tools based on satellite and aerial imagery
- tools enabled by the Internet of Things (IoT).

Mobile-based RDC tools

The number of mobile phone users in 2020 is estimated at 4.78 billion,[3] which is 61 per cent of the total population of the world. It should be kept in mind that mobile subscription rates vary greatly between countries.[4] The widespread use of mobile phones has opened up access to people in remote or hard-to-reach areas; physical visits are not needed anymore. Some of the most commonly used mobile-based RDC tools are described below:

Computer-assisted telephone interview (CATI). CATI is a telephone surveying technique in which the interviewer follows a script provided by a software application. CATI, which has been used since the 1970s for market research, is now the RDC tool of choice in the humanitarian and development sectors.

Interactive voice response (IVR). IVR is an automated telephony system technology that enables interaction with respondents to gather the required information: users communicate via either the touch-tone keypad selection or voice telephone input.[5] Sophisticated IVR systems can gather responses through spoken words with voice recognition. IVR is typically used in settings where a large number of people need to be reached, and especially in areas with low literacy rates.

Short Messaging Service (SMS). SMS-based RDC tools make it possible to reach a target population through a series of pre-defined text messages. Respondents also send their answers in text messages. SMS-based RDC tools can be used to contact large numbers of people; however, unlike IVR, they need respondents to be literate.

Internet-based RDC tools

It is estimated that there are 4.13[6] billion internet users throughout the world; and mobile internet traffic is said to constitute 52 per cent of all global online traffic.[7] Currently, there are around 2.96 billion people using social media platforms.[8] Facebook, WhatsApp and WeChat are among the most widely used messaging apps. These social media applications wield tremendous power in modern society, not just to connect people but also to shape public opinion. As a result, humanitarian and development organizations have been making use of the long reach of the internet to collect information, by means of the internet-based RDC tools described below:

Tools based on social messaging platforms: Messaging tools such as U-Report[9] that are available via SMS, Facebook and Twitter have been successfully used to conduct polls and collect information to support decision-making processes.

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3 Statista Research Department, "The number of mobile phone users worldwide from 2015 to 2020" (2018): https://www.statista.com/statistics/274774/forecast-of-mobile-phone-users-worldwide/

4 World Bank, "Mobile cellular subscriptions (per 100 people)", 2019: https://data.worldbank.org/indicator/IT.CEL.SETS.P2?end=2018&start=1989

5 Miruna Mitranescu, "IVR definition and benefits", *Aircall* (25 August 2016): https://aircall.io/blog/call-center/interactive-voice-response/

6 Statista Research Department, "Internet usage worldwide: Statistics & facts" (8 September 2020): https://www.statista.com/topics/1145/internet-usage-worldwide/

7 Statista Research Department, "Mobile internet usage worldwide: Statistics & facts" (11 September 2019): https://www.statista.com/topics/779/mobile-internet/

8 Statista Research Department, "Number of social media network users worldwide from 2010 to 2021" (2019): https://www.statista.com/statistics/278414/number-of-worldwide-social-network-users/

9 UNICEF Office of Innovation, U-Report: https://www.unicef.org/innovation/U-Report

Tools based on crowdsourcing: In the context of information collection, 'crowdsourcing' refers to the process of collecting data from the 'crowd' of people who submit their data via SMS, the internet – including social media – smartphone apps, etc. Crowdsourcing has been very useful during disasters, when members of the population affected who had access to phones, the internet, or mobile networks were able to send data to aid the relief effort.

Big data-based analytical platforms: An Oxford dictionary online defines big data as "extremely large data sets that may be analysed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions". Although not a data-collection tool, big-data analytics enables the mining of large volumes of data generated by structured and unstructured sources, which can then be used to uncover hidden patterns and correlations. For example, analyses of big-data sources such as Twitter feeds have been used to map the scale of disasters and identify the areas most affected.

RDC tools based on satellite and aerial imagery

Photographs and other images of the earth taken by earth-orbiting satellites, or by unmanned aerial vehicles(UAVs) or drones, provide a great deal of information. Data collected like this have a wide range of applications, from land-use mapping to resource exploration; lately, they has also proven their usefulness in supporting humanitarian action.

RDC tools enabled by the Internet of Things

The International Telecommunication Union (ITU) defines the Internet of Things (IoT) as "a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.[10] In other words, 'IoT' refers to an interconnected network of devices capable of capturing and sending information over a communication network, for the purpose of enabling appropriate action. For example, devices that remotely capture information on weather conditions – temperature, atmospheric pressure, etc. – have enabled the creation of early-warning systems, with life-saving consequences.[11]

10 Phillippa Biggs (ITU) et al., Harnessing the Internet of Things for Global Development, 2016: https://www.itu.int/en/action/broadband/Documents/Harnessing-IoT-Global-Development.pdf

11 Libelium Sales Department, "Early flood detection and warning system in Argentina developed with Libelium sensors technology" (27 June 2018): http://www.libelium.com/early-flood-detection-and-warning-system-in-argentina-developed-with-libelium-sensors-technology/

RDC IN THE HUMANITARIAN AND DEVELOPMENT CONTEXT

Over the past decade, there has been a major shift in the data-collection paradigm in the humanitarian sector. Organizations are moving towards adopting solutions that do not require them to have a physical presence in the field. This largely grew out of a need to better assess and monitor insecure and hard-to- reach areas where large-scale humanitarian operations were in progress, but without adequate traditional monitoring frameworks in place. Most humanitarian actors operate in highly fluid environments; they therefore have to conduct assessments frequently, to ensure that the information generated by them remains relevant – for themselves and for the broader humanitarian community.

RDC tools have also found favour in the development context, where their use has been driven mostly by the need to develop high-frequency and low-cost monitoring systems. The World Bank used mobile phone-based surveys to collect data for policy-level decision-making following the financial crisis of 2008; these are some of the earliest examples, in the development setting, of the use of RDC tools.[12] This has been made possible by the rapid proliferation of digital communication systems across the world.

This section highlights some of the contexts in which RDC tools have been used with considerable success. It should be noted that the examples below illustrate the use of RDC tools in specific contexts. However, with adequate research and a detailed understanding of the prevailing needs, these tools can be adapted for use in other contexts as well.

SITUATION MONITORING IN INSECURE AND HARD-TO-REACH AREAS

RDC tools are being used, increasingly, to monitor a wide range of issues – physical safety, food security economic vulnerability, etc. – in insecure and hard-to-reach areas. In these comparatively inaccessible areas, RDC tools offer an alternative approach; and the information generated by them provides invaluable support for humanitarian decision-making based on the facts on the ground.

Mobile Vulnerability Analysis and Mapping (mVAM) is an RDC project by the WFP that uses mobile-phone technology to remotely monitor household food security and nutrition, and food market-related trends in real time.[13] Launched in 2013 with small-scale pilots in Somalia and the Democratic Republic of the Congo, it is currently operational in 32 countries across all six WFP operational regions.

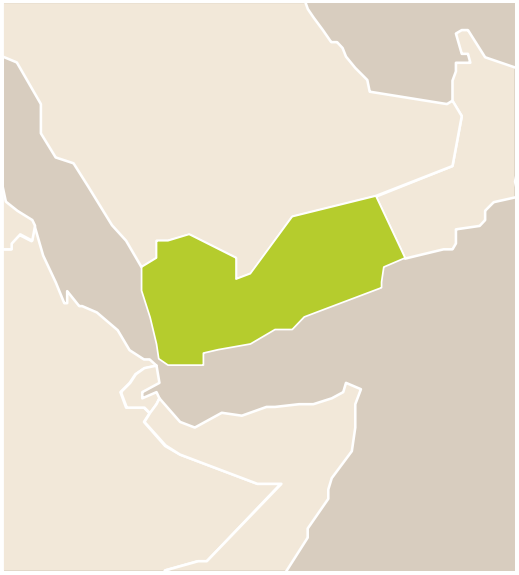
The CATI is the RDC tool used most extensively by the mVAM project: every month, tens of thousands of telephone calls are made in several different countries to assess food security in the population of interest. After each round of data collection, food-security bulletins containing the most significant findings are produced and shared publicly through the mVAM[14] website.

12 Amparo Ballivian, João Pedro Azevedo and Will Durbin, "Using mobile phones for high-frequency data collection", chapter from D. Toninelli *et al.* (eds), *Mobile Research Methods: Opportunities and Challenges of Mobile Research Methodologies,* Ubiquity Press, London, 2015: https://www.ubiquitypress.com/site/chapters/10.5334/bar.c/

13 WFP , "Mobile Vulnerability Analysis and Mapping (mVAM): Delivering real-time food security data through mobile technology": https://vam.wfp.org/sites/mvam_monitoring/

14 See also: https://vam.wfp.org/sites/mvam_monitoring/

COUNTRY: YEMEN



Context: The war in Yemen escalated in 2015, when a coalition led by Saudi Arabia intervened, in behalf of the internationally recognized government, against Houthi rebels. The conflict became widespread and led to a humanitarian catastrophe. In an already impoverished country this meant further economic decline, food insecurity, and the collapse of essential services. It thus became extremely important to collect information about the situation on the ground, in order to facilitate the scale-up of humanitarian operations. However, most conflict-affected areas in need of urgent assistance could not be reached to collect data by traditional means.

Agency: In July 2015, WFP Yemen – using the mVAM approach – began remote, phone-based data collection to monitor food security in the country.

Monitoring indicators: Three outcome-level indicators were used to monitor food security: i) FCS; ii) RCSI; and iii) MDD-W.

Methodology: The phone-based survey was conducted at the household level to assess and monitor food security and economic vulnerability among conflict-affected Yemeni households. A rotating panel design was used, in which every day, respondents were randomly selected from previous survey rounds, and new respondents added to the sample. This compensated for rates of non-response; it also reduced the degree of change associated with introducing new households into the sample. The phone interviews covered all mobile network operators and phone numbers were generated via RDD. Some 2500 households from 21 governorates are interviewed every month.[15]

Outputs: The monthly survey helped WFP Yemen understand the severity of food insecurity, and the variability in food security, among conflict-affected Yemeni households. By February 2019, the project had produced 42 food-security bulletins. The aggregate food security data can be downloaded from the mVAM website and the humanitarian data exchange portal.[16]

Impact: Identification of the severity of food insecurity and its temporal dimension enabled the WFP and other humanitarian agencies to revise their food-assistance programming to ensure that conflict-affected households received an adequate amount of food when they needed it the most.[17]

Strengths:

- Data was collected at high frequency; this made it possible to monitor changes in food insecurity.
- The survey was the best source of field information, given the accessibility constraints.
- It did not put enumerators at unnecessary risk.
- In some contexts, telephone surveys were more cost-effective than face-to-face interviews.

Limitations:

- Given the survey design, the representativeness of the findings was limited to the population with access to phones.
- There was also the possibility of leaving out the most vulnerable sections of the populations, which introduced a bias in the estimates.
- The survey could incorporate only limited, and carefully tested, sets of questions.

15 WFP, *Yemen mVAM Methodology:* https://vam.wfp.org/sites/mvam_monitoring/Methodology/read_me_yemen.pdf

16 The Humanitarian Data Exchange (HDX), "Yemen – Food security indicators" (2019).

17 WFP, "Humanitarian food assistance is playing a critical role in mitigating the severity of food insecurity in Yemen", 2019: https://docs.wfp.org/api/documents/WFP-0000103438/download/?_ga=2.83194258.587238993.1583916872-1077692345.1580699588

WHAT IS RDD?

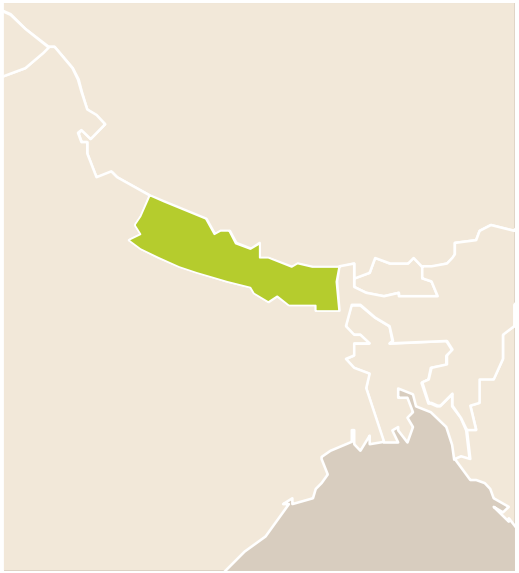
RDD is a method of generating phone numbers randomly, and is used mainly when a list of phone numbers to be called for interviews is not available. RDD might produce non-existent phone numbers and waste time. Machine learning algorithms – based on a small subset of verified existing numbers – have been used recently to create new numbers that are more likely to be of use.

REPRESENTATIVE SURVEYS USING MOBILE PHONES

In general, data collected through mobile phones will have certain biases, the most significant of which is the exclusion of people without access to phones. Bias can also occur if there are significant differences between people who own mobile phones and people who do not. Identifying sources of bias is often not a straightforward process. All these factors make it difficult for the estimates generated to be representative of the target population.

In recent times, a few empirical studies have looked into the possibility of using mobile phones to collect representative statistics on a limited set of indicators. The World Bank has developed one of the most important sets of guidelines[18] for surveyors considering the use of mobile phones to collect representative data.

COUNTRY: NEPAL



Context: After a decade-long conflict during the turn of the century, Nepal has gradually moved towards peace and stability in recent years. However, it remains a poor country and is ranked, based on the human development index, 147th out of 189 countries.[19] It is also a small country, with a rugged terrain: hills and mountains cover almost 75% of the land. This makes field surveys extremely challenging.

Agency: Since 2016, the government of Nepal with technical assistance from the WFP has been conducting a mobile phone-based household survey[20] in some of the most food-insecure and remote districts of the country In these areas, poverty and stunting are much higher than elsewhere in Nepal, and much higher than the national average.

Major indicators: The indicators monitored by the survey include the FCS, the coping strategy index, household shocks, market prices, availability of food items, and market conditions.

18 Andrew Dabalen *et al.*, *Mobile Phone Panel Surveys in Developing Countries: A Practical Guide for Microdata Collection*, International Bank for Reconstruction and Development / The World Bank, Washington DC, 2016: https://openknowledge.worldbank.org/bitstream/handle/10986/24595/9781464809040.pdf

19 UNDP, "Inequalities in human development in the 21st century: Briefing note for countries on the 2019 *Human Development Report:* Nepal", *Human Development Report 2019* (2019): http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/NPL.pdf

20 WFP, mVAM Food Security Monitoring: Nepal: https://dataviz.vam.wfp.org/reports_explorer

Methodology: To track seasonal changes over time in the remote middle and far-western regions, WFP Nepal, in collaboration with Nepal Food Security Monitoring System (which is under the Ministry of Agricultural Development), launched a food-security monitoring survey with a panel of 1,470 randomly selected households. A representative face-to-face baseline assessment was conducted in November 2016; and in June 2017, WFP completed the first follow-up survey through dual-mode data collection, which combined face-to-face and remote phone-based surveys. Call-survey respondents were contacted through a call centre and asked to respond to a brief set of questions. To compensate for any attrition that might occur, the sample frame was periodically refreshed with new households via face-to-face interviews; this resulted in a rotation design, during each survey round, that consisted of new and previously interviewed households.

The estimates produced from the project were representative of the mountainous middle and far- western regions of Nepal. A total of 89 traders were also interviewed via telephone calls, for information on market prices, food availability and market conditions.

Outputs: The survey highlighted the significant differences in food security between households in the eight districts surveyed and the rest of the country. The results showed that households in these areas were significantly more food insecure. The findings of the survey are periodically published in the food-security bulletins produced jointly by the WFP and the government of Nepal.

Impact: The bulletins have been used by the government of Nepal and the WFP, and by other stakeholders, to implement programmes related to food security in the regions surveyed.

Strengths:

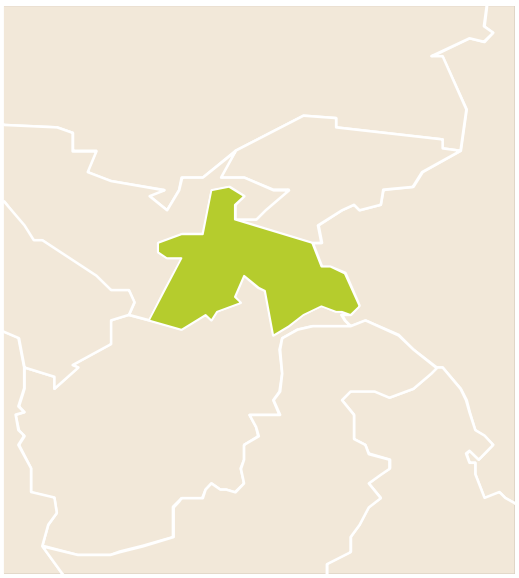
- The data was representative of the target population, given the survey design.
- The estimates generated were accepted as a valid source of information – and used – by national statistical agencies.
- This type of survey is also an inexpensive alternative to a full face-to-face survey.

Limitations:

- The survey followed a complex design, so implementation was not straightforward. Significant expertise is needed to design and implement a survey of this type.
- The survey is costlier than the usual CATI survey, as it requires some fieldwork (an face-to-face survey at the initial stage).
- The survey may not work as well when high-frequency data collection is needed, if a rotation-based design is implemented (as in Nepal).

HIGH-FREQUENCY NATIONALLY REPRESENTATIVE SURVEYS

COUNTRY: TAJIKISTAN



Context: Tajikistan is the poorest country in Europe and Central Asia and particularly vulnerable to shocks to household well-being. It faces substantial risks to livelihoods and welfare: seasonal shortages of electricity, water and heating – and in 2014, the economic downturn in the Russian Federation. Monitoring these challenges was therefore crucial.[21]

Agency: In May 2015, the Poverty and Equity team at the World Bank launched Listening to Tajikistan, a monthly, nationally representative, phone-based survey of households. Listening to Tajikistan provides timely data on income sources, employment, vulnerabilities, and household responses to risk and deprivation.

Methodology: In March 2015, a comprehensive face-to-face was conducted with 3000 households in Tajikistan. Households from this baseline interview were then randomly selected for participation in the high-frequency portion of the survey, which was based on mobile phone interviews. This design ensured that participants remained as geographically dispersed as in the baseline survey, and minimized the intra-cluster correlation of respondent characteristics to the greatest extent possible. Sample weights for households were adjusted to reflect the sub-sample design developed on the basis of the baseline survey of 3000 households.

Outputs: A comprehensive review of the first 24 rounds of the Listening to Tajikistan survey (covering the period from May 2015 to December 2016) found strong associations between monthly changes in subjective well-being and food security, income, employment, sending household members abroad, illness, and medical expenses. The analysis sent one unambiguously clear message: in Tajikistan, the unavailability of a sufficient quantity of food – as defined by the respondent – was very strongly related to a state of contentment, or satisfaction with life. When a household goes from sufficient to insufficient, it is often accompanied by a large drop in well-being, due to other types of shock.

Impact: The outputs of the survey highlighted the importance of food security for household well-being. This led to the development of a food-security policy document that drew attention to the importance of food security in people's lives.

Strengths:

- The data was representative of the target population, given the survey design.
- The high-frequency aspect of the survey enables regular tracking of changes.
- This type of survey is also an inexpensive alternative to a full face-to-face survey.

Limitations:

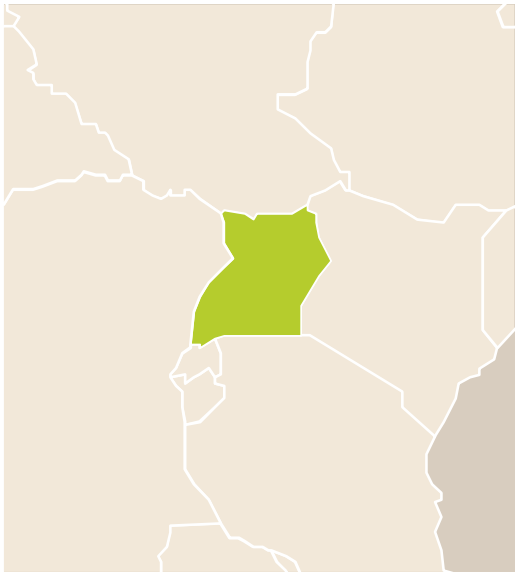
- The survey design was complex, so implementation was not as straightforward.
- The survey required an initial representative face-to-face-based household survey to collect phone numbers.
- As it is a panel survey, it can suffer attrition when respondents drop out before the end of the survey.

21 Chiara Broccolini, William Seitz and João Pedro Azevedo, *Listening 2 Tajikistan Household Survey: Background, Implementation, and Methods*, World Bank Group, 2017: http://documents.worldbank.org/curated/en/624621538136672723/pdf/130293-WP-PUBLIC-ListeningtoTajikistanHouseholdSurvey.pdf

SOCIAL MESSAGING TOOLS

Social messaging tools are widely used throughout the world. Billions of people regularly use such applications as WhatsApp, WeChat, Snapchat, and Viber. It is estimated that WhatsApp alone has 1.6 billion users; Facebook Messenger has 1.3 billion, and WeChat 1.1 billion, users.[22] Taken together, these users make up more than half of the world's population. In addition, people throughout the world send a total of 23 billion SMS messages every day.[23] Given the popularity of these messaging platforms, it is no surprise that the humanitarian and development communities have been looking into the possibility of using these platforms, including SMS, to collect and disseminate information in connection with their activities.

COUNTRY: UGANDA



Context: Uganda has one of the youngest populations in the world: the median age is estimated to be 17.[24] It is expected to have 100% network coverage by 2020, with a mobile-phone penetration rate of 70%.[25] This presents a valuable opportunity to engage with young people, and collect and share information on various matters of importance, from health and education to disease outbreaks.

Methodology: U-Report[26] is a social messaging tool and data-collection system developed by UNICEF to improve citizen engagement, inform leaders, and foster positive change. The system sends SMS polls and alerts to participants, collects responses in real time, and subsequently publishes the data that has been gathered.[27] U-Report is available via numerous messaging, social media (Facebook Messenger and Twitter) and SMS channels, and even works on a basic mobile phone.[28]

Outputs: At present, U-Report has more than 404,000 subscribers in Uganda. Interacting with such a large audience has given the system an accurate picture of a broad range of social issues. For example, U-Report recently conducted a survey on the rise in FGM cases in the Sebei and Karamoja region in 2019; the poll revealed that cultural issues played a major role in FGM. Some 50% of the respondents said that the practice was continuing in their communities, which they named.[29]

Impact: Because of the poll communities still practising FGM were identified; and this will enable the relevant agencies to implement awareness-raising campaigns and other activities to prevent FGM.

Strengths:

- Tools based on social messaging can reach a large number of people.
- A network of reporters can provide information that is crucial for project planning.

22 Statista, "Most popular global mobile messenger apps as of October 2019" (2019): https://www.statista.com/statistics/258749/most-popular-global-mobile-messenger-apps/

23 Teodora Dobrilova, "35+ must-know SMS marketing statistics in 2020": https://techjury.net/stats-about/sms-marketing-statistics/#gref

24 Statista, "Uganda: Average age of the population from 1950 to 2050" (2019): https://www.statista.com/statistics/447643/average-age-of-the-population-in-uganda/

25 Robert Sebunya, "12 things you need to know about Uganda's mobile landscape", *TechJaja*, 15 March 2018: https://www.techjaja.com/12-things-need-know-ugandas-mobile-landscape/

26 UNICEF Office of Innovation, *U-Report*: https://www.unicef.org/innovation/U-Report

27 *Ibid.*

28 U-Report Uganda, *About Us* (2019): http://ureport.ug/v2/about/

29 U-Report Uganda, *Opinions* (2019): http://ureport.ug/v2/opinion/3877/

Limitations:

- Depending on the demography of the reporters, survey results can be biased in ways that are not easily identified.

CHITCHAT: A CHATBOT TO SUPPORT HUMANITARIAN ORGANIZATIONS[30]

The increase in mobile connectivity and the use of instant messaging platforms have opened up new channels to communicate with people in crisis. Now, humanitarian organizations can communicate directly with local communities. But this can also create daunting new challenges: such direct communication might provoke a massive volume of incoming messages, and humanitarian organizations will have to find ways to adequately process and respond to them.

ChitChat is a chatbot designed by the Centre for Innovation at Leiden University to support organizations in direct communication with people in crisis. This means support for any or all of the following activities: RDC; enabling communities to indicate their needs; answering questions; providing critical information; and classifying messages sent through many different channels.

Tests are being conducted to determine how ChitChat could supplement existing helplines for beneficiaries and allow them to provide information back to communities, for example, on food prices and assistance programmes.

30 Centre for Innovation – Leiden University, "CFI chatbot to support humanitarian organizations" (2019): https://www.centre4innovation.org/stories/cfi-chatbot-to-support-humanitarian-organisations/

CROWDSOURCING AND BIG-DATA ANALYTICS FOR CRISIS MAPPING

Crowdsourcing is a method of data collection that relies on social-media communities and users of messaging tools to answer questions and provide relevant information. Humanitarian organizations have used crowdsourcing to gather crucial information immediately after disasters, as was the case in Haiti during and after the earthquake of 2010[31] In Haiti, huge volumes of data were gathered – via Twitter, Facebook and other social media – and analysed simultaneously.

COUNTRY: HAITI

Context: On the afternoon of 12 January 2010, magnitude 7.0 earthquake struck Haiti, a country that had been enduring decades of political, economic, and social crises.[32] Approximately 3 million people were affected by the earthquake, which was the most devastating natural disaster that had taken place in Haiti, the poorest country in the Western Hemisphere. Roughly 250,000 lives were lost and 300,000 people injured. About 1.5 million people were forced to live in makeshift camps. The earthquake created humanitarian needs on a scale that was unprecedented in the country's history.

Methodology: A toll-free SMS number was set up to gather information on the most urgent needs and their location. The people affected – and anyone with pertinent information – could send SMS messages to this number.[31] Sources of big data – Twitter, Facebook, and other social media – were used to create crisis maps.

Outputs: Tens of thousands of SMS messages were received from people in the areas affected, stating their needs and asking for help. These messages were translated and geo-located by hundreds of volunteers on the internet.

Outcome: "I cannot overemphasize to you what the work of the Ushahidi/Haiti has provided. It is saving lives every day. I wish I had time to document to you every example, but there are too many and our operation is moving too fast. Your site saved these people's lives. I say with confidence that there are 100s of these kinds of stories. The Marine Corps is using your project every second of the day to get aid and assistance to the people that need it most." (US Marine Corps)

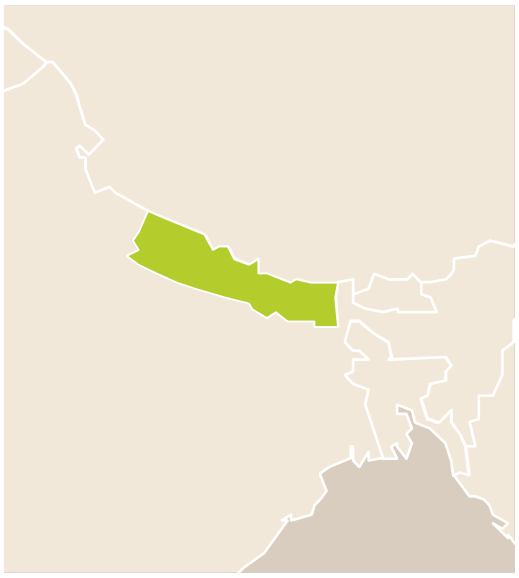
31 Patrick Meier, "How crisis mapping saved lives in Haiti", *National Geographic*, (2 July 2012): https://blog.nationalgeographic.org/2012/07/02/how-crisis-mapping-saved-lives-in-haiti/

32 Kathryn Reid, "2010 Haiti earthquake: Facts, FAQs and how to help", *World Vision* (25 November 2019): https://www.worldvision.org/disaster-relief-news-stories/2010-haiti-earthquake-facts

INTERNET OF THINGS (IOT)

The humanitarian sector is familiar with the IoT, which has functioned as an early-warning system on occasion, for example, by enabling the measurement of water levels in flood-prone areas. Similarly, location information – in the form of call detail records sent by mobile phones to cellular towers – has made it possible for aid agencies to track the movement of vulnerable populations before, during and after conflicts or disasters, and prepare a response.

COUNTRY: NEPAL



Context: Nepal was hit by a magnitude 7.8 earthquake on 25 May 2015. Nearly 9,000 people were killed and more than 22,000 injured. Approximately 8 million people in 39 of the nation's 77 districts were affected. Some 600,000 homes were destroyed and 288,000 homes partially damaged in the 14 districts worst hit. Destruction of livelihoods and infrastructure was extensive.

Agency: Flowminder,[33] a non-profit organization, analysed the call detail record during the earthquake to map the flow of population in its aftermath.

Methodology: The mobile-phone penetration rate in the country is high: it is estimated that there are 23 million phone subscribers; the population of Nepal is 28 million. The Flowminder team thus had a vast amount of data from the mobile-phone networks to analyse in support of the response to the earthquake. Population movement estimates are calculated by combining de-identified data on SIM-card movements with available population data. Changes in mobility patterns are identified by comparing SIM-card movements to normal pre-earthquake movements.[34]

Outputs: A comprehensive analysis of post-earthquake population movement trends was prepared and shared with the humanitarian community less than two weeks after the earthquake. The analysis showed that around 0.5 million people had left the capital, Kathmandu, and that most of them had gone to the districts surrounding the city.

Impact: The report was found to be very useful in identifying areas where food and other essentials had to be distributed to people affected.

33 See https://web.flowminder.org/

34 Flowminder. org., "Nepal population estimates as of May 1, 2015": https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/flowminder_nepal_population_estimates_as_of_01-may-2015.pdf

MOBILE CONNECTIVITY: A LIFE-SAVING TOOL FOR REFUGEES[35]

UNHCR estimates put the total number of people forced to flee their homes by conflict or persecution at 70.8 million:[36] most of them (41.3 million) are displaced within the borders of their own countries, and most of the others (25.9 million) are hosted by neighbouring countries as refugees, often for many years. It is crucial to promote the inclusion of these millions of displaced people in national services like health and education, and to ensure their freedom of movement and access to livelihoods. It is essential also to cultivate an environment where their rights are protected and that allows them to rebuild their lives and flourish.

The internet and mobile connectivity play an important role in all this; in many instances, they can be as indispensable as water or food. Research[37] carried out by UNHCR revealed that refugees regarded connectivity as a critical survival tool, and often prioritize it over education, clothing, and health care. After travelling thousands of miles, the main thing on their minds was getting online and letting their families and friends know where they were. For many refugees, connectivity meant being able to learn about their new environment and to participate in social networks. It is also an avenue to employment or to services such as cash transfers or digital education.

35 Centre for Innovation – Leiden University, "CFI chatbot to support humanitarian organizations" (2019): https://www.centre4innovation.org/stories/cfi-chatbot-to-support-humanitarian-organisations/

36 UNHCR, "Figures at a glance" (2020): https://www.unhcr.org/figures-at-a-glance.html

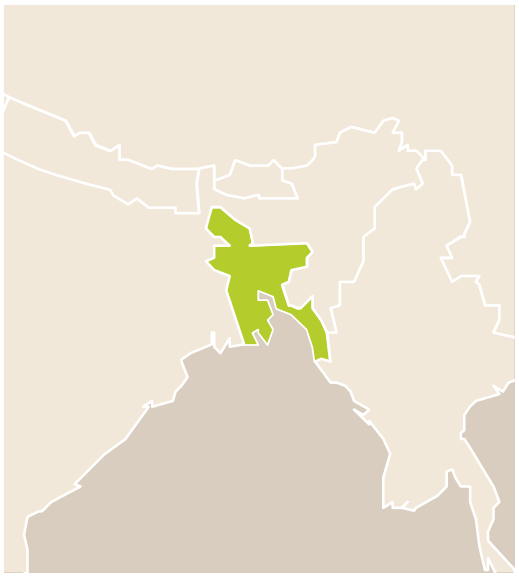
37 UNHCR, *Connecting Refugees: How Internet and Mobile Connectivity can Improve Refugee Well-Being and Transform Humanitarian Action*, UNHCR, Geneva, 2016: https://www.unhcr.org/innovation/wp-content/uploads/2018/02/20160707-Connecting-Refugees-Web_with-signature.pdf

CROWDSOURCED MAPPING OF GEOSPATIAL INFORMATION

The situation on the ground is often unclear after a disaster, as areas affected become inaccessible and communication infrastructure, such as telephone networks, are often seriously damaged. In such circumstances, satellite maps and GIS can provide crucial information on the extent of the disaster, to assist emergency relief operations. Such tools have now become invaluable for the humanitarian community, as they are a much speedier source of information than field visits during the different stages of an emergency response. Satellite imagery can provide early warning during the pre-disaster stage; it also aids damage assessment and planning of relief activities in the post-disaster phase. In addition, satellite imagery can be used to monitor the evolution of a disaster.

In recent years, crowdsourcing has become an extremely useful way to manage data from satellite and aerial imagery: volunteer mappers around the world provide a great range of capabilities in analysing geospatial data about a disaster or a conflict.

COUNTRY: BANGLADESH



Context: Since August 2017, more than 9,00,000 Rohingya, a Muslim ethnic minority group in Myanmar, have fled to Bangladesh to escape state persecution: this is the fastest and largest influx of refugees into Bangladesh. Aid agencies struggled to cope during the initial stages of the exodus, when some 379,000 refugees arrived in Bangladesh in just over two weeks.

Methodology: OpenStreetMap[38] is a project to create a free and open map of the entire world, built entirely by volunteers using GPS, digitizing aerial imagery, and collecting and liberating existing public sources of geographical data. The information from OpenStreetMap can fill in the gaps in base map data and assist responses to disasters and crises. The Humanitarian OpenStreetMap Team (HOT)[39] acts as a bridge between traditional humanitarian responders and the OpenStreetMap community. HOT works both remotely and physically in various countries: it assists in collecting and using geographical data, and trains others in the use of OpenStreetMap.

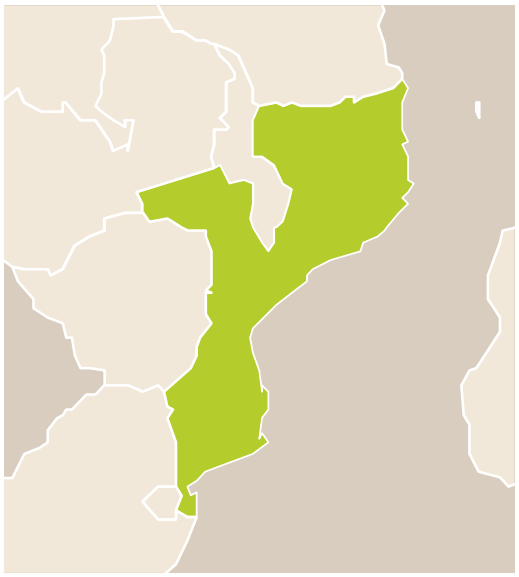
Outputs: The OpenStreetMap project helped the humanitarian community to expedite relief and recovery operations. It provided crucial information on infrastructure – sea ports, airports, railways, road networks, etc. – in Cox's Bazar, the site of numerous refugee camps. In addition, aerial imagery revealed the thousands of emergency shelters that had sprung up in a matter of weeks; this gave aid agencies a true idea of the scale of effort and coordination needed to provide assistance. The maps were made available for downloading through the humanitarian data exchange portal.[40]

38 See also: https://wiki.openstreetmap.org/wiki/Humanitarian_OSM_Team/Website/About
39 See also: https://www.hotosm.org/
40 See also: https://data.humdata.org/dataset/

DISASTER ASSESSMENT USING UNMANNED AERIAL VEHICLES

Unmanned aerial vehicles (UAVs) or 'drones' are being used increasingly to support humanitarian operations, especially for rapid assessments of sites and people affected. During an emergency, first responders require information on the location, nature, and scale of a disaster, and on the number of people affected and their immediate needs. Images captured by drones provide relatively cheap and quick answers to these questions. Drone imagery also has some advantages over satellite imagery. Drone images tend to have a much higher resolution, and the ability of drones to fly below cloud level makes them ideal when cloud cover blocks satellites' view.

COUNTRY: MOZAMBIQUE



Context: On 14 March 2019, Cyclone Idai made landfall near Beira, a city in central Mozambique. The resulting heavy rain led to flash flooding, which caused hundreds of deaths, massive loss of livelihoods and severe damage to infrastructure. Five weeks later, Cyclone Kenneth caused widespread destruction about 600 miles north of Idai's impact zone. Almost 2.2 million people were affected by these two cyclones, which necessitated a massive rescue, relief and recovery operation.

Methodology: In coordination with the National Disasters Management Institute of Mozambique, the WFP deployed drones to aid the humanitarian response.[41]

Outputs: Using the drones, assessments – of the damage to infrastructure and of the number of people affected – were rapidly made. An assessment was also conducted for the Health Cluster, which was trying to prevent floods-related outbreaks of cholera and malaria. A digital elevation model was created to perform such activities as flood mapping and risk assessment. Over 70,000 images were used to create dozens of detailed maps of the villages and towns affected.

Impact: The maps generated from drone imagery helped around 20 humanitarian organizations to deliver aid where it was needed the most. Drones were also used to rescue people stranded in flooded areas, and to identify access points for the delivery of food and other essentials.

41 WFP, "WFP Drones in Mozambique", YouTube (uploaded 2019): https://www.youtube.com/watch?v=_-kW1TvJLzM; accessed 24 January 2020.

KEY OBSERVATIONS FROM THE EXTERNAL REVIEW OF RDC TOOLS

- The use of RDC tools has been widely accepted by the humanitarian and development communities as a valuable low-cost and time-efficient means of collecting field data at high frequency. The ability of RDC tools to collect data from besieged, insecure and hard-to-reach areas, and the people living there – areas and populations unavailable for physical assessments – is a major reason why humanitarian assistance can now be delivered on the basis of empirical evidence.
- Users of RDC tools can now draw on an extensive body of knowledge based on research and on lessons learnt from implementation. Various organizations continue to invest in research and development with regard to RDC tools, and to build upon their successes. Hence, any organization looking to implement RDC tools can now refer to pre-existing guidelines and knowledge bases.
  - The contribution of companies such as Nielsen, Gallup and GeoPoll in enabling the use of RDC tools in the non-profit sector cannot be understated. It is worth remembering that RDC tools such as CATI, IVR, and SMS were initially developed and used by commercial market-research firms. Partnerships with such companies has resulted in the transfer of knowledge to the humanitarian and development sectors. And academic institutions such as Leiden University and Tulane University have conducted reviews and developed learning materials, thus contributing to the improvement of RDC tools and to their wider use.[42, 43]
  - There is a strong commitment among users of RDC tools to preserve their relevance and to continue to innovate. This has led to the adoption by humanitarian and development agencies of new forms of RDC tools such as UAVs or drones, and IoT devices, for gathering data remotely.
  - The innovations in RDC have had a positive knock-on effect. The large volumes of data that organizations have been generating, owing to the cheapness and frequency of data collection, have opened up possibilities for advanced techniques such as machine learning on these datasets. For example, the WFP is working on producing high-resolution hunger maps by combining survey data from various sources with open data sources that have features such as night-time intensity, vegetation, water or infrastructure. Machine learning techniques will be applied to train the machine in identifying the relationship between survey indicators and features extracted from open data sources. This will ultimately enable the machine to make predictions for areas where no survey was conducted.[44]
  - Since the rise in popularity of RDC tools, organizations have been collecting enormous volumes of data. The authors of certain studies have argued that this enthusiasm for data in the humanitarian sector is vastly greater than the sector's capacity to analyse data meaningfully.[45]
  - It is more necessary than ever for data projects to implement privacy-by-design principles – by conducting proper privacy- and risk-impact assessments. This applies to all stages of a data project, from the very outset to the dissemination of results.[46, 47]

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42 Leiden University, "Mobiles can help prevent famine" (11 November 2016): https://www.universiteitleiden.nl/en/news/2016/11/using-mobiles-to-combat-famine

43 N. Mock *et al*, *Review of mVAM Programme: Novel Application of Mobile Technologies for Food Security Monitoring*, Tulane University, 2015: https://www.elrha.org/researchdatabase/review-mvam-programme-novel-application-mobile-technologies-food-security-monitoring/

44 WFP, "Mapping our way towards zero hunger", *MVAM: The Blog* (20 July 2018): https://mvam.org/category/tech/geostatistical-mapping/

45 R. Read, B. Taithe and R. MacGinty, "Data hubris? Humanitarian information systems and the mirage of technology", *Third World Quarterly*, Vol. 37, Issue 8, 2016: https://doi.org/10.1080/01436597.2015.1136208

46 ICRC, "Ethics, data and innovation" (3 July 2019): https://blogs.icrc.org/inspired/2019/07/03/ethics-data-innovation-lunch/

47 Miguel Luengo-Oroz, "10 big data science challenges facing humanitarian organizations", UNHCR (22 November 2016): https://www.unhcr.org/innovation/10-big-data-science-challenges-facing-humanitarian-organizations/

GENERAL RECOMMENDATIONS

The following recommendations can be made after reviewing the most popular RDC tools and the organizations that have implemented them most successfully:

Determine whether there is a genuine need for RDC tools within the organization

Organizations that have successfully incorporated RDC tools in their working methods have a genuine need to innovate. For example, when policymakers in Latin America and the Caribbean asked the World Bank how the 2008 financial crisis would affect their efforts to reduce poverty, the organization found itself in a quandary: there were no pre-existing data that could be used to answer their questions, and a large-scale comprehensive survey would take months to complete. It was forced therefore to turn to mobile phone-based surveys, which would save time, and generate meaningful data. Similarly, the WFP launched its mVAM project in response to a pressing need for more information on food insecurity in the insecure and hard-to-reach areas where it had been conducting large-scale operations.

Build partnerships with institutions and companies that are more adept in the use of RDC tools

It is indisputably the case that the humanitarian and development sectors have less expertise than the private sector in collecting, storing and analysing large amounts of data.[48] Developing meaningful partnerships with companies or institutions that have a record of helping humanitarian and development organizations with their RDC efforts is crucial. For example, Nielsen, which is a global information and measurement company, collaborated with the WFP on the mVAM project: as a result, the WFP was better equipped to use RDC tools.[49] Organizations implementing RDC tools have also benefited greatly from working with academic institutions: collaboration of this kind has helped them build their knowledge base through research and by evaluating their implementation of RDC tools.

RDC tools must support broader organizational strategic objectives

The success of any endeavour within an organization depends very heavily on ownership at the management level. Senior managers are responsible for fostering innovation and experimentation. One way to ensure the importance of RDC tools within an organization is to make certain that implementation of every tool contributes significantly towards achieving the strategic objectives of the organization. This can be done by developing RDC tools not as stand-alone products, but as an integral part of the broader business-intelligence ecosystem that converts data into information, and ultimately, action.

Invest in in-house capacity development

Collecting data with RDC tools is just the first of a series of fairly complex steps to ensure high-quality and meaningful outputs. Organizations that are successfully implementing RDC tools usually have a team of skilled personnel – data scientists, analysts, and experts in various other fields – capable of turning data into actionable intelligence. Together, they are responsible for ensuring that the outputs generated are timely, relevant and of high quality. In the ICRC's case, this is also important for the eventual scale-up of activities that will necessitate supporting many different delegations.

48 OCHA. "Partnering with the private sector to innovate humanitarian response" (26 September 2018): https://www.unocha.org/story/partnering-private-sector-innovate-humanitarian-response

49 WFP and Nielsen, *Revolutionizing Data Collection* (2015): https://www.nielsen.com/wp-content/uploads/sites/3/2019/04/nielsen-wfp-case-study-june-2015.pdf

TECHNOLOGIES FOR CONDUCTING RDC

Rapid global digitization has significantly transformed the way organizations work. It has created numerous opportunities for humanitarian and development organizations and agencies to streamline their working methods and fulfil their mandates more efficiently and completely, while maintaining full accountability to donors and beneficiaries. Using innovative means of information gathering enables organizations to make the right decisions quickly and with fewer resources. This section presents a list of tools for conducting RDC in the humanitarian and development contexts. Their comparative advantages and disadvantages have been analysed strictly on the basis of their functionality, and not the operational environments in which they are deployed, as that might have introduced additional complexities.

Tools	Description
CATI	Telephone calls are made to respondents by human operators and information is recorded on a computer/tablet/ mobile phone.
IVR	IVR software makes calls to respondents: pre-recorded voice messages get information from respondents and guide them through the process.
SMS and internet messaging platforms	To get information, SMS software sends text messages to respondents, who send their answers in SMS messages.
Crowdsourcing and big-data analytics	Information is obtained from a large number of people, typically via the internet, and big-data analytical tools are used to analyse it. A large number of people can also be enlisted to work on this.
Satellite and aerial imagery	Satellites and UAVs are used to detect, classify and monitor objects on earth.
IoT devices and sensors	Devices placed at remote locations and connected to communication networks such as the internet can be used to collect information on topography, temperature, rainfall, water levels, etc.

CATI, IVR and SMS collectively constitute mobile phone-based RDC tools. Hence, they have some of the same strengths and limitations associated with mobile phone-based surveys. All these methods have benefited from the rising use – and the lowered costs, improved network connectivity, and expanded coverage – of mobile phones across the world. However, mobile-based surveys can reach only the people who own mobile phones, which means that the voices of those who are most vulnerable might go unheard.

CATI

CATI is a method of conducting surveys by using phones to contact the target population. Calls are made by human operators, and an electronic device, mostly a computer, is used to record the response. A properly functioning CATI system has the following characteristics:

- The interviewer uses specialized CATI software to make calls and record responses.
- The software make the calls.
- After the respondent picks up the phone, the interview gets under way with questions taken from the scripts displayed on the computer screen.
- The flow of the questionnaire's logic is built into CATI software, as are the validation rules and skip patterns.
- While an interview is in progress, CATI software can also display useful information such as the number of questions answered, the remaining questions, and the duration of the call.
- CATI software can also collect metadata related to the interview, such as call duration, call quality, and a record of the conversation for quality-assurance purposes.

Advantages

- CATI is the RDC tool that most closely resembles the traditional face-to-face interview. The use of human operators ensures that – as in an face-to-face interview – questions can be clarified for respondents to prevent misinterpretation. And as in an face-to-face survey, the operators add a human element to the conversation, thus helping to create an environment of trust. For all these reasons, CATI is considered to be the most suitable replacement for an in-person interview.
- CATI surveys cost much less than face-to-face interviews, as they do not require field visits. Also, respondents can be called again to clarify their answers or to answer questions they were not asked; this might be difficult to do after face-to-face interviews.
- Compared to SMS or IVR, CATI allows for more targeted data collection with a much higher probability of reaching the sampling units in question. It is also capable of collecting both quantitative and qualitative responses.
- A carefully chosen sample for CATI can result in estimates that are representative of an entire population.[50] This is not possible with IVR or SMS, for instance.
- CATI is also extensively used to gather complaints and other reactions from beneficiaries. In this regard, IVR or SMS, for instance, are not as convenient or reliable.
- CATI has a much higher response rate compared to IVR- or SMS-based surveys, mostly because it uses human operators.

Limitations

- In general, CATI survey findings, like all telephone-based surveys, are representative only of the population that picked up the phone and agreed to be interviewed. Such limitations can, however, be mitigated by careful survey design. It must be noted that bias can be much greater in IVR- and SMS based surveys.
- CATI surveys are more expensive and elaborate than IVR- or SMS-based surveys. Setting up and implementing one is a much more complex process; CATI also requires significant investment in the development of skilled interviewers.
- As with any mobile-based survey, CATI functionality depends heavily on mobile-penetration rates, reliability of phone calls, phone ownership, and telecommunication-network coverage.
- CATI cannot replace assessments designed to gather comprehensive information about the areas and populations of interest; that is because during a CATI survey, in order to maintain the quality of data, many fewer questions – number and type – can be asked than in an face-to-face survey.

50 WFP, *mVAM for Nutrition: Kenya Case Study:* https://documents.wfp.org/stellent/groups/public/documents/manual_guide_proced/wfp291938.pdf

IS CATI BETTER OR WORSE THAN FACE-TO-FACE?

Case study: Mode experiment to compare CATI and face-to-face for collecting data on nutrition indicators.[51]

Objective: Conduct a mode experiment to compare the use of CATI and traditional face-to-face interviews to collect accurate information on MAD and MDD-W.

Experiment design: A mode experiment was carried out in Kenya to determine whether different modes of data collection resulted in different estimates of MAD and MDD-W, using the test-retest method[52] to compare results from face-to-face and CATI surveys.

Result: The results of the study showed that the mode of data collection had no significant effect on MDD-W scores, but MAD scores were substantially higher via CATI: the prevalence of adequate meal frequency was 12% higher and adequate dietary diversity 18%.

Conclusions: This study shows that not all indicators are suitable for CATI or for any other method of RDC. It is therefore recommended that extensive pre-testing of indicators be carried out before selecting an RDC tool to measure them. Such tests can also reveal better ways to frame the questions for a given RDC exercise.

IVR

The use of IVR technology to collect data remotely requires specialized computer software that will interact with survey respondents through a set of pre-recorded voice messages in the form of questions. Robust implementation of IVR typically cycles through the following steps:

- The IVR software starts the telephone call to the selected respondent.
- The respondent then listens to the pre-recorded voice messages.
- Depending upon the question, the respondent submits answers by using the phone keypad or by recording voice messages.
- The IVR software automatically records the answers in its database.
- Typical IVR software allows for a call to develop a flow, and also describes how calls are handled, from beginning to end. The flow develops from the structure of a given questionnaire.
- Calls can be schedule based on a project's information requirements.

Advantages

- IVR systems are able to interact with respondents in an automated manner, thus obviating the need for human operators.
- IVR systems are more cost-effective than CATI. An increase in sample size does not mean additional resources.
- As the system is voice-driven, IVR is effective when communicating with illiterate populations, who obviously cannot read text messages.
- Fast turnaround time is another advantage IVR has, because many different calls can be placed simultaneously.
- Data entry is automated, so data do not have to be entered manually, with a data entry tool.
- It has also been found that respondents tend to be more comfortable providing sensitive information via self-administered tools like SMS and IVR.[53]

51 See footnote 50.

52 Statistics How To, "Test-retest reliability" (2016): https://www.statisticshowto.datasciencecentral.com/test-retest-reliability/

53 Frauke Kreuter, Stanley Presser and Roger Tourangeau, "Social desirability bias in CATI, IVR, and web surveys: The effects of mode and question sensitivity", *Public Opinion Quarterly,* Vol. 72, Issue 5, 5 December 2008: https://academic.oup.com/poq/article/72/5/847/1833162

Limitations

- Because of the nature of the input system, IVR data might require extensive cleaning. Respondents cannot see what they have entered, so they are unable to correct their mistakes.
- IVR is a relatively new tool for conducting surveys, especially in the humanitarian sector. Hence its success is dependent on respondents' familiarity with IVR. Unfamiliarity with IVR, accompanied by the expectation that the system will behave like human operators, is one of the main reasons why the IVR system tends to have very low response rates.
- IVR lacks the personal touch that comes with a telephone call from a human being: this can make an IVR survey a dehumanizing experience for respondents.
- It is not possible to set a different pace for slow and fast respondents. The system might therefore be too fast for some and too slow for others.
- With IVR, unlike CATI, it is not possible to rephrase questions that respondents do not understand.
- In an IVR survey, only a limited number of questions – which have to be short and simple – can be asked.

SMS-BASED SURVEYS

In an SMS-based survey a chain of automated and pre-recorded text messages is sent to respondents by means of the SMS feature on mobile phones. The answers sent by the respondents, via SMS messages, are then collected and recorded. A robust SMS survey has the following characteristics:

- It is administered by specialized software that initiates the survey by sending respondents the question and waiting for the response.
- Based on the response, the SMS software then sends them sequences of intelligent follow-up questions automatically.
- The responses are saved automatically in the software database. The software is also able to validate the responses by matching them with the set of allowed values.

Advantages

- SMS surveys are self-administered, which means that respondents can choose to answer at their convenience and pick up where they left off.
- They can be used to reach a large population within a very short time, which is not possible with CATI.
- They require less effort and time, and are cheaper, than IVR and CATI. As they do not require human involvement, they can, like IVR, be administered round the clock.
- Ease of implementation makes SMS surveys an attractive option in fluid environments such as disease outbreaks or natural disasters, where there is a need to collect data quickly for informed decision-making.
- Unlike the case with IVR, respondents can see their responses – which are being typed – and correct them if necessary.

Limitations

- The success of an SMS survey is heavily dependent on the literacy rate in the target population. SMS surveys must not be conducted in areas where most of the respondents are illiterate or where literacy levels are low.
- As with IVR, respondents cannot ask for clarifications; hence, there is a risk of questions being misinterpreted if they are not phrased clearly.
- As with IVR, SMS surveys are unsuitable for collecting qualitative data that require a lot of typing.
- Every SMS message is limited to 140 or 160 characters, which makes it difficult to ask long and complex questions. As a result, SMS surveys are most suitable for situations in which short and simple questions, and short and simple answers, will do.
- Response rates can be severely affected if respondents do not know whether they will be charged monetarily for their participation.

CROWDSOURCING AND BIG-DATA ANALYTICS

Crowdsourcing refers to a process in which work, information and opinions – in the form of data communicated through the internet, social media, and smartphone apps – are obtained from a large group of people: paid freelancers or volunteers willing to perform small tasks without pay.[54]

Big-data analytics – based on well-established principles – complement crowdsourcing, and can be of great help in making sense of crowdsourced data.

Increasingly, companies are beginning to develop innovative means of exploiting the potential of crowdsourcing. For instance, native.io[55] and premise.com[56] enlist the services of local people to collect data and monitor activities for commissioning organizations. The following case study – in which a large number of people were locally recruited to collect market-price information – is an example.

CASE STUDY:[57] CROWDSOURCING HIGH-FREQUENCY COLLECTION OF FOOD-PRICE DATA IN RURAL INDONESIA

Background: Data on market commodity prices are critical for assessing the food security and economic vulnerability of a population. In places where there are no established monitoring systems, crowdsourced data can fill the information gap.

Methodology: The process involved recruiting local "citizen reporters" – through advertisements on social media – to upload food-price information through a mobile-based app. More than 200 people were recruited, and each contributed more than one report every month. Reporters behaving dubiously were identified through automatic and manual approaches, and discarded.

Outcome: More than 65,000 data points were collected, and 2,650 unique trade outlets referenced, across target areas covering approximately 20,000 square kilometers. In less than six weeks, enough data had been collected – in fact, more than the minimum required – to accurately capture price trends across most basket items within the target area.

Conclusions: The study showed that crowdsourcing the collection of data on prices can supplement existing monitoring systems, especially in areas on which there are no data. The crowdsourcing approach offers an added value since it creates networks of reporters through the mobilization of social-media platforms.

Advantages

- Crowdsourcing makes use of the collective efforts of a large number of people; this can be very useful in disasters, during which there is often a dearth of resources for collecting and analysing information.
- It can be an alternative in places without a proper monitoring system.
- It is a cheap alternative to more structured methods of collecting data.

54 Marshall Hargrave, "Outsourcing" (8 July 2019): https://www.investopedia.com/terms/c/crowdsourcing.asp
55 See also: https://www.native.io
56 See also: https://premise.com
57 Pulse Lab Jakarta, "Crowdsourcing high-frequency food price data in rural Indonesia" (2019): https://www.unglobalpulse.org/project/feasibility-study-crowdsourcing-high-frequency-food-price-data-in-rural-indonesia/

Limitations

- Crowdsourced data are more liable to manipulation by data contributors – leading to inconsistent outcomes – as there have little accountability.
- Maintaining the quality of data can be a challenge since it is not possible to train all the contributors; the consequence is extensive data cleaning.

SATELLITE AND AERIAL IMAGERY

- Satellite and aerial imagery is used to detect, classify and monitor objects on earth and their characteristics, which enables accurate mapping of features and events on a regional, continental, even a global scale. Its applications cover a vast range: disaster-mitigation planning, agricultural development, extraction of mineral deposits, and so on.
- Capturing these images requires interaction between incident radiation and targets of interest.[58] How imaging systems capture information by using reflected energy: this process is described below. Note, however, that remote sensing also involves detection of emitted energy and the use of non-imaging sensors.
- First, remote sensing requires sources of energy that illuminate or provide electromagnetic energy to the target of interest.
- As energy travels from source to target, it will interact with the atmosphere.
- Contact and interaction between the energy and the target will depend on the property of both the target and the radiation.
- The energy scattered or emitted by the target will be recorded by the sensor in the form of electromagnetic radiation.
- The energy recorded by the sensor will then be transmitted to the receiving station where the data are processed into an image.
- The image is then analysed to extract information about the target that was illuminated.
- Finally, information extracted about the target will be used to better understand the target or solve a particular problem.

Advantages

- Remotely sensed images are extremely useful when there is an urgent need to get information about an area or phenomenon that is physically inaccessible for various reasons, such as conflict or natural disasters.
- It enables coverage of large areas, and thus permits assessment of large-scale phenomena: floods, forest fires, massive displacement, monitoring of vegetation, etc.
- It also permits repetitive coverage, which means that a time-series analysis of the object or phenomenon under study can be performed.
- Remotely sensed images can be used for many different purposes. A single image can find application in several thematic areas.
- Analysis of remotely sensed images follows standard practices and algorithms; this means that the process of generating outputs is fairly rapid and affected only by the processing power of the computer.
- Remote sensing data can be acquired at various resolutions.

Limitations

- It is a fairly expensive method of collecting data remotely, especially when it involves identification and analysis of small objects or features.
- It requires specialized training in analysing and interpreting data, which means relying on a limited number of experts and thus a high turnaround time.
- This is a process that entails mainly passive observation and no interaction with the community from which data are being collected. It can therefore create mistrust in the output when the communities concerned don't know much about remote sensing.
- The use of drones in insecure areas can endanger both operators and equipment if the drones are thought to be weapons or spying devices.

58 Canada Centre for Remote Sensing, "Fundamentals of remote sensing" (2001): https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/resource/tutor/fundam/pdf/fundamentals_e.pdf

IoT

'IoT' refers to an interconnected network of devices capable of capturing and sending information over a communication network for the purpose of enabling appropriate action. For example, devices that remotely capture information on weather conditions – temperature, atmospheric pressure, etc. – have enabled the creation of early-warning systems, with life-saving consequences. In fact, the development and humanitarian sectors have been using internet-enabled devices to increase the efficiency of their operations. Data from IoT devices enable real-time monitoring of the situation on the ground; they also provide information on any variable of interest. Some current and potential uses of IoT devices are described below:

- UNHCR uses thermal sensors at the refugee camps in Lebanon. Data collected from these sensors provides enough information on camp conditions during winter for UNHCR to verify that the camps are sufficiently heated.[59]
- The internet-connected sensors in hand pumps in Rwanda were able to immediately communicate any pause or break in functioning. This cut down average repair times and ensured that the community's water supply suffered no disruption.[60]
- In Tanzania, data are collected from the IoT devices connected to the flour mills that produce fortified flour. This has eliminated the need to physically visit the facility to retrieve operational data, and significantly reduced operational costs.[61]

CAN IOT DEVICES HELP TO IMPROVE COORDINATION AND ACCOUNTABILITY DURING HUMANITARIAN ACTION?[62]

Background: After a disaster, coordination among relief agencies is extremely important. It is also perhaps the most difficult task to carry out. When sufficient information about the situation on the ground is unavailable, this task becomes even more complex and difficult. One consequence is that relief efforts will concentrate on areas about which information is currently available. In the first few days after a disaster, it is also difficult to track where first responders have been deployed and which areas remain uncovered.

Proposed solution: First responders should carry internet-enabled devices that allow them to signal their identification of a site needing assistance. The device can be as simple as a button that when pressed, immediately sends location information. This information can then be displayed on a dashboard at a central location. Relief agencies can then decide which areas each will cover. This will enable better coordination of relief efforts, as they can be monitored in real time and changes made if necessary. It will also ensure transparency and accountability in the delivery of aid.

59 Development Impact and You, "Innovating humanitarian response for refugees" (15 November 2017): https://diytoolkit.org/innovating-humanitarian-response-for-refugees/

60 Sarah Finch, "IoT Measuring the True Impact of International Development", *Disruption Hub* (16 August 2018): https://disruptionhub.com/aid-internet-of-things/

61 Bob Violino, "An IoT Initiative with a Humanitarian Purpose", *ZDNet* (6 November 2018): https://www.zdnet.com/article/an-internet-of-things-initiative-with-a-humanitarian-purpose/

62 Marcelo Andrieu, "Altruistic Applications for IoT Technology", *Appian* (18 December 2018): https://www.appian.com/blog/altruistic-applications-for-iot-technology/

RDC AT THE ICRC

In its institutional strategy for the period 2019–2022,[63] the ICRC committed itself to transforming and optimizing its information environment, and to regarding digital accessibility and engagement with populations affected and other key stakeholders as critical support for its protection, assistance and prevention activities.

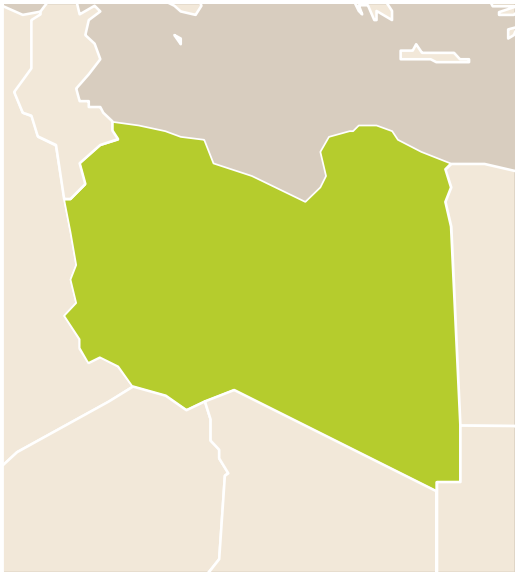
The ICRC's Economic Security Analysis and Evidence Unit has also aligned its strategy for 2019–2022[64] with the institutional strategy mentioned above, specifically with regard to the following institutional objectives:

- The ICRC strengthens collection and use of evidence, data and research.
- The ICRC establishes the relevant mechanisms to disaggregate the data it collects about populations affected, with a particular focus on ensuring that vulnerabilities specific to gender, age and disability can be identified, so that It can provide a more relevant humanitarian response.
- Within the humanitarian ecosystem, the ICRC influences other organizations to follow a humanitarian purpose-driven approach to the use of data concerning vulnerable individuals.

This strategic shift has created opportunities to implement solutions for capturing data more efficiently. This chapter describes the experiences of ICRC delegations in the use of RDC tools.

LIBYA: POST-DISTRIBUTION MONITORING

Operational context: In Libya, the EcoSec unit provides cash and in-kind support to targeted populations affected by the protracted conflicts in Benghazi and Sabhacrow, respectively. In Benghazi, the ICRC provides cash support in the form of e-cards for widows and divorced women, or low- income and large families. In Sabha, Internally displaced persons displaced mostly from Tripoli and Murzuk are given in-kind support.



RDC tool used and purpose: CATI is used in Libya: since 2016, by the call centre for project monitoring; and to contact beneficiaries, and collect complaints and other reactions from them, under the Community Contact Centre (CCC) project.[65]

Monitoring framework: A post-distribution monitoring survey is conducted after each distribution cycle. A random sample of a fixed number of beneficiary households is taken and telephone calls are made to gather information on project outputs, process, and complaints and feedback from them. The staff entrusted with telephone-based monitoring are based in Tunis.

63 ICRC, *ICRC Strategy 2019-2022,* ICRC, Geneva, September 2018: https://shop.icrc.org/icrc-strategy-2019-2022.html?store=default&_ga=2.72149715.1588642176.1580830336-296284283.1535352635

64 ICRC, Analysis and Evidence Strategy 2019–2022: Better Data, Stronger Analysis, Smarter Decisions.

65 The CCC is a global ICRC project to receive and respond to complaints and other reactions from beneficiaries and others. This does not conduct output, outcome or impact monitoring of the ICRC projects.

Monitoring outputs: After data collection is completed, distribution reports are prepared: these contain the monitoring results and recommendations for future action.

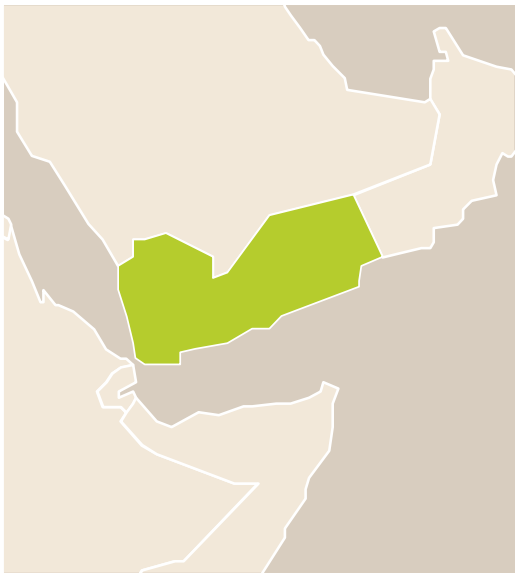
Good practices review

- The remote monitoring team is fairly experienced in the use of RDC tools, as the project has been operational since 2016.
- The comprehensive monitoring reports that are produced periodically have helped shaped the direction of the project.
- Targets for sample sizes are often met, resulting in estimates that can be considered representative within a given margin of error.

Challenges associated with RDC-based monitoring

- The telephone calls are made from Tunisia. This will increase costs and create operational difficulties, as the rest of the ICRC's staff are based in Libya. Hence, the possibility of moving the CATI operation inside Libya should be explored periodically.
- The telephone numbers provided by partners such as National Red Cross and Red Crescent Societies are often not updated to reflect changes in beneficiaries' numbers; beneficiaries also become inaccessible as they pass in and out of cell-tower range. For example, around 600 calls have to be made usually to reach a sample size of 150 beneficiaries, which can delay the production of reports by as much as a month. This can also introduce bias if the beneficiaries responding to calls are – regularly – different from those who do not.
- Currently, telephone-based monitoring of EcoSec projects is restricted to post-distribution monitoring surveys of cash and in-kind distributions, because of the limited number of people available for making calls.
- Since the inception of CATI in 2016, staff have not been provided guidance for collecting field data remotely. Resources such as SoP and training manuals are important for ensuring that RDC tools are implemented in accordance with corporate standards and procedures, and also for ensuring uniformity in the application of these tools across delegations.
- There has been no formal or informal review to ascertain the effectiveness of RDC tools.
- The ICRC has been registering beneficiaries since October 2019; this is expected to result in more reliable lists of phone numbers, which will lessen turnaround time and make RDC more efficient.

YEMEN: PROGRAMME MONITORING

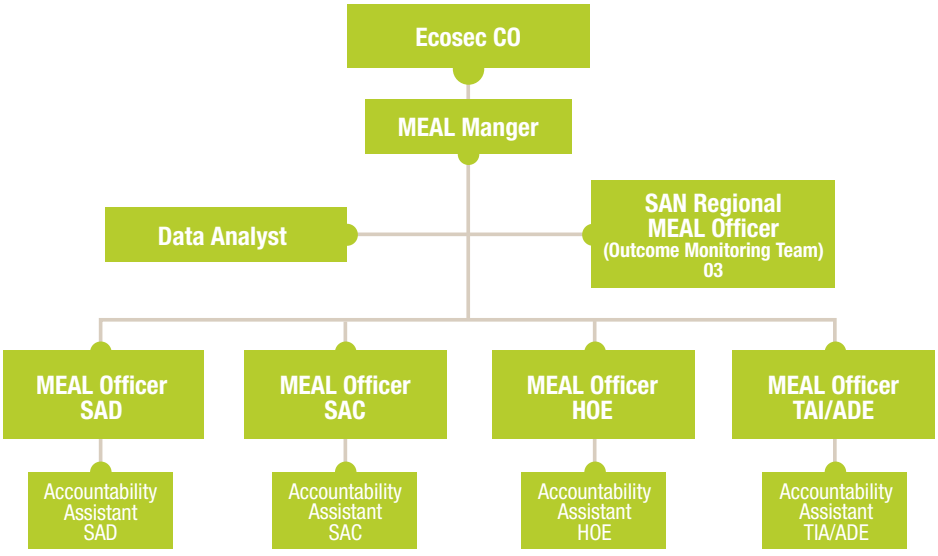


RDC tool used: CATI is used for project monitoring.

Monitoring framework: The Yemen delegation has been using mobile phone-based remote monitoring since 2018. The use of CATI in Yemen is not restricted to any specific activity; it is used for many different activities. Employment of CATI varies with the ICRC's ability to reach beneficiaries through field visits and the availability of personnel to conduct monitoring activities. The latter issue will be addressed once the positions in the Monitoring and Evaluation unit are filled. RDC activities might include calling beneficiaries after each distribution cycle (post-distribution monitoring) – if the EcoSec team is unable to reach them through field visits – or calling beneficiaries in order to verify their information and to confirm that they were correctly selected to receive assistance. The questionnaires are designed to collect information on both output and outcome- level indicators.

Good practices review

- The database of phone numbers is regularly updated through field visits. In addition, calls are made to beneficiaries to verify their phone numbers. This has resulted in relatively high response rates and short turnaround times for mobile-based data collection.
- A review of monitoring tools was conducted: its recommendations helped to improve monitoring practices.
- As seen below, the staff structure of the EcoSec monitoring, evaluation and learning (MEAL) team in Yemen has been designed to enable the team to conduct extensive monitoring of EcoSec activities.

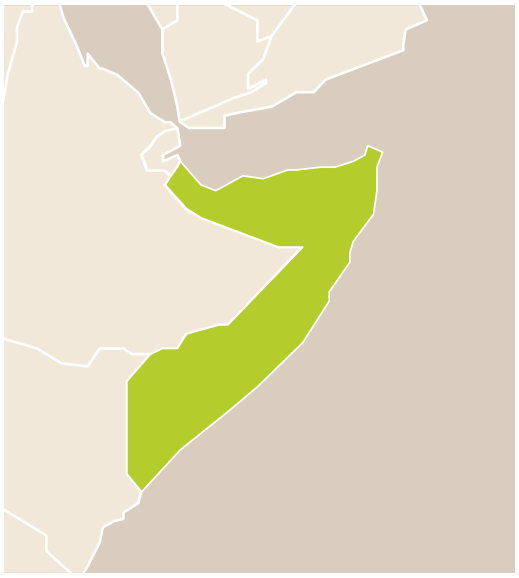


EcoSec MEAL organizational chart

Challenges associated with RDC-based monitoring in Yemen

- Outcome-level monitoring has begun in Yemen only recently; hence, the initial challenge is to ascertain the quality of the data collected, to ensure confidence in the results of monitoring.
- The Monitoring and Evaluation unit needs guidance – in the form of documents – for setting up and implementing RDC tools, including methodologies for selecting and testing indicators for remote monitoring.

SOMALIA: THE RISK MANAGEMENT UNIT



Context: The Risk Management Unit (RMU) supports the Somalia delegation's mechanisms to ensure accountability for and due diligence about the use of ICRC resources. The RMU collects monitoring data through two in-house contact centres: the Call Centre in Nairobi and the CCC in Mogadishu. The Call Centre carries out telephone-based interviews with beneficiaries to verify the existence of registered beneficiaries and confirm that assistance was delivered to them in the right quantities and of the proper quality. This also enables beneficiaries to be aware of their rights and entitlements in advance of the delivery of assistance: they can draw on this knowledge to hold the ICRC accountable when their expectations are not met.

The CCC offers people affected a means to provide complaints and other reactions or request information related to ICRC activities in their locations, through a short code, toll-free number that puts them directly in touch with the ICRC. This two-way communication creates a direct link between communities and the ICRC, and facilitates continuous dialogue on the quality of beneficiary inclusion and service delivery within the framework of ICRC assistance programmes.

RDC tool used: CATI.

Operational framework: ICRC projects in Somalia are monitored primarily for compliance with ICRC protocols and rules and regulations: the level of monitoring varies from one project to another. All programmes are monitored before, during and after the distribution of assistance to beneficiaries – to verify that the persons listed meet the criteria for receiving assistance, and to ensure that beneficiaries received what they were entitled to without encountering any problems during the process. The procedures for implementation and the risk levels of programmes determine the type and scope of monitoring. For example, a voucher-based, cash or in-kind distribution may be monitored directly in the field, and mobile-based cash payments monitored primarily through the Call Centre.

Good practices review

- The Call Centre in Nairobi is well organized. It has one full-time Call Centre manager, two assistants, and a roster of about 50 operators who are always available. The operators have diverse profiles, are fluent in the local language and various dialects.
- The Call Centre has been extremely effective in verifying that activities under the project are in line with its objectives and meet minimum standards, especially after major disasters in Somalia, like floods and droughts. In 2017, 103,721 calls were made to drought-affected beneficiaries; in 2018, 61,999 calls were made to beneficiaries, including calls to some who were affected by floods; and in 2019, 62,145 calls were made to beneficiaries affected by floods and drought.
- In 2020, because of the Call Centre's access to beneficiaries during compliance-related post-distribution monitoring, EcoSec is thinking of asking for the Call Centre's help in conducting outcome-level monitoring for specific activities; the Call Centre will be guided by technical specialists. The Call Centre's involvement will result in a single interview being enough to capture information for compliance and project monitoring from beneficiaries; this will increase the overall efficiency of ICRC operations in Somalia and reduce 'monitoring fatigue' among beneficiaries.

THE DEMOCRATIC REPUBLIC OF THE CONGO: POST-DISTRIBUTION MONITORING

Operational context:[66] In early November in 2018, seven teams – each consisting of four EcoSec staff members – toured the town of Kamako, household by household, registering 8,942 beneficiaries for assistance. Subsequently – from 14 to 24 November – the EcoSec team in Kamako conducted one-off, unconditional over-the-counter cash distributions, targeting returnees from Angola. Despite regular communication with most of the stakeholders, and the assistance that was regularly provided to people affected, access remained a major obstacle.

RDC tool used: SMS-based survey.

Monitoring framework: A post-distribution monitoring survey was carried out among 300 of the 8,942 people who benefited from the unconditional cash distribution. The survey questionnaire was developed by the EcoSec delegate, with the aid of the EcoSec Analysis and Evidence Regional Adviser. The questions asked where the beneficiaries were, how they spent the money, how quickly they spent it, whether they had difficulties in using the cash, whether they had reached their final destination, and their means of transport. GeoPoll[67] was contracted to conduct a 15-question SMS survey among the 300 beneficiaries.

Lessons learnt

- Beneficiaries who did not have them were given mobile phones so that they could participate in the survey. This eventually almost caused a security incident, as those were not given the phones began to demand them. For future surveys, the decision to hand out phones must be made only after a careful analysis of the situation.
- The response rate was quite low. Hence, obstacles – phone ownership, literacy rates, availability of electricity for charging phones, network connectivity, incentive to respond, etc. – must be studied thoroughly before conducting SMS-based surveys.
- The low response rate might also have been a consequence of this being a survey to monitor a one-off cash distribution. It is possible that having already received the cash, beneficiaries had no incentive to take part in the survey.
- It is important to conduct awareness-raising activities before implementing machine-operated surveys such as IVR and SMS. This will help ensure that respondents are prepared – for instance, by knowing the procedures involved and by keeping their phones charged. People are also unlikely to respond if they think that taking part in the survey will cost them money and that they will not be reimbursed.

66 ICRC Kananga sub-delegation, EcoSec team, "The Democratic Republic of the Congo mission report: Enhancing cash distributions" (2018).

67 See also: https://www.geopoll.com/

COLOMBIA: WEB-BASED DATA COLLECTION FOR MONITORING ASSISTANCE TO MIGRANTS

Operational context: Migrants affected by Non-international armed conflict and other situations of violence while passing from Venezuela to Colombia were given one-off cash or other assistance that would enable them to have a month's worth of food. Beneficiaries were selected on the basis of their demographics, food insecurity and economic vulnerability.

RDC tools used: CATI, using Device Magic[68] as a Web-based data-collection platform.

Monitoring framework: After delivering the assistance, the beneficiaries' phone numbers are collected; and in a few weeks, telephone calls are made to assess whether their immediate food security situation has improved. Calls are made from Bogota and data are entered, using the Web-based forms available in Device Magic, a corporate mobile-based data-collection tool.

Good practices review

The use of Device Magic to collect and process data helps establish data privacy by design. In general, the use of Device Magic is strongly recommended – as a data-collection tool when conducting CATI or, by granting rights in line with Device Magic's technical guidance (only available to ICRC staff), even when employing the services of external service providers or third-party monitors.

68 See more at Device Magic website: https://www.devicemagic.com/

THE DEMOCRATIC REPUBLIC OF THE CONGO: DRONE-BASED MONITORING OF ICRC-SUPPORTED AGRICULTURAL PLOTS (CONCEPT NOTE)

Operational context: In the Kasaï Central province of the Democratic Republic of the Congo – and particularly after the clashes between the Kamwina Nsapu militia and the armed forces of the Democratic Republic of the Congo in 2017, and the humanitarian crisis that ensued – the ICRC has been implementing various agricultural activities for several years to revive the livelihoods of people affected by armed conflict and other situations of violence. For instance, to support the revival of agricultural production and livelihoods, it provided 6,162 households with seed for cultivation.

RDC tool used: Agriculture drones.

Monitoring objective: The monitoring activity will facilitate the general follow-up of seed plots and seed multiplication, and make corrections if necessary. The use of agricultural drones in monitoring should enable, among other things, precise monitoring of certain selected fields; the collection of more precise data on the area under cultivation, and on production per household, should give a clearer and more accurate picture of the impact of agricultural assistance.

Implementation plan: An agriculture drone will fly over at least 15 hectares of cassava and peanut seed plots. The drone will be equipped with a camera and sensors of various kinds (S.O.D.A. 3D, temperature sensors, Parrot Sequoia +, etc.), and a geo-referencing system, to produce a variety of maps for managing agricultural plots (calculation of sown areas, plant cover (NDVI index) monitoring of plant growth and development, (pre)-estimation of agricultural yields, etc.).

Opportunities for the ICRC: The project is designed to be the pilot phase of a larger project, which should later make it possible for the ICRC to: decide whether to use drones to monitor agricultural activities / seed distribution; and test the use of drones in a larger project (like the agricultural land register in Kasaï Central).

WHAT ARE DEVICE MAGIC AND RED ROSE?

Device Magic is a tool designed to conduct mobile device-based data collection; store, share and visualize data; and facilitate workflows. It is particularly suitable for collecting structured data via both simple and complex surveys. Its form-builder and data-synchronization functions require an internet connection; data collected offline will be sent – as soon as connectivity is re-established (e.g. WiFi/3G) – to a server that the ICRC trusts. A new feature, the Web Client form, has been added recently: this enables data entry via the web form on a PC/laptop (e.g. for data transfer from the paper form) and data collection via the web form on a PC/laptop (e.g. during a phone-based survey). Currently, Device Magic is used in more than 40 countries. The ICRC uses a version of Device Magic that has been customized to fulfil its specific needs.

Red Rose is a beneficiary management system that provides an end-to-end solution for all aspects of cash-transfer, in-kind, and voucher programmes. It enables beneficiary registration and management, programme-cycle management, beneficiary communication, and the compilation of output data in reports and dashboards. Built-in security features and audit trails – and tools for beneficiary and financial accountability – help to meet ever-growing donor requirements in this regard. Red Rose was chosen to manage all beneficiary-related data for the ICRC's EcoSec programmes. It will be in service in at least ten countries by the end of 2020.

KEY OBSERVATIONS FROM THE REVIEW OF THE ICRC'S USE OF RDC TOOLS

The following observations can be made after reviewing the ICRC's use of RDC tools:

- The ICRC uses RDC tools less frequently than some other humanitarian and development organizations. It must be said, however, that there are already a number of good examples of RDC use by the ICRC: for instance, to monitor projects in Libya, Yemen and Somalia.
- One reason why RDC tools weren't more widely implemented by the ICRC is the unavailability of SoP and training materials for setting up and implementing these tools. In the countries where the review was conducted, staff members implemented the tools on their own, without much technical guidance from either the region or headquarters.
- Currently, the ICRC uses telephone-based interviews only to monitor project outputs and not for outcome or situation monitoring, except in Yemen, where it recently began to monitor outcome-level indicators.
- So far, no formal or informal reviews, or lessons learnt exercises, have been undertaken to measure the impact of RDC tools. Such exercises are hugely beneficial and often yield valuable recommendations for improvement.
- Setting up and implementing RDC systems requires specialized staff, but such personnel are not yet available in most countries.
- The ICRC has no long-term partnerships with companies that specialize in developing these tools; this, too, inhibits the sustained implementation of RDC tools by the organization.
- There is a growing demand among ICRC management that RDC tools be used to monitor ICRC activities in insecure areas. This sentiment is echoed by John Karongo, the regional agronomist at ICRC Nairobi, who also believes that the ICRC has a long way to go before it can implement RDC tools effectively.

THE ICRC AND DRONE-BASED MONITORING

For the past few years, the ICRC has been studying the possibility of using drones to conduct its monitoring activities remotely. A drone-based project is an excellent opportunity for the ICRC to significantly expand its monitoring capacities, enabling it, for instance, to assess crop growth as well as the impact of its water-and-habitat projects. In addition, national governments are expressing interest in collaborating with the ICRC in drone-based monitoring. Some important considerations related to drone-based monitoring are listed below:

- Successful implementation will require the requesting unit to develop a functional partnership with other units, such as ICT, GIS, and Logistics.
- Designing drone-monitoring projects in coordination with national governments might boost the chances of effective implementation.
- In general, it takes significant time and effort to analyse the remote sensing outputs. Hence, in addition to using traditional tools, it is also important to explore the latest innovations in the field of analytics. Significant advances have taken place in machine learning and its ability to identify and extract features from remote-sensing imagery has grown. Although machine learning is still in the early stages of development, organizations are increasingly adopting its techniques to derive meaningful conclusions from the data they have collected. The extremely high-resolution imagery that the drone-monitoring project will provide can be used to train machine learning models to expedite analysis and prove helpful for possible future usage.

"We really have not explored what technology are available in terms of remote data collection. For example, we recently distributed seeds and tools to 20,000 families in Darfur, Sudan. But when we came back for post distribution monitoring, so many places were not reachable due to ongoing clashes. If our team had thought of using phone based interviews, we would have been able to collect post-distribution monitoring data."

– *John Karongo, Regional Agronomist*

SWOT ANALYSIS OF THE ICRC'S IMPLEMENTATION OF RDC TOOLS

STRENGTHS	WEAKNESSES
• Expertise available for the use of certain RDC tools • The ICRC's recent strategic orientation towards digitization • Availability of numerous corporate guiding documents on data protection and responsible use of RDC tools • Plans under way to conduct drone-based agriculture monitoring.	• Unavailability of corporate SoP for RDC implementation. • Lack of human resources to implement at the country level • Absence of partnerships with external actors who have RDC expertise • No formal impact evaluations conducted or lessons learnt recorded • Current use limited mostly to output monitoring
OPPORTUNITIES	**THREATS**
• Increased monitoring of ICRC's projects • Ability to reach physically inaccessible communities • Collect data for outcome and situation monitoring • Institutionalize RDC systems and processes • Better decision-making based on better field-based information • Build partnerships with external actors possessing RDC expertise • Acquire expertise in drone-based monitoring • Information collection that is both high-frequency and less expensive	• Collecting volumes of data without being able to extract meaningful information from them • The risk to the ICRC's reputation if RDC activities are not implemented as per SoP (data protection, AAP) • Respondent fatigue if data-collection activities are not coordinated • The risk to the ICRC and its staff or to the target population if implementation of RDC tools like drones is not managed carefully

SPECIFIC RECOMMENDATIONS

Exploit existing RDC expertise and experience

The technical capacity to implement RDC tools, from CATI to drone-based monitoring, exists at the ICRC. Developing a long-term vision for RDC and empowering staff involved in RDC projects will enable the ICRC to collect more meaningful information from the field.

Develop institutional documents for setting up and implementing RDC tools

Documents such as SoP and training manuals should be incorporated in ICRC training modules. This will help ensure that the usage of RDC tools is the same throughout the ICRC, and will also result in the adoption of procedures that reflect the organization's founding values and principles. Such documents and manuals will also be extremely useful when a particular tool has to be scaled up. And – another important consideration – they help preserve institutional memory.

Ensure that implementation is in line with the ICRC's mandate and strategic objectives

Whenever one of the RDC tools described in this document is considered for use, the feasibility, and the advantages and risks, of doing so must be evaluated. RDC tools are not universally applicable: some tools will not be suitable for certain contexts. Hence, careful evaluation and selection of tools is necessary to ensure that potential risks – arising from their use – are assessed and mitigation measures put in place. At the ICRC, it is vitally important to ensure that when choosing an RDC tool, certain considerations are taken into account: established guidelines for data protection; protection for the population affected; and rigorous adherence to the "do no harm" principle. For example, the use of drones for monitoring is extremely risky in conflict settings, and lack of due diligence while selecting a third-party mobile-phone survey company can compromise data related to the population affected.

Conduct impact evaluations and studies

Evaluating the impact of RDC tools on ICRC operations, and lessons learnt exercises, will help institutionalize the tools and prevent the organization from repeating its mistakes. RDC tools are non-traditional methods of interacting with respondents: hence, studying respondents' reactions to their use is a valuable and important exercise; it should also be noted that there is a dearth of literature on the subject.

Maximize the impact of captured data

Collection of primary data is an expensive endeavour and requires significant investments of time and money. It is thus imperative to maximize the potential of data collected and to get a high return on your investment.

THOUGHT EXPERIMENT: COLLECTING MONITORING DATA AT SERVICE-DELIVERY POINTS

Scenario: The beneficiaries of the assistance (cash or in-kind) arrive at the service-delivery point (a shop, a bank, etc.), where they participate in a short survey that asks them questions related to the project.

Set-up: The service-delivery points are equipped with survey kiosks for beneficiaries. The interface design is extremely simple. It allows beneficiaries to choose how they want to respond: via text, audio, or visuals. The kiosks are internet-enabled, so data are sent to the central server immediately.

Considerations:

- Beneficiaries can be given incentives to respond and/or compensated for their time, to ensure greater participation.
- It is important to situate the kiosks apart from the general flow, so that beneficiaries don't feel conspicuous, uncomfortable or awkward.
- This set-up is likely to be more viable for long-term projects.
- The system should allow for checklists to be automatically updated by the central server.

ANNEX: LIST OF RDC TOOLS REVIEWED

Organization	Tool	Context	Links
WFP	High-frequency survey using CATI, IVR, and SMS	Situation monitoring in insecure, inaccessible and hard-to-reach areas; representative-sample survey in the development context	https://dataviz.vam.wfp.org/
	Monitoring based on drone imagery	After sudden-onset disasters; crop monitoring	https://insight.wfp.org/drones-5-reasons-why-the-world-food-programme-is-using-them-20ca47e73b56
	Internet chatbot	Collect and provide information on food insecurity, market prices, etc. in areas with internet connection	https://mvam.org/2017/10/09/designing-a-new-communication-channel-the-food-bot/
UNICEF	Social Messaging based on SMS, Facebook, Twitter	Conduct opinion polls; get and share information	https://www.unicef.org/innovation/U-Report
World Bank	High-frequency survey using CATI	Gather nationally representative household data in the development context	http://documents.worldbank.org/curated/en/624621538136672723/pdf/130293-WP-PUBLIC-ListeningtoTajikistanHouseholdSurvey.pdf
Humanitarian OpenStreetMap	Generation and analysis of crowdsourced geospatial information	Generate spatial maps during disasters and pre-recovery and post-emergency situations	https://www.hotosm.org/
Flowminder	Track population movement using mobile phones	Sudden-onset disaster	https://web.flowminder.org/
native.io premise.com	Data collection based on crowdsourcing	Situation monitoring	http://www.native.io/ http://www.premise.com/
Centre for Innovation, Leiden University	Chatbot	Data collection and information dissemination	https://www.centre4innovation.org/stories/cfi-chatbot-to-support-humanitarian-organisations/
Nielsen	Global information and marketing	Capacity strengthening for mobile-based data collection	https://www.nielsen.com/us/en/
GeoPoll	Data collection based on CATI, IVR and SMS	Mobile-based data collection	https://www.geopoll.com/
Gallup	CATI-based data collection	Survey design and implementation	https://www.gallup.com/home.aspx

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