Data Audit | 2022-2023

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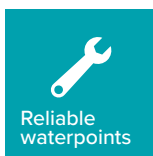
UPTIME
global

Executive summary

In late 2023, Uptime conducted a data audit to assess the integrity of reported performance across a portfolio of 12 results-based contracts in 12 countries. Data audits play an important role in Uptime's wider data integrity strategy to ensure that results-based payments to rural water service providers are grounded in accuracy. Specific objectives of the audit were:

- to corroborate observed and self-reported performance metrics with supporting documentation;

- to assess the likelihood of fraud and systematic discrepancies between reported and observed performance;

- to inform the renewal of results-based contracts; and

- to support improved data management for operational monitoring.

In this data audit, service providers with active results-based contracts in January 2023 were required to submit supporting documentation for performance data reported to Uptime on a representative sample of handpumps and piped water schemes. Original operational and financial records were reviewed for completeness and agreement with reported performance. This report summarises the methods, findings, and recommendations for future data audits.

Key metrics and findings

Reliable waterpoints: Supporting documentation corroborates 95% of the reported breakdowns. Infrastructure uptime is further substantiated by reports of preventative maintenance activities, routine operational tasks, and automated water meter readings, which are available for more than 97% of the audited handpumps and schemes.

Volumes: All water volume data associated with piped schemes on volumetric results-based contracts are confirmed with records of water meter readings. No discrepancies between reported and audited volumes are identified.
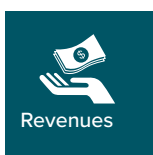
Revenues: Supporting documentation corroborates more than 97% of reported revenue records. Discrepancies between reported and audited revenues do not appear to have had a systematic influence on results-based payments.

Based on the findings, all data submitted to Uptime over the audit period can be considered accurate within an acceptable range of uncertainty. More than 91% of the quarterly breakdown, volume, and revenue records are corroborated with evidence from supporting documentation. Data gaps appear resolvable with small improvements to quality assurance and quality control processes, and major discrepancies impact less than 1% of all results-based payments made during the audit period.

The data audit process has led several service providers to adopt enhanced operational processes and internal reporting checks. In particular, photographic evidence and established protocols for review and approval reduce manual data entry errors, enable redundancy, and enhance reporting efficiency. The audit has also highlighted the value of digital and automated data for verification of results-based contracts. Service providers with integrated digital data are easily able to locate supporting documentation for audited waterpoints, while those managing hard copies or unconnected systems tend to have more difficulty and data gaps. Furthermore, the most transparent and accountable way to confirm uptime and usage of handpumps between maintenance visits is with automated data from *in situ* sensors. Although sound record-keeping and streamlined data management processes can generally suffice where digital or automated systems are impractical or cost prohibitive, digital and automated data enhance the efficiency and effectiveness of verification efforts.

Based on the findings of this report, Uptime plans to:

- monitor service provider responses to recommendations for addressing data discrepancies during quarterly submissions and future site visits;

- explore secure channels for submitting unmanipulated automated data, such as direct export and encryption; and

- revise data audit methods to consider water safety data.[1]

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1   Results-based funding for safe drinking water services: How a standard contract design with payment for results can accelerate safe drinking water services at scale.

Acknowledgements

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Uptime is a global initiative to keep drinking water flowing for millions of rural people through results-based funding to achieve Sustainable Development Goal 6.1.

www.uptimewater.org

Introduction

Uptime increased the dollar value of its portfolio from 2022 to 2023 by more than USD $1.5M annually to include results-based contracts across Latin America, Sub-Saharan Africa, and Asia. Under these arrangements, operational data are self-reported by rural water service providers on a quarterly basis and non-repayable funding is issued after Uptime confirms performance.

Figure 1: A handpump mechanic in Central African Republic writes a service fee receipt and documents the transaction in a digital form. Credit: Water For Good. Private information in this image has been redacted.

The integrity of results-based contracts depends on transparent and robust systems and processes for generating, managing, and scrutinising data. To this end, Uptime has advanced a triangulated approach that screens rural water services and data systems, makes it difficult for reported performance to be falsified, and ensures that results-based payments are grounded in accuracy. The approach involves routine validation of ongoing data submissions against historical records and verification across a representative sample of waterpoints via site visits and data audits. In addition to assuring performance for contract funders, data audits benefit service providers by revealing operational data gaps and opportunities for improved reporting.
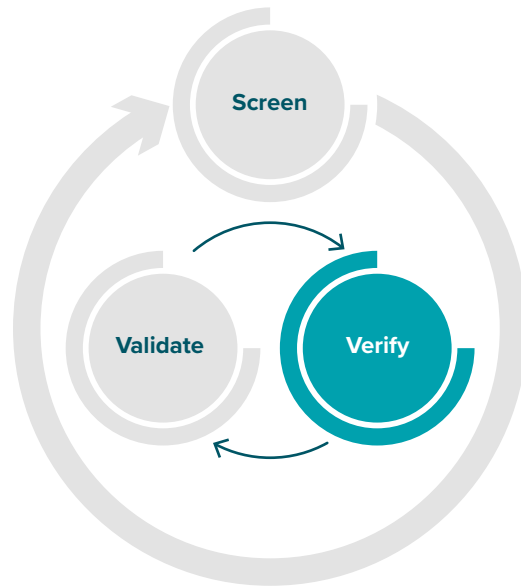
Figure 2: Uptime's triangulated approach to data integrity involves screening services and data systems, validating data submissions, and verifying performance with site visits and data audits.

In late 2023, Uptime conducted a data audit to assess the integrity of reported performance across its portfolio of results-based contracts. Specific objectives of the audit were:

- to corroborate observed and self-reported performance metrics with supporting documentation;
- to assess the likelihood of fraud and systematic discrepancies between reported and observed performance;
- to inform the renewal of results-based contracts; and
- to support improved data management for operational monitoring.

This report summarises the methods and findings of Uptime's 2022-2023 data audit.

Methods

The audit sought to cover a period of at least 12 months to account for annual cycles and seasonal variations in maintenance activities, water use, and revenues. Data were audited for five quarters from January 2022 through March 2023 for all service providers with active results-based contracts in January 2023.[2] Unpaid historical data from 2022 were audited for service providers whose contracts began in January 2023.

The data audit investigated supporting documentation for three metrics from the 'Uptime Framework'[3]: the number of waterpoints that worked reliably during the quarter, the volume of water produced by those waterpoints during the quarter in cubic metres, and the amount of local revenue received. Handpumps and piped schemes were the units of analysis. Piped scheme data were considered at the scheme level rather than individual taps to prevent the audit sample being excessively weighted towards household connections.

Data were reported for a total of 3,799 handpumps and 1,565 schemes over the audit period. A representative sample (90% confidence level, 5% confidence interval) of contracted handpumps and piped schemes (n=261) was randomly selected from service providers in proportion to their contribution to Uptime's portfolio by infrastructure count. This meant that several service providers which operate at relatively small scales were required to submit documentation for just one handpump or scheme, while service providers with the largest operational footprints were required to submit documentation for several dozen.

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2   When the audit was initiated, complete data submissions had not been received beyond the first quarter of 2023.

3   Delivering global rural water services through results-based contracts: How a standard contract design with payment for results can ensure resilient water services at scale.
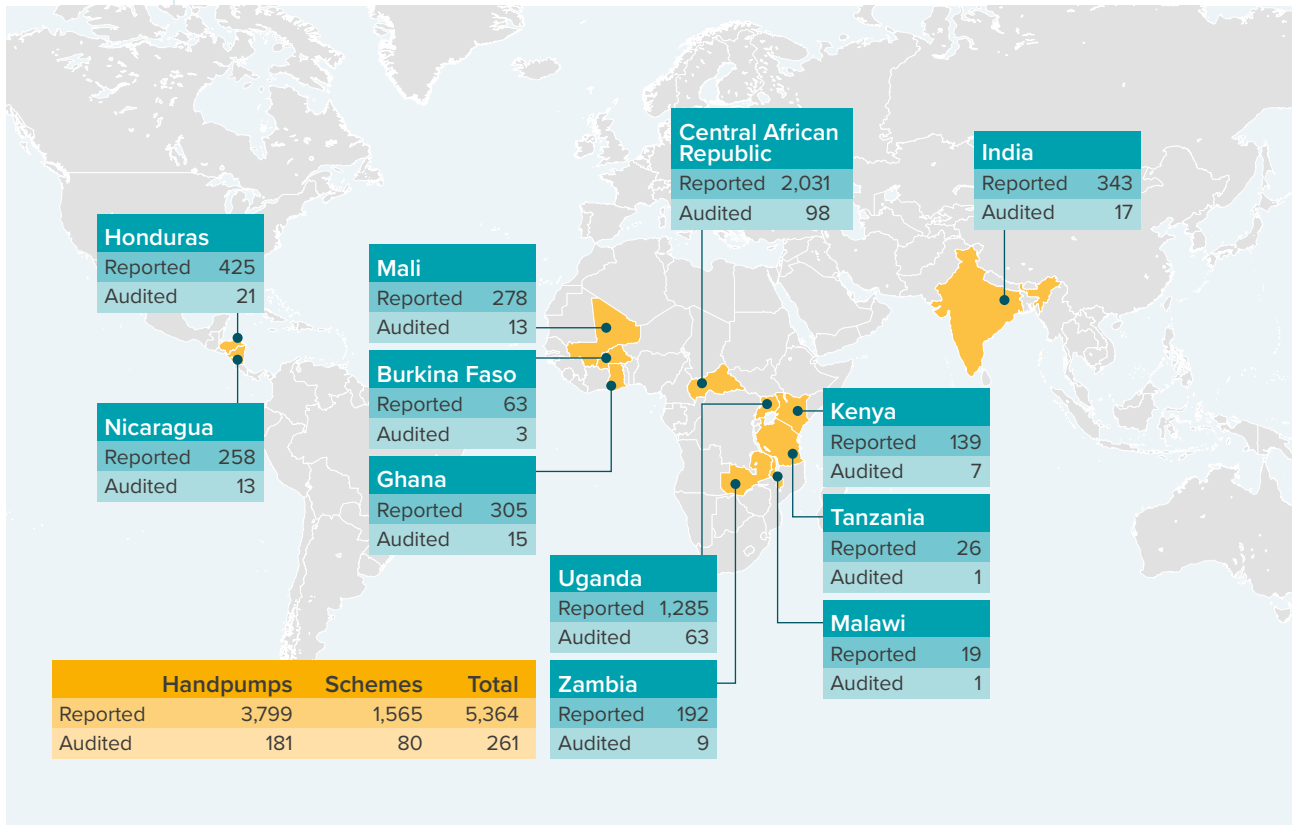
Figure 3: Data audit population and sample.

Service providers first submitted descriptive summaries of all documentation available to support the reliability, water usage, and revenue reported for the selected waterpoints over the audit period. These summaries were reviewed by Uptime for adequacy, and clarification or additional documentation was requested when necessary. Service providers then compiled and submitted supporting documentation in digital format, either as original files or photographs of physical copies. Submitted documentation could be broadly categorised into two types: primary documentation, which are presumably unmanipulated files such as photos, screenshots, and direct exports; and secondary documentation, which are digital data compiled in spreadsheets. All files submitted to Uptime were subjected to a desk-based review by an internal auditor, during which the metrics of interest were extracted and compared to quarter-matched data reported over the audit period. Inquiries into apparent data gaps and discrepancies between reported and audited performance were addressed directly with service providers. Additional supporting documentation was requested when available. All findings were summarised at the service provider level to inform Uptime's results-based contract renewal process.

Results and discussion
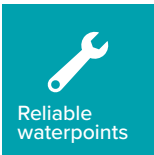
Reliable waterpoints

Verification of waterpoint reliability requires proof of breakdown events and repairs as well as routine maintenance or monitoring to confirm that infrastructure is functional between breakdowns. The documentation submitted in support of reported breakdown dates, durations, and the number of reliable waterpoints for which results-based payments were made over the audit period is summarised in Appendix Table A1.

Breakdowns and repairs

Supporting documentation corroborates 95% of the 241 breakdown instances and durations reported during the audit period. This evidence is mostly available in dated repair logs and descriptive reports compiled by operational staff, which are either handwritten or digital and often contain photographic evidence of the state of infrastructure before and after repairs. One service provider uses automated water meter readings with daily timestamps to monitor and report scheme downtime. Although these data are automated, the documentation is classified as secondary because it is submitted in a spreadsheet instead of direct export or encrypted format.

In general, the 13 discrepancies between reported and audited breakdown frequencies and durations are minor, not systematic, and likely result from clerical errors. Three unreported breakdown instances corresponding to three audited handpumps are identified in supporting documentation, each lasting just one day. One of these occurred on a handpump that experienced another breakdown during the same quarter, which would have disqualified the waterpoint from receiving a results-based payment. This is considered a major discrepancy because it resulted in overpayment and is discussed further in the conclusion section of this report. All other breakdown data discrepancies had no influence on results-based payment amounts.

Figure 4: A digital report describing a repair conducted on a handpump in Uganda with timestamped photographic evidence. Private information in this image has been redacted.

Preventative maintenance

More than two thirds of the audited handpumps and schemes did not experience a breakdown during the audit period. However, waterpoints cannot be assumed to provide reliable service simply from the absence of breakdown records. It is imperative to document that those waterpoints were being actively operated or maintained. Reports of preventative maintenance activities, routine operational tasks, or automated water meter readings are available for more than 97% of the audited handpumps and schemes. This suggests that a majority of Uptime's contracted waterpoints are actively managed and corroborates most reported cases of uninterrupted service.

Supporting documentation is not available for five schemes and two handpumps in the audit sample. The undocumented schemes do not pose a major concern because the amount of results-based payment issued under the terms of the particular contract would not have changed even if the schemes had been removed from the original data submissions. However, the two handpumps received undue results-based payments because they were misclassified in data submitted to Uptime. In the first scenario, a handpump was mistakenly reported as being under an active service contract when the service provider had actually only visited the site to market its services and no maintenance activities had ever been conducted. In the second case, due to a misclassification in the service provider's data system, one waterpoint that was reported as a handpump during the audit period was discovered to be a borehole source connected to a separate scheme that had also received a results-based payment. These are the only two identified cases where data discrepancies would have impacted results-based payments. Implications are discussed further in the conclusion section of this report.

Volumes

Verifiable data on water volumes are captured by either digital or analogue water meters. Volumetric estimates from unmetered infrastructure such as handpumps are also reported by some service providers, but the accuracy of these estimates is unknown. Estimated volumetric data are not used in results-based payment calculations and were not reviewed in the data audit. As with breakdowns, supporting documentation for reported water volumes can be classified as primary and secondary. Submitted files for schemes under volumetric results-based contracts during the audit period are summarised in Appendix Table A2.

All volume data associated with piped schemes on volumetric results-based contracts are confirmed with records of water meter readings, and no discrepancies between reported and audited volumes are identified. Furthermore, two out of every three audited schemes use automated meter readers which are associated with a high degree of accuracy. More than half of these are linked to automated revenue data through prepaid water meters.
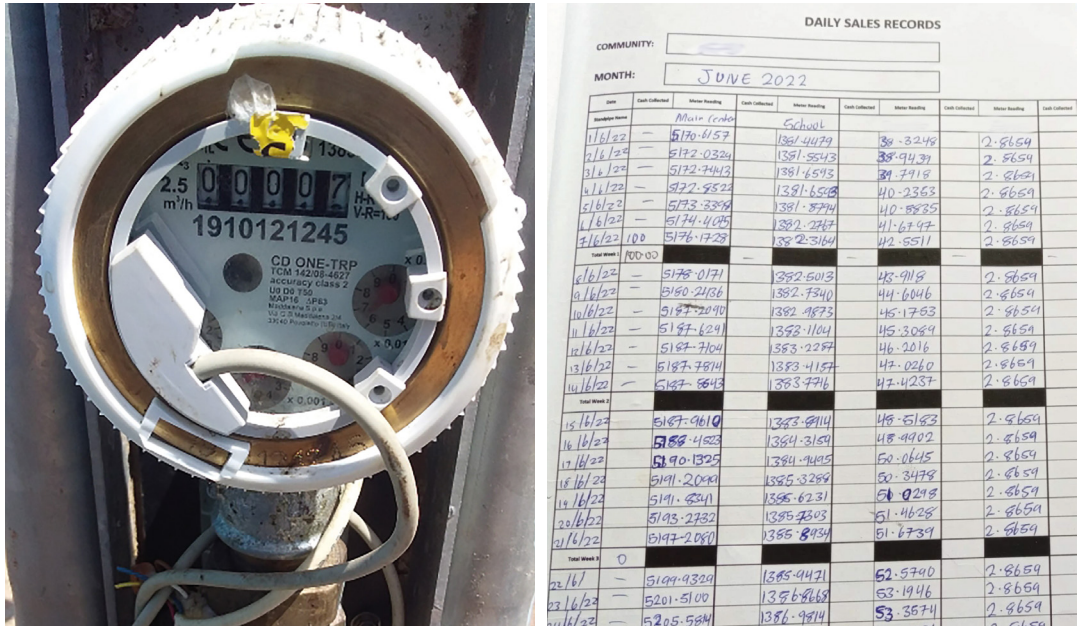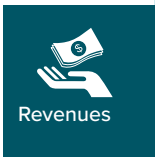
Figure 5: A photograph of a pulse output water meter reading in Mali (left); a daily operations log with manual water meter readings from kiosks and shared taps in Ghana (right). Private information in this image has been redacted.

Revenues

Revenue is defined as the funds received by a service provider as payment for services. All service providers within Uptime's portfolio undergo regular and comprehensive external audits of their financial statements and accounting practices. Instead of duplicating those efforts, the scope of financial record review during the data audit was intentionally limited to point-of-sale transactions. Service providers were requested to provide proof of revenue generated from user payments. Appendix Table A3 summarises the documentation provided to support the revenues reported during the audit period.

Supporting documentation corroborates more than 97% of 1,558 reported quarterly revenue records. Of the 43 unverified records, 25% result from documentation gaps. Half of the remaining discrepancies (52%) correspond to errors where audited revenue is less than reported revenue, and the other half (48%) correspond to errors where audited revenue is greater than reported revenue. The average audited quarterly revenue is USD $9.77 higher per handpump or scheme than reported.

Figure 6: A handwritten receipt for a handpump maintenance subscription payment in Central African Republic. Private information in this image has been redacted.

Conclusions

We find that the global performance data submitted to Uptime over the audit period can be considered accurate within an acceptable range of uncertainty. More than 91% of the quarterly breakdown, volume, and revenue records assessed are corroborated with evidence from supporting documentation. Nearly all data gaps and discrepancies identified during the audit process appear to be minor and resolvable with small improvements to quality assurance and quality control processes. The discrepancies identified between reported and audited performance are summarised in Table 4.

Table 4: Summary of discrepancies between reported and audited data

	Handpumps and schemes		Quarters[b]	
	Number	Percent of audited sample	Number	Percent of audited sample
Discrepancies not identified	208	80%	1,040	91%
Minor discrepancies identified	50[a]	19%[a]	87	8%
Major discrepancies identified	3[a]	1%[a]	10	<1%

a Handpumps and schemes for which at least one discrepancy between reported and audited performance was identified over the audit period
b Complete quarters of performance records reported for individual handpumps or schemes including relevant metrics for breakdown instances and durations, revenue, and volume; disagreement between any single reported and audited metric in a quarter is classified as a discrepancy

Data discrepancies that could have influenced amounts of results-based payment are classified as 'major'. These involve three handpumps, each with a unique and unrepeated data omission or misclassification. However, these types of discrepancies correspond to only 10 quarters of performance records, or less than 1% of the audited sample. Minor discrepancies are more common and are associated with nearly one in five of the audited handpumps and schemes. These involve clerical errors, misclassifications, or gaps with unsystematic or negligible impact on results-based payments, or that correspond to unpaid historical data.

Most errors in historical data appear to stem from the fact that many service providers had not implemented quality assurance and quality control measures in their data systems before Uptime's results-based contracts were initiated. All sources of major and minor discrepancies have been addressed directly with service providers and do not pose serious concerns with respect to renewal of Uptime's active results-based contracts. In fact, the audit process has led several service providers to adopt enhanced operational processes and internal reporting checks aimed at improving data integrity. In particular, photographic evidence and established protocols for review and approval reduce manual data entry errors, enable redundancy, and enhance reporting efficiency.

The quality of supporting documentation maintained by Uptime's contracted service providers is generally high. This is partially due to the fact that the service providers know that their data systems will be audited. Files reviewed during the data audit are evenly distributed between primary and secondary types. Maintenance activities are often documented via presumably unmanipulated handwritten or digital reports, while revenue is often summarised or compiled from multiple sources or files. Although primary documentation may be associated with a somewhat higher degree of accuracy and transparency, automated meter readings, prepaid credit transfers, and profit and loss statements are also dependable and constitute a sizable portion of the secondary documentation reviewed during the audit. Notably, automated data would be classified as primary documentation if submitted in encrypted format or directly exported rather than summarised in a spreadsheet.

Several limitations to the data audit are acknowledged. First, we examined a selection of handpumps and schemes according to the statistical protocol outlined in this report. Different units of analysis, confidence levels, or sampling procedures might have led to different quantitative results. Yet, our methods were intentionally crafted to yield findings that are most likely to represent a portfolio of results-based contracts with an acceptable level of uncertainty. We also cannot assure that the documentation provided to support reported breakdowns, volumes, and revenues has not been manipulated or falsified. Service providers maintained and supplied their own records for the audit. Furthermore, the discovery of unreported breakdowns in supporting documentation highlights a limitation that the data audit depends on the validity and accuracy of service providers' data systems and reporting processes. The unreported breakdowns identified in the data audit appear to have been inadvertent. However, there could have been more breakdown instances that were undocumented, either intentionally or unintentionally, which also went unreported. A related but perhaps more critical limitation is that, while routine water meter readings from piped schemes are available to substantiate reported periods of continuous service, the only documentation available to support similar claims for handpumps is infrequent preventative maintenance reports. These limitations can be addressed, and confidence in the overall performance of each results-based contract reinforced, when the data audit is considered alongside the other coordinated data integrity processes Uptime applies.

The data audit has also highlighted the value of digital and automated data for verification of results-based contracts. Service providers with integrated digital data are easily able to locate supporting documentation for audited waterpoints, while those managing hard copies or disjointed systems tend to have more difficulty and data gaps. Furthermore, the most transparent and accountable way to confirm uptime and usage of individual handpumps between maintenance visits is with automated and encrypted data from *in situ* sensors. Although sound record-keeping and streamlined data management processes can generally suffice where digital or automated systems are impractical or cost prohibitive, digital and automated data enhance the efficiency and effectiveness of verification efforts.

Based on the findings of this report, Uptime plans to:

- monitor service provider responses to recommendations for addressing data discrepancies during quarterly submissions and future site visits;
- explore secure channels for submitting unmanipulated automated data, such as direct export and encryption; and
- revise data audit methods to consider water safety data.[4]

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4   [Results-based funding for safe drinking water services: How a standard contract design with payment for results can accelerate safe drinking water services at scale.](#)

Appendix

Table A1: Summary of supporting documentation for waterpoint reliability

	Primary Documentation[b]		Secondary Documentation[c]	
	Number of handpumps or schemes referenced	Percent of audited sample[d]	Number of handpumps or schemes referenced	Percent of audited sample[d]
Breakdown repair logs or reports[a]	27	10%	24	9%
Preventative maintenance or operational logs or reports	230	88%	19	7%
Sensor data or automated meter readings	0	0%	4	2%

a Breakdown repair logs or reports are only relevant for handpumps or schemes that experienced a breakdown during the audit period
b Presumably unmanipulated files such as photos, screenshots, or direct exports
c Digital data compiled in spreadsheets
d Percentages values displayed in columns do not add to 100% because different types of documentation are sometimes submitted for the same handpump or scheme

Table A2: Summary of supporting documentation for water volumes

	Primary Documentation[a]		Secondary Documentation[b]	
	Number of schemes referenced	Percent of audited sample	Number of schemes referenced	Percent of audited sample
Manual meter readings	11	23%	4	9%
Automated meter readings	0	0%	32	68%

a Presumably unmanipulated files such as photos, screenshots, or direct exports
b Digital data compiled in spreadsheets

Table A3: Summary of supporting documentation for local revenues

	Primary Documentation[a]		Secondary Documentation[b]	
	Number of handpumps or schemes referenced	Percent of audited sample[c]	Number of handpumps or schemes referenced	Percent of audited sample[c]
Payment receipts	71	27%	0	0%
Bank or mobile money statements	39	15%	0	0%
Billing and pre/payment records	0	0%	116	44%
Profit and loss statements	0	0%	55	21%

a Presumably unmanipulated files such as photos, screenshots, or direct exports
b Digital data compiled in spreadsheets
c Percentages values displayed in columns do not add to 100% because different types of documentation are sometimes submitted for the same handpump or scheme