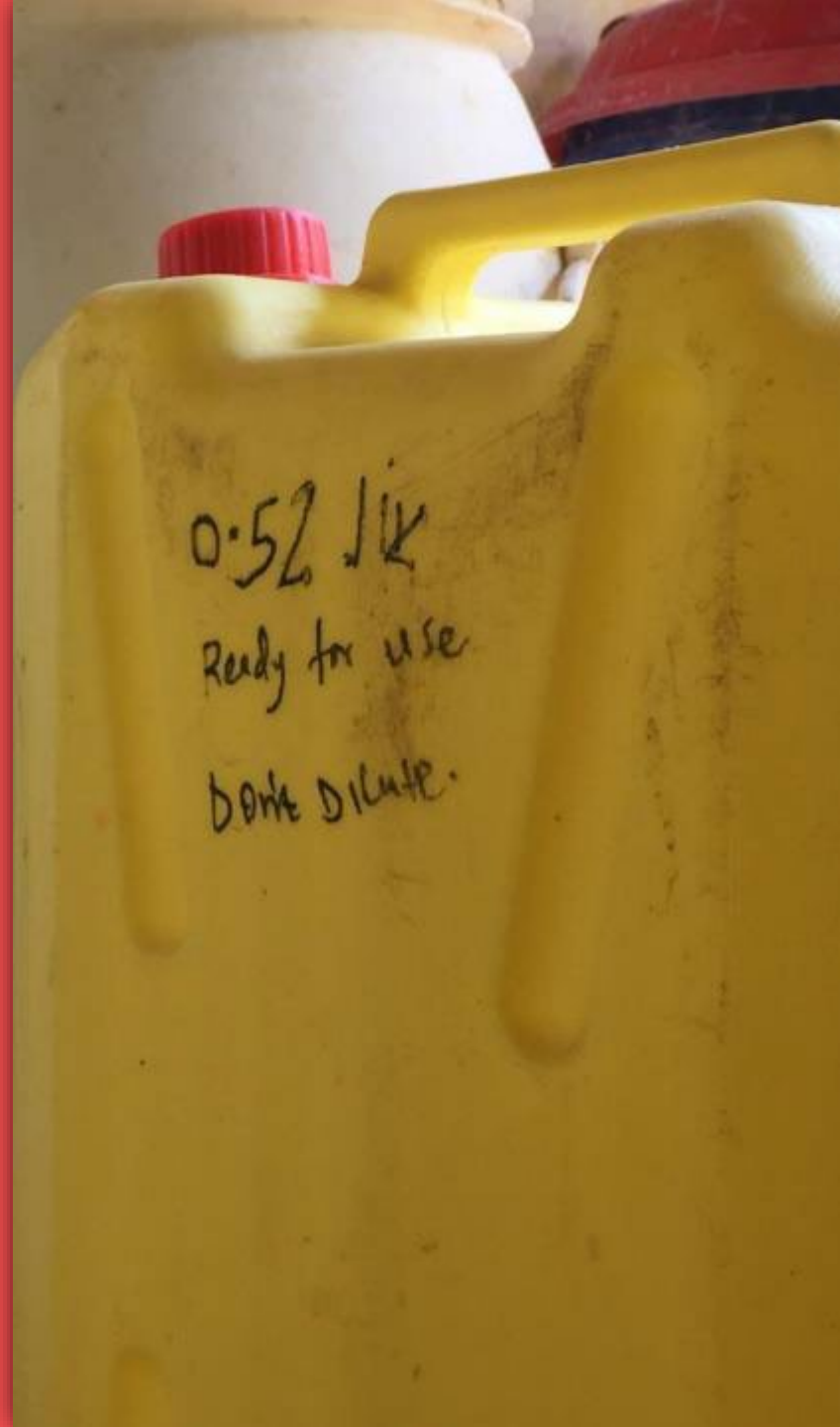
March 2023

Global Community of Practice (CoP) on decentralized chlorine production



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Please note: this webinar will be recorded.

Agenda

- Introduction & CoP overview
- Presentations
    - **Data for policy/market approval**
    - **Data for health system adoption and integration**
    - **Data for national and cross-national system design**
- Discussion
- Wrap up

1 Welcome and CoP introduction

2 Presentations

3 Discussion

Purpose

- The decentralized chlorine production **Global Community of Practice (CoP) aims to be an international consortium** of civil society organizations, private-sector companies, and individuals committed to advancing innovative chlorine generation technologies and service delivery models for disinfection and water treatment.
- The CoP will function as a **global learning, networking, and advocacy alliance** aiming to stimulate collaborative and transparent discussion among partners on lessons learned, evidence gaps, and candid feedback on challenges faced through the deployment and use of on-site chlorine generators.
- The CoP seeks to **build on increasing global momentum and integration** of onsite chlorine generators in WASH services across the globe.
- We seek a diverse, inclusive, and equitable platform that **fosters open and honest communication** and encourages a broad range of views and backgrounds. Please reach out with any suggestions, comments, or topics you wish to highlight.

Impact

- **Reduce the burden of water-borne diseases** in low- and middle-income countries by supporting the introduction and use of on-site chlorine generators for water treatment in household and community-based water systems.

- **Reduce the burden of hospital-acquired infections** in low-and middle-income countries through the introduction and use of on-site chlorine generators for improved infection prevention and control practices in healthcare facilities.

CoP structure

- Voluntary & open to all
- Complement to Global WASH in HCF CoP
- Quarterly meetings with rotating topics
- Previous meetings covered:
  - Technologies
  - Service models
  - Emerging evidence
  - Innovation
- Slides and recording available here:
  - https://www.washinhcf.org/cop/

Theme	Illustrative specific topics/questions
Technologies	• What technologies exist? • How do chlorine generators work • Efficacy & effectiveness • Advantages/disadvantages
Collaboration & learning	• Learn how other orgs are applying these technologies for IPC and water treatment • Synergies, establishing connections, exploring collaboration, and information exchange • Experience with piloting and government engagement • Research opportunities for young professionals
Implementation	• Study design and methodologies • Barriers and enablers to adoption • Training approaches • Large scale introduction and scale up strategies • Integration into and way to automate workflow processes • Indicators and monitoring approaches
Application and use cases	• Water treatment – with various water sources, complementary technologies, and community settings • Infection prevention and control – reduction of hospital acquired infections, AMR, and pandemic preparedness/outbreak control
Business/distribution models	• Decentralized chlorine production and distribution models • Business models for chlorine distribution (water tx or IPC) in rural/semi-urban areas

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1 Welcome and CoP introduction

2 Presentations

3 Discussion

Introduction of a novel WASH technology to the Uganda public healthcare system

Case study: Evidence and processes necessary for introducing and seeking governmental approvals for the STREAM Chlorine Generator in Uganda

Dr Martin Ruhweza, Consultant

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THE REPUBLIC OF UGANDA
MINISTRY OF HEALTH

Project rationale

- **Poor WASH and environmental hygiene can lead to poor health outcomes and health system burden**
    - HAIs affect an estimated **15% of patients** in low- and middle-income countries; **28% in Uganda**.
    - Sepsis-related deaths, resulting in part by HAIs, account for **20% of the global deaths**
    - Psychosocial staff burden of not being able to provide quality care to patients

- Improved WASH and IPC practices in health facilities have been shown to **reduce HAI prevalence rates by 10 – 70%** and **sepsis deaths by 50%.**

- Chlorine is a widely recommended chemical disinfectant used for IPC in health care settings, yet **not consistently available**.
    - Globally, an estimated **36% of HCFs face chlorine stock outs**
    - Uganda: stock outs have been found to range from **26 to 132 days per year**

THE REPUBLIC OF UGANDA
MINISTRY OF HEALTH

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Aqua Research STREAM Disinfectant Generator

The **Uganda MOH and PATH partnered to strengthen WASH/IPC services in HCFs** and reduce the burden of HAIS by introducing and evaluating the Aqua Research STREAM chlorine generator.

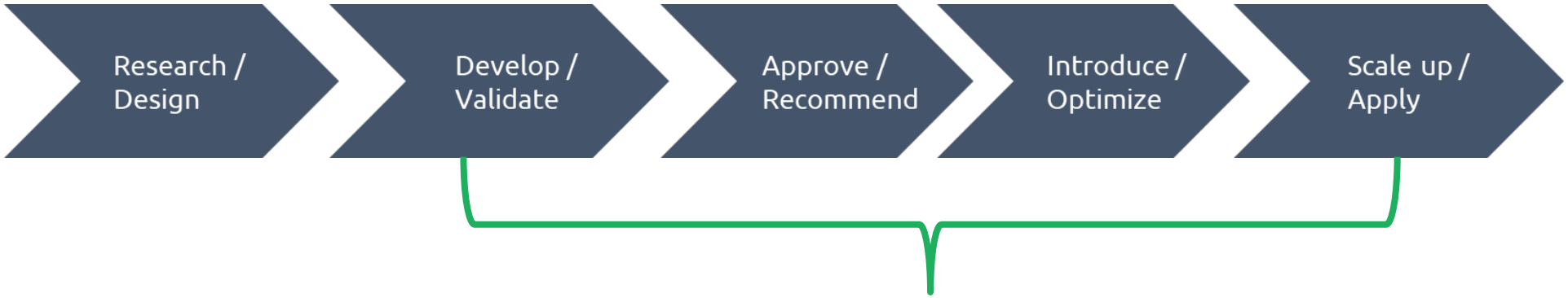
Chlorine concentration (FAC)	0.5%
Brine salinity	15 g/L
Chlorine production rate	4.8 L/hour
Chlorine generation mode	Continuous
Drinking water treatment rate	Up to 230,000 L per day
Input power	110/220 V AC, 2 A, 50/60 Hz, 12 V DC, 16 A
System weight	8.2 kg
Dimensions	42 x 33 x 17.3 cm

Abbreviation: FAC, free available chlorine.

Photo credit: Aqua Research, LLC

A structured introduction process

PATH product and market development process



Over the last seven years, PATH/MOH have focused on advancing through the four final stages

Proof of concept validation and design/market advancement (2016 – 2019)

Objectives:

- **Design refinement**: beta to pre-production prototype design
- **Evidence generation:** feasibility and operational data
- **Market analysis**: Assess market demand and commercial strategy

Evidence generation and policy/regulatory approval (2019 – 2022)

Objectives:

- **Policy approvals and government champions**: advocacy and approvals
- **Evidence:** Implementation research on health system fit, cost, acceptability
- **Market entry:** Regulatory approvals and and go to market planning

National scale-up and district implementation (2022 – 2025)

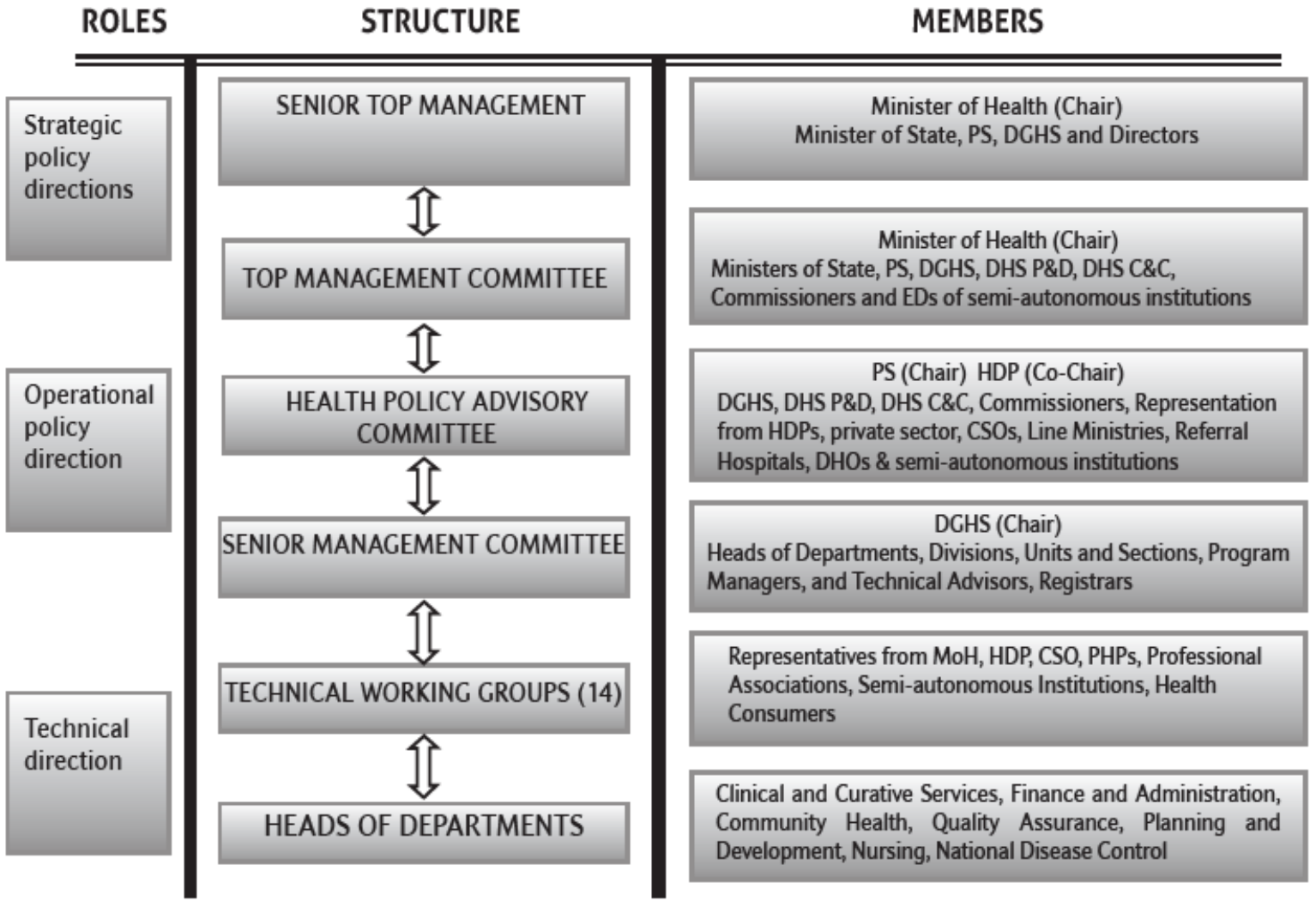
Objectives:

- **National ownership**: Support MOH with national scale-up
- **Dual purpose:** Expand use of STREAM for HCF water treatment
- **Market integration**: Support AR with executing go to market plans

Case study: Uganda

- Establish MOH champion and counterpart → Clinical Services Department Director
- Outline evidence needs with CSD Director and launch evaluations
- Present results starting with TWGs, adjusting results to review requirements for each committee

Uganda MOH Governance and Management structure



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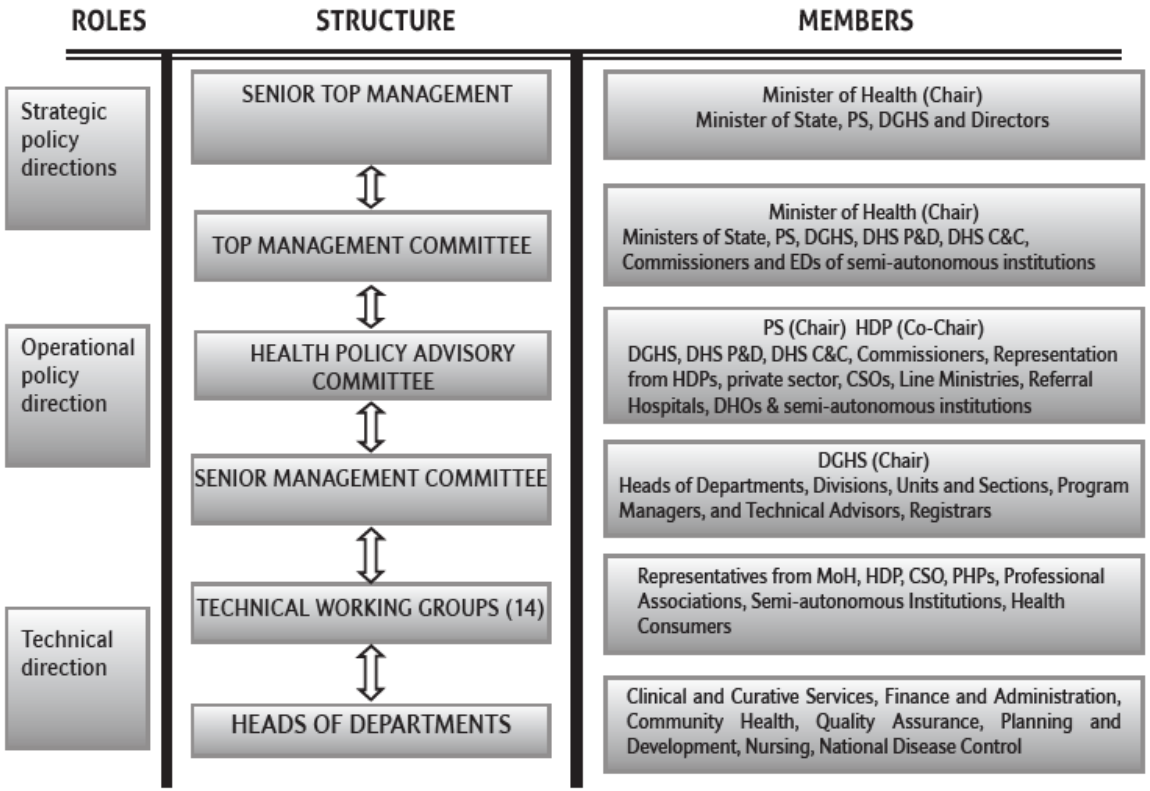
Results: Uganda



Note: Numerous other government agencies, implementing partners, funders, etc. were also engaged to generate awareness, support, and share best practices/challenges.

Approvals received to date

1. MOH letter of support (Sept 2020)
2. Pilot/ethical study approvals (NDA, MHREC, UNCST, URA) (2020/21)
3. **WASH/IPC Pillar and Hospital & Health Infrastructure TWG** (March 2021)
4. **SMC approval** to present to HPAC (June 2021)
5. **HPAC** requested further NACME evaluation (April 2022)
6. 6a **NDA** Certificate of Analysis (July 2022)
   6b **NACME** Recommendation (October 2022)
7. **Top Management Committee** presentation by MOH CSD (March 2023)

Data presented

1. Health facilities face significant chlorine stock out periods

- 74.3 days per year: average duration that HCFs operated without any chlorine stock [25.8 - 132.3 days]
- Stock outs lead to rationing, over/improper dilution, asking patients to bring in chlorine, or using inadequate cleaning supplies (e.g., laundry detergent)

2. STREAM units can eliminate chlorine stock outs

- 49,009 liters of 0.5% chlorine disinfectant produced onsite by STREAM units to date (Dec 2020 – Dec 2022; total value of 156,662,054 UGX)
- During the evaluation, none of the ten HCFs experienced a chlorine stock out

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Data presented

3. STREAM units generate significant cost savings for HCFs

- Average cost savings of 36% in chlorine supply costs across facilities due to STREAM

	Commercial chlorine	STREAM	Cost savings USD (%)
Average cost per liter of 0.5% chlorine	$0.8378 3,197 UGX	$0.5333 2,040 UGX	**$0.3020 (36%)** **1,157 UGX**

4. High acceptability and workflow improvements resulting from STREAM

- 100% of DHOs, hospital administrators, and users agreed the STREAM improved IPC practices by:

– Increasing IPC practices and cleaning due to increased chlorine availability

– Safer, more hygienic patient and staff environments

– Simplified chlorine distribution processes and cost savings

Next steps

PATH and MOH will continue to generate data to inform and strengthen scale-up planning and service model expansion.

Data focus for scale

- **Sustainable operational models:** Installation, training, monitoring, and maintenance and repair plans
- **Data and information:** Data architecture and indicators that leads to sustained use and oversight; processes for integration into national monitoring systems
- **Market integration:** Prioritizing target geographies, HCFs, and distribution plans
- **Financing:** Identifying short- and long-term financing options and requirements

National STREAM scale up plan for Uganda

District level STREAM implementation plan

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PATH Uganda

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DIGITAL DATA ARCHITECTURE & AUTOMATION

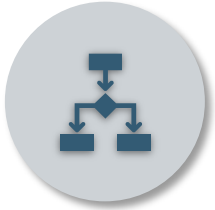
Amanda Miner, Envicom

INTRODUCTION

PROJECT BACKGROUND

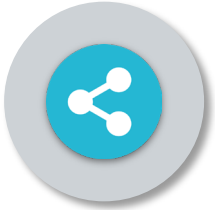
WHY AUTOMATE DATA COLLECTION?

HOW DO WE DO IT?



WHAT WERE OUR OUTCOMES?

WHAT CHALLENGES DID WE ENCOUNTER?



IMPLICATIONS FOR SYSTEMIC IMPROVEMENTS

Remote Data Capture and Visualization Frameworks to Support Chlorine Generator Use throughout National Healthcare Systems

envicom

AQUA RESEARCH

PATH

CRS CATHOLIC RELIEF SERVICES

GHANA HEALTH SERVICE GHS Your Health · Our Concern

Remote Data Capture Locations from STREAM Units in Ghana

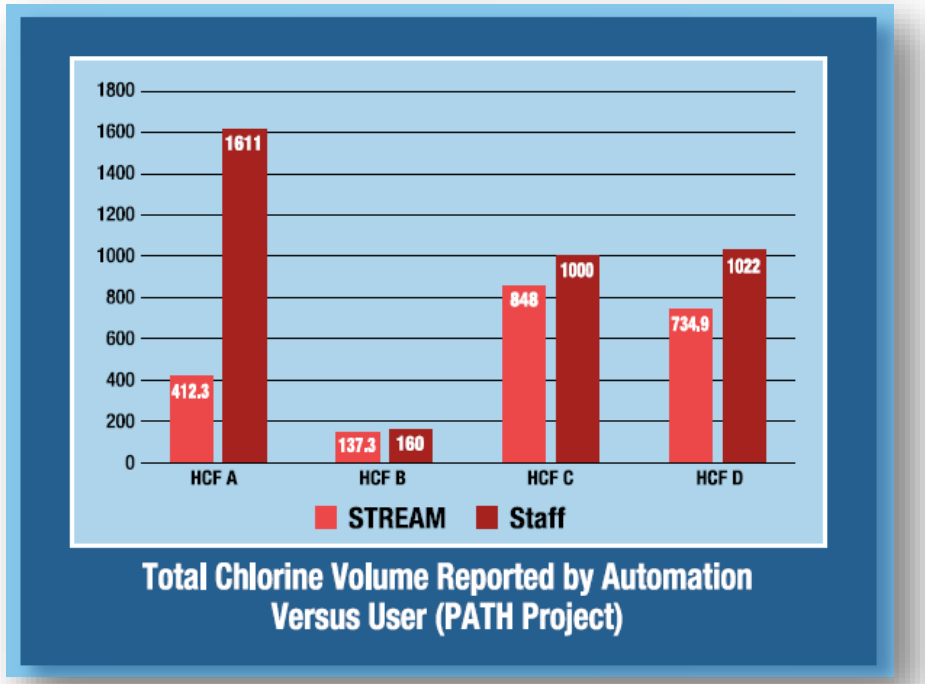
Good data architecture is an imperative component of strengthening healthcare systems and evidence-based decision making. While data in the WASH in HCF sector has become increasingly available, the environmental hygiene service area remains a clear gap.

PROJECT BACKGROUND

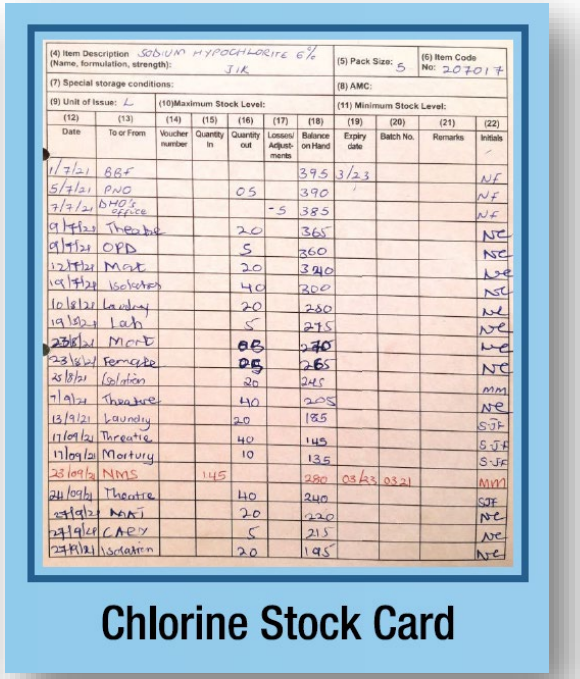
Develop and pilot a remote data capture system that:

1. Automatically collects and transmits frequent technical performance data from an onsite chlorine generator (STREAM Disinfectant Generator)

2. Automatically update cloud-based, end user-centric dashboards.



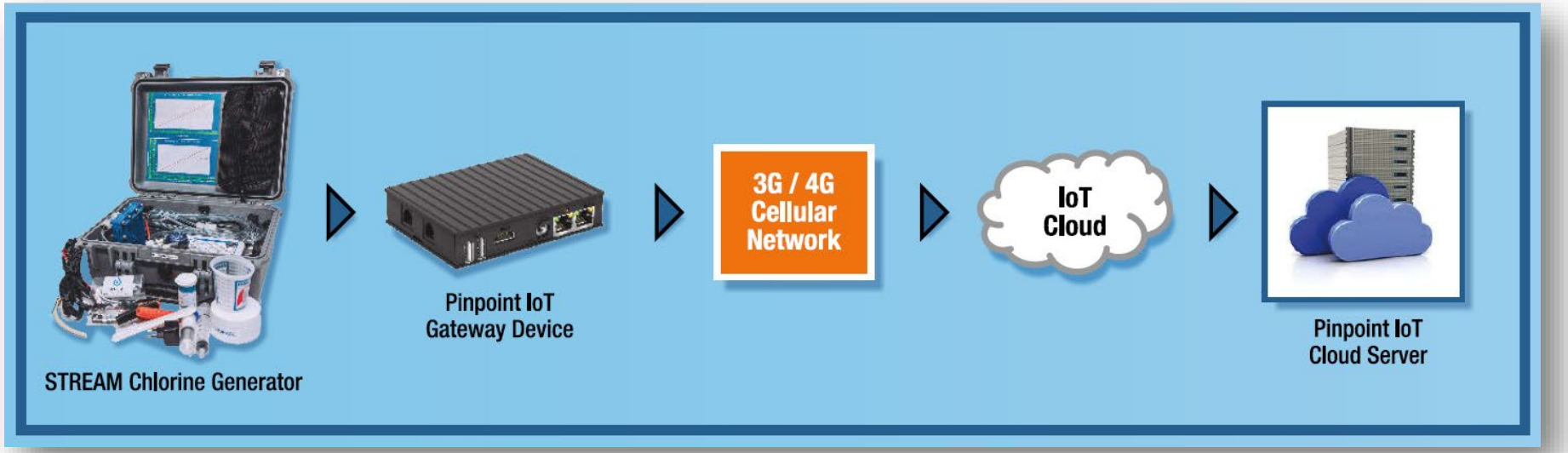
Total Chlorine Volume Reported by Automation Versus User (PATH Project)



Chlorine Stock Card

WHY AUTOMATE DATA COLLECTION?

- Form-based data collection depends on (already busy) humans
- Datasets are incomplete at best…hard to make meaningful inferences or comparisons
- Difficult to automate visualization or data sharing from form-based collection:
  - Non-standardized data
  - Not obtaining real-time sector insights about patterns or correlations

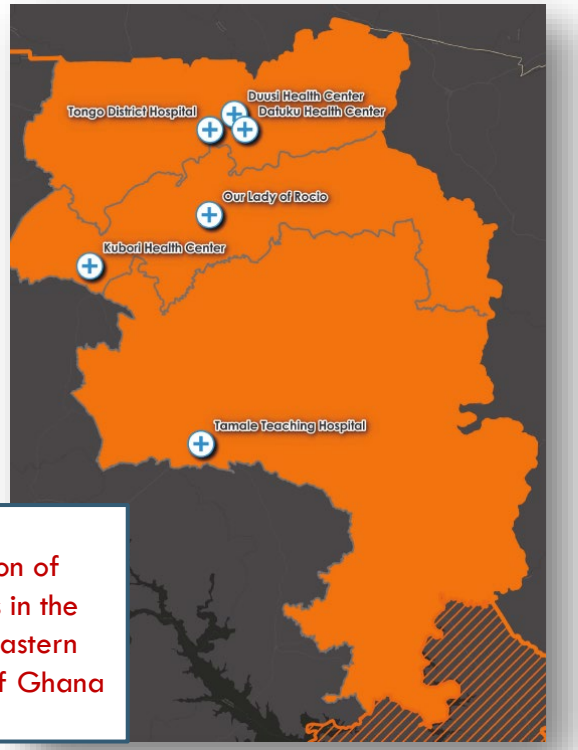


IoT What Is It?

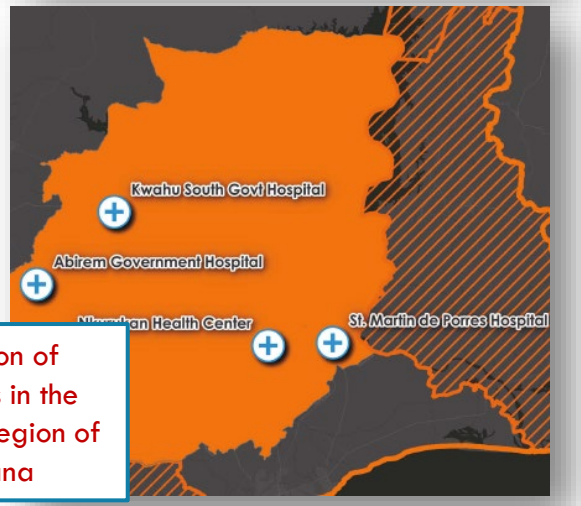
- IoT = 'Internet of Things'
- Refers to "the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves" (AWS 2022)

HOW DID WE DO IT?

- We developed a Gateway device that communicates with the STREAM via Bluetooth every 5 minutes.
- The Gateway uses available 3G/4G cellular network to transmit data packages to the IoT Cloud, where it is sent to our IoT Server.
- Data is ingested into pre-configured visualizations that update in near real-time



Location of Systems in the North-Eastern Regions of Ghana



Location of Systems in the Eastern Region of Ghana

HOW DID WE DO IT?

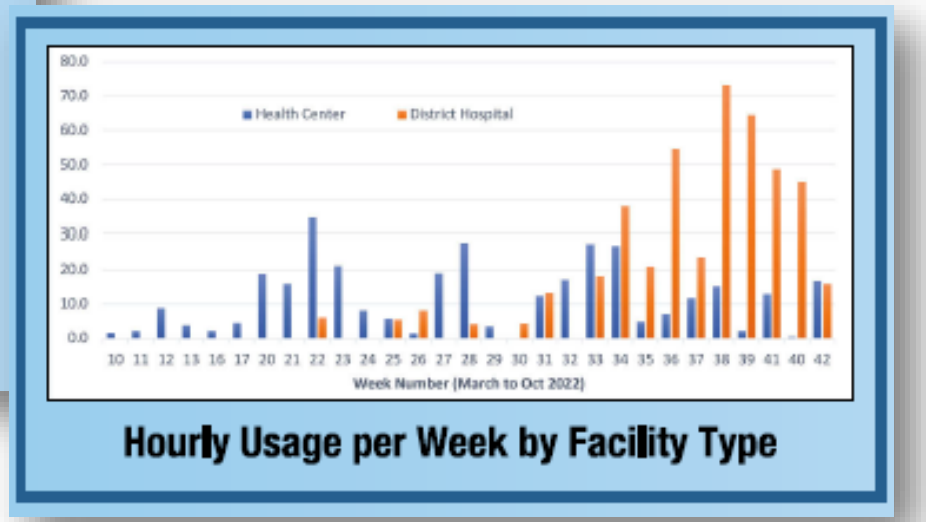
Describe Methods

Data Visualizations: Improvements over Prior Insights

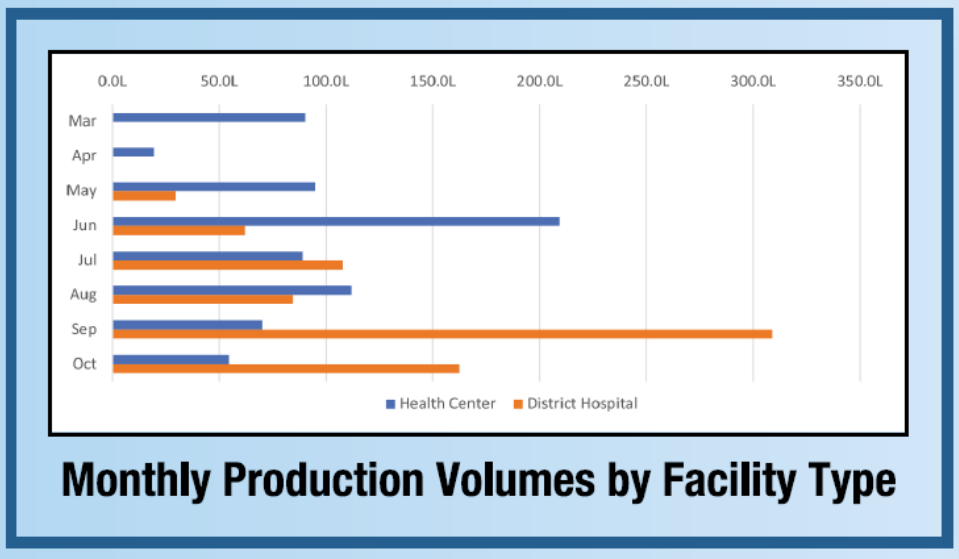
When compared with the paper stock cards, the improvements in information available to all project stakeholders are substantial:

- Receive hour-by-hour information on production and supply
- Granularity of the data allows for clear view of activity over time
- Provides a common operating picture for all stakeholders
- Addresses a gap in our understanding of the supply chain
- Provides insights to maintenance staff that improve useability of the **STREAM**
- Helps our understanding of use challenges by staff (e.g., common errors)
- Provides visual guidance on the maintenance needs of the asset
- Downloadable reports are available with pre-aggregated data (efficiencies)

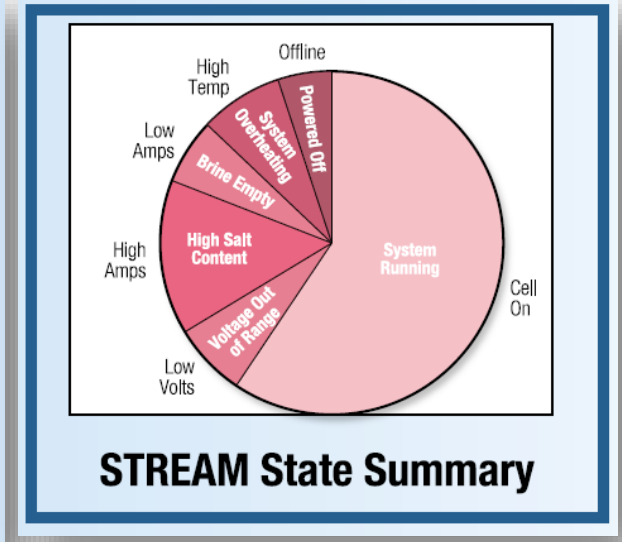
WHAT WERE OUR OUTCOMES?



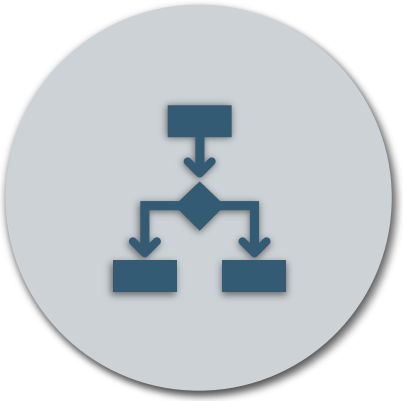
Hourly Usage per Week by Facility Type



Monthly Production Volumes by Facility Type



STREAM State Summary

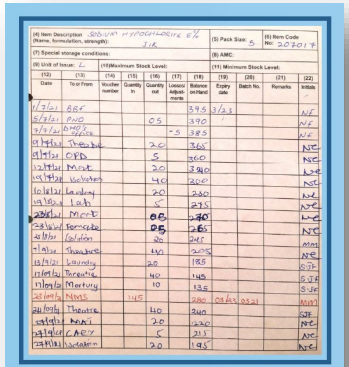


WHAT WERE OUR OUTCOMES?

Telemetry

Monthly Production Volumes

VS.



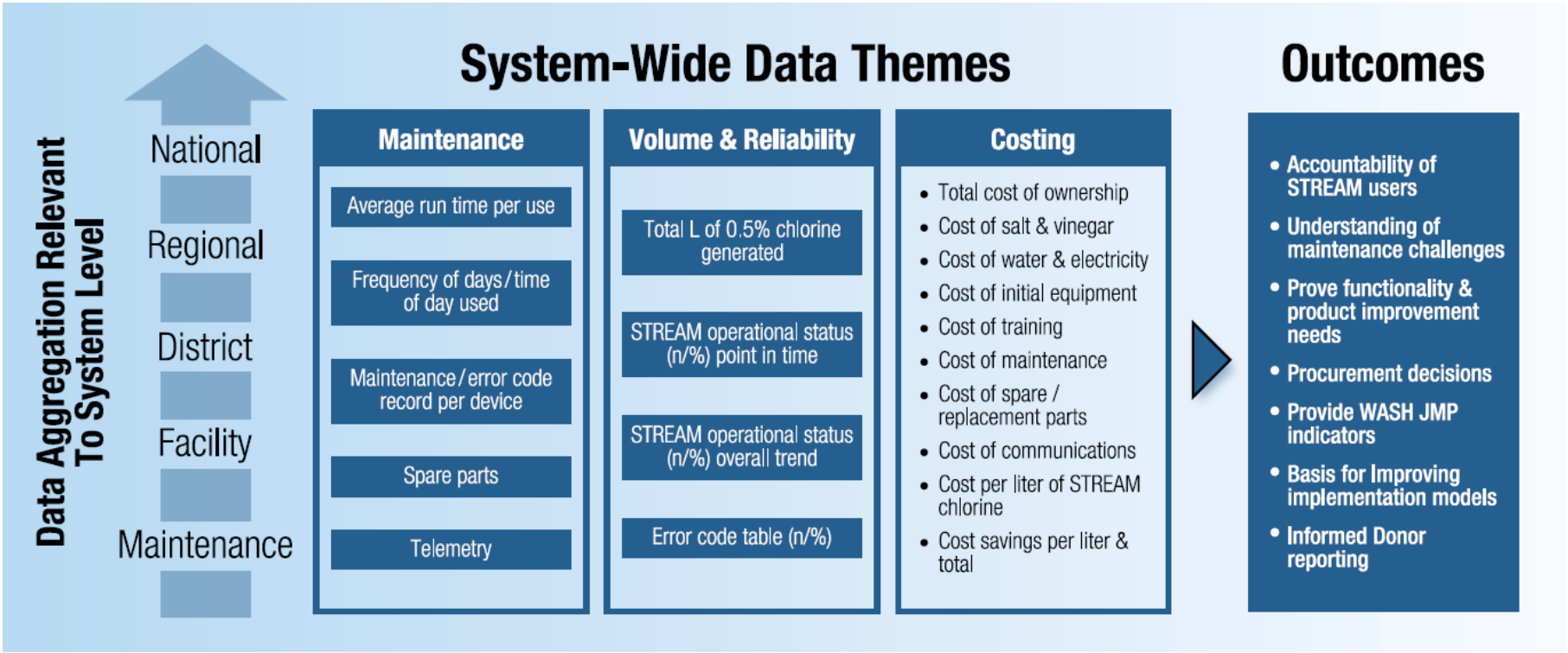
Chlorine Stock Card

WHAT CHALLENGES DID WE ENCOUNTER?

- Incorrect telecommunications information provided on government website
- Shipping and customs
- Govt. approval of equipment use
- Meaning of data visualizations – iterative refining for user understanding

What Makes this Solution Novel?

- It does not require behavior change or additional effort from overworked staff to get data
- Data architecture allows the same data to be 'served' in different ways to different users in the system
- Data is configured to support different user roles and their workflows in a specific way

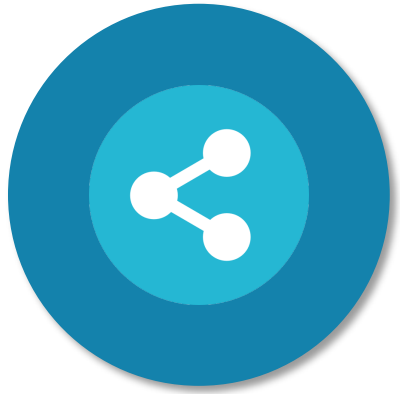


IMPLICATIONS FOR SYSTEMIC IMPROVEMENTS

End User Data Needs

Key questions to ask end users:

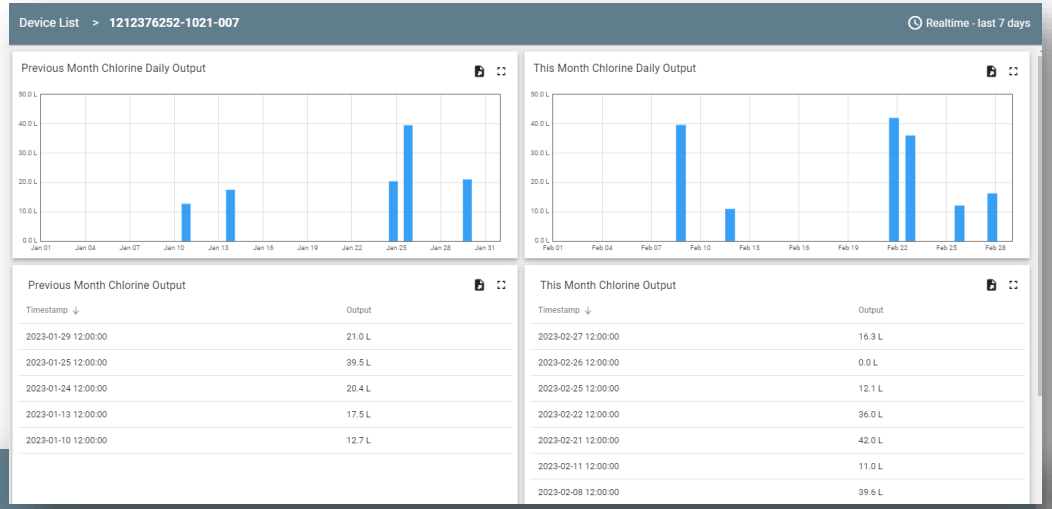
- What are the most critical things you need to understand for your job/workflow?
- What are the things you need to understand most about the STREAM itself?
- How would you like to see those things represented?
- What will make things easier for you and your team?
- Does this data need to integrate with an 'official' data system (e.g. DIMES)

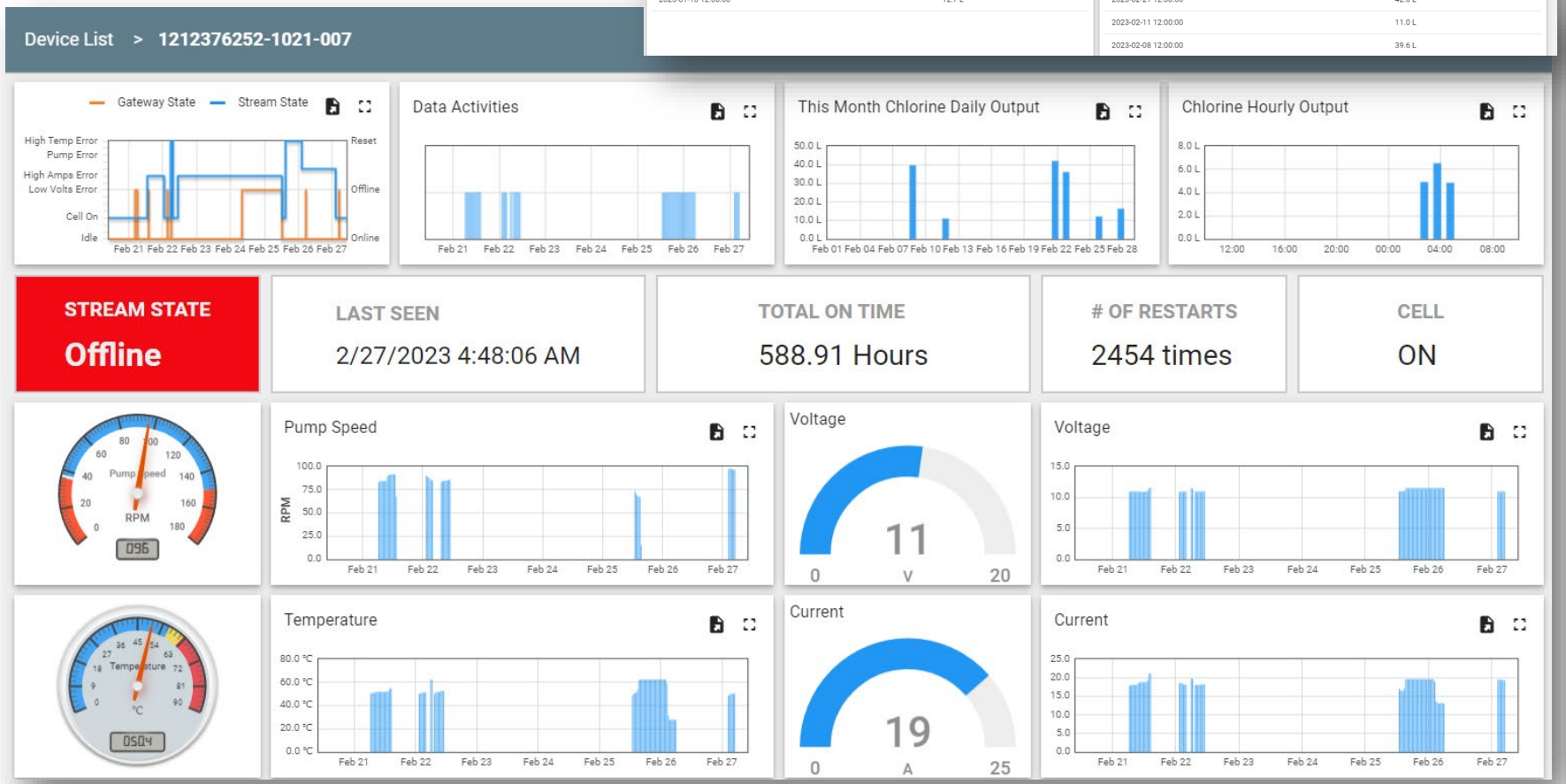


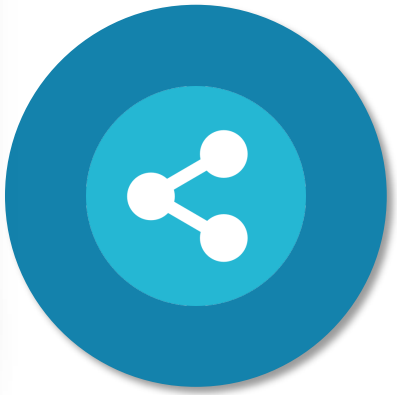
IMPLICATIONS FOR SYSTEMIC IMPROVEMENTS

End User Data Needs

Regional Biotechnical Engineers at Ghana Health Services







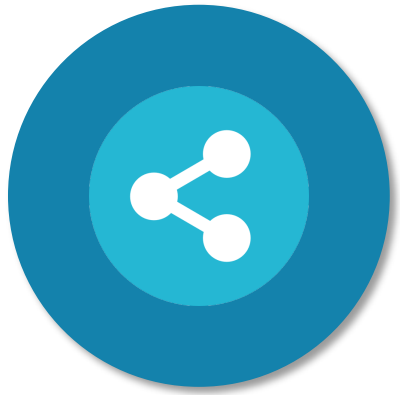
IMPLICATIONS FOR SYSTEMIC IMPROVEMENTS

End User Data Needs

Regional Biotechnical Engineers at Ghana Health Services

Key feedback from end users (Lead Clinical Engineer & Staff for Eastern Region)

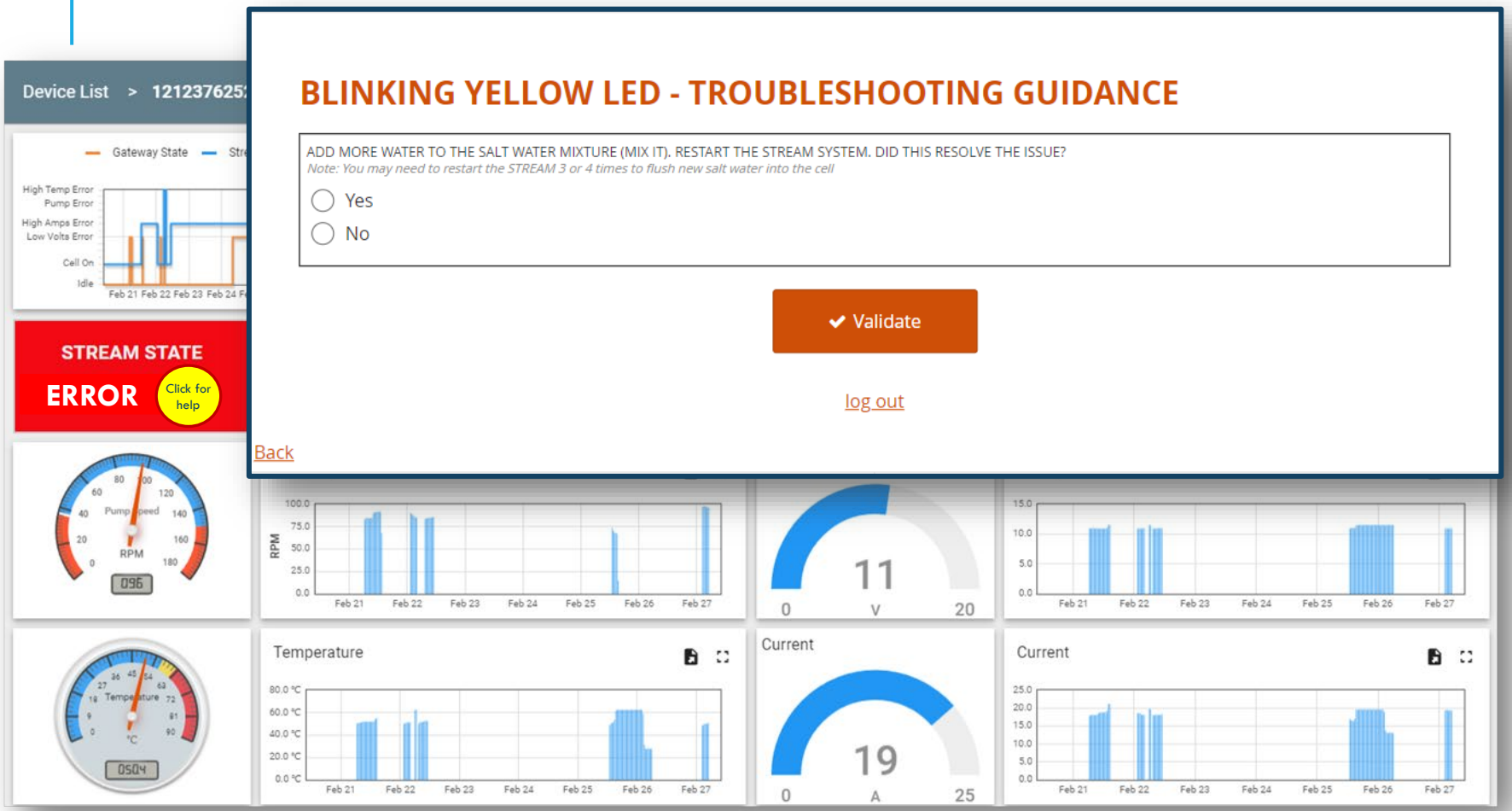
- Would like to know the CAUSE of any restarts or abnormalities
- Would like to see troubleshooting help on the dashboard
- Question about TEMPERATURE being due to factors other than the pump itself
- Would like to monitor the CONCENTRATION of the product (FDA wants to do quality control testing)



IMPLICATIONS FOR SYSTEMIC IMPROVEMENTS

End User Data Needs

Regional Biotechnical Engineers at Ghana Health Services



Example of feedback integration -- Providing troubleshooting help on dashboard

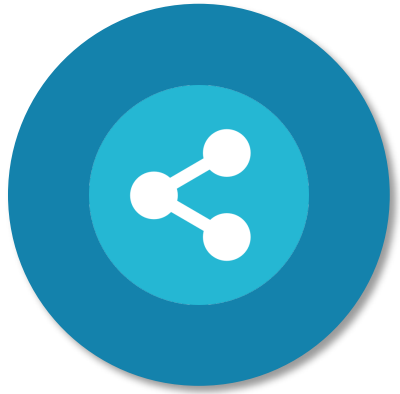
IMPLICATIONS FOR SYSTEMIC IMPROVEMENTS

- Addition of a Kobo Toolbox form within dashboard – click icon to access
- Provides guided troubleshooting in the dashboard
- Gives us more data to learn from!

NEXT PHASE:

- HOW WILL WE APPROACH THE INTEGRATION OF DIFFERENT USER NEEDS AND WORKFLOWS WITHIN GHS – THINK ABOUT THE POTENTIAL USE OF DATA BEYOND JUST ONE NATIONAL SYSTEM
  - DIAGRAM THE WHOLE SYSTEM ARCHITECTURE!!
- DEMONSTRATE THE POWER OF TRUSTWORTHY DATA FOR SYSTEMS STRENGTHENING, IN ADDITION TO ENABLING BETTER DECISION-MAKING
- COST: IoT IS EXPENSIVE, BUT IT CANNOT BE PROHIBITIVE. LOOKING INTO LOCALIZED IoT SOLUTIONS AND TRAINING A LOCAL WORKFORCE HOW TO HELP SET UP

One monumental data architecture effort is preferable to the thousands of 'iterations' that manual input and data sharing entails – this is how we get to professionalized data systems



IMPLICATIONS FOR SYSTEMIC IMPROVEMENTS

Thank you for attending.

Questions? Please feel free to reach out!

envicom CORPORATION

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whdx
wash health facility data exchange

Unleashing the power of open data to make transformational improvements to

WASH in Health Care Facilities

A new, free data sharing and decision-support platform to guide decision-maker investments, policies and programs

GWC
GLOBAL WATER CHALLENGE

Turning data into information

Information into insight

Insight into impact

whdx wash health facility data exchange

A global-local support tool to guide decision-making about funding, progress and gaps

- **Share:** Data standard for harmonization
- **Access:** Online data repository for open access
- **Use:** Analytics and tools for decisions and investments

WHdx Target Audience & Goals

Support and enable:

- Governments
- NGOs/Service Providers
- Funders
- Sector actors

To use data to effectively at the sub-national scale:

- Optimize investments
- Assess service coverage
- Develop actionable workplans
- Monitor progress

By offering innovative services including:

- Data cleaning and harmonization
- Data storage and access
- Cutting edge analytics and visualizations
- Interactive web apps
- Options for customization

Motivation

- Many organizations are collecting data on WASH in HCF
  - JMP core indicators
  - WASH FIT
  - Routine M&E
  - HMIS
- However, data is generally not widely shared
- Lack of sharing leads to duplication of efforts, incomplete understanding, challenging decision-making
- Recognition that data use can be catalytic in improving services
- Building on lessons learned from Water Point Data Exchange (WPdx)

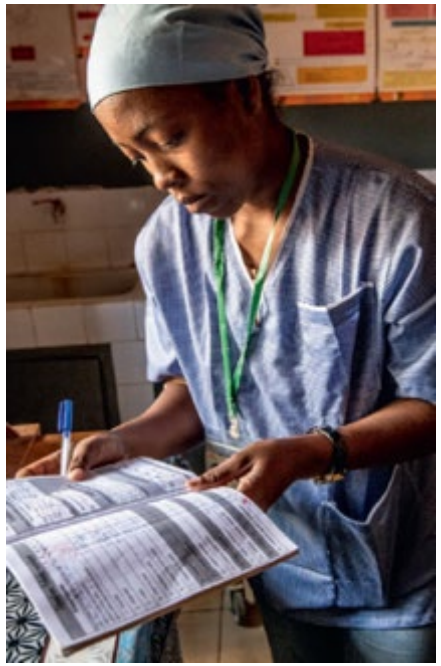
whdx wash health facility data exchange

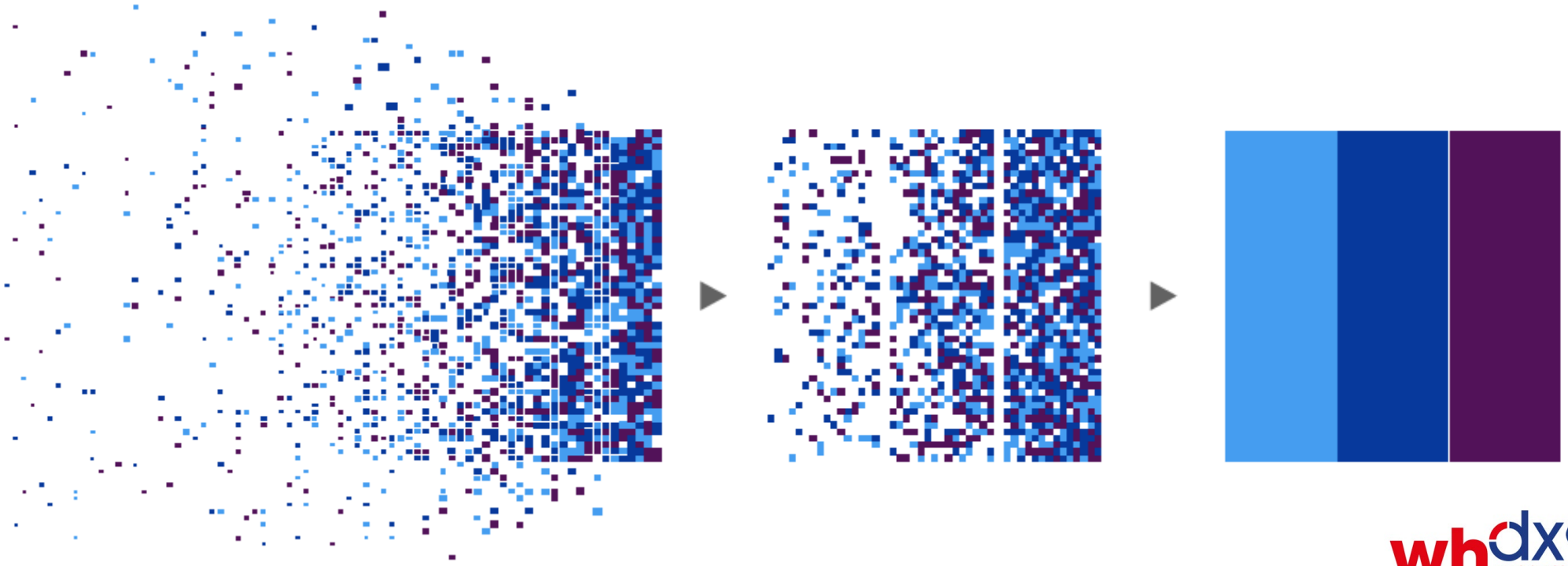
Mission critical:
Data sharing & decision support from a common platform

Open, standardized data is fundamental to improving WASH in HCF

Without granular, updated and publicly available data on the quality of WASH in health care facilities, it is almost impossible to understand needs and inform plans to improve standards of care.

A common operating picture is needed to optimize investments and innovate within the sector

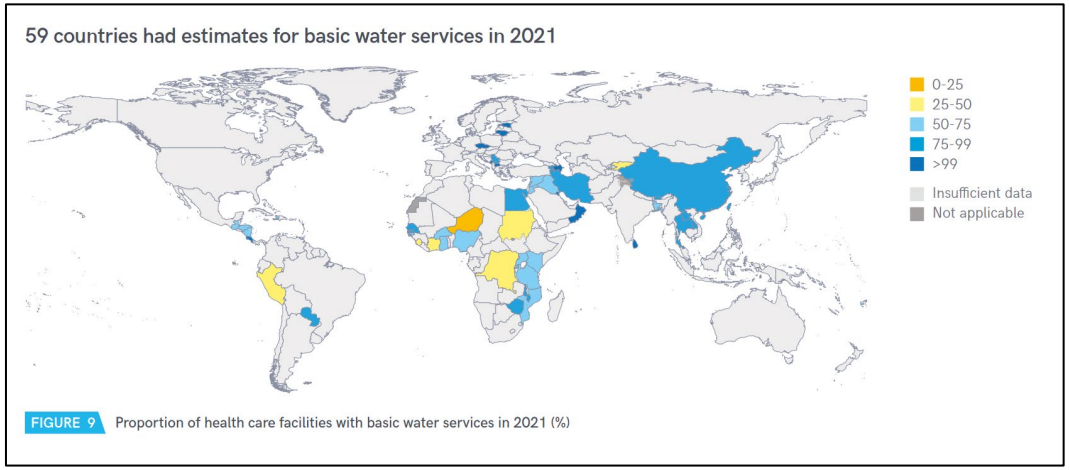


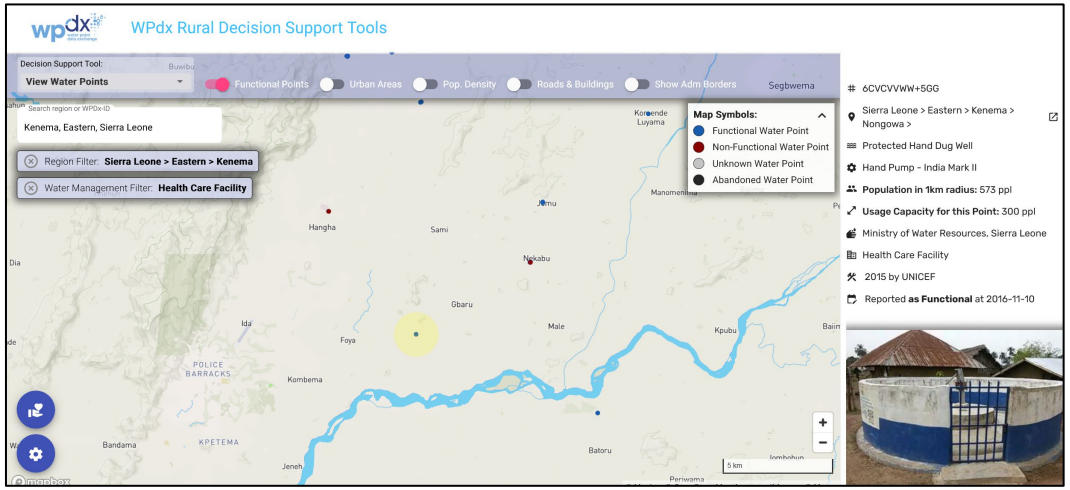


whdx wash health facility data exchange

WHdx Focus: Sub-national scale

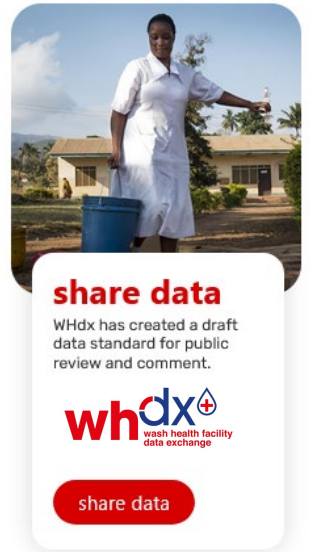
- **JMP** → nationally representative, statistically significant estimates and trend analysis for benchmarking progress towards SDGs
- **WHdx** → sub-national/district-scale granular analysis for local benchmarking, planning and monitoring efforts





whdx wash health facility data exchange

WHdx Data Standard



- Built on existing JMP core indicators and WASH FIT survey questions
- Includes ~20 required parameters and ~25 additional optional parameters covering:
  - Facility information
  - Water supply
  - Sanitation
  - Hand hygiene
  - Environmental cleaning
  - Waste Management
  - Other (budget, electricity)
- Feedback welcome!

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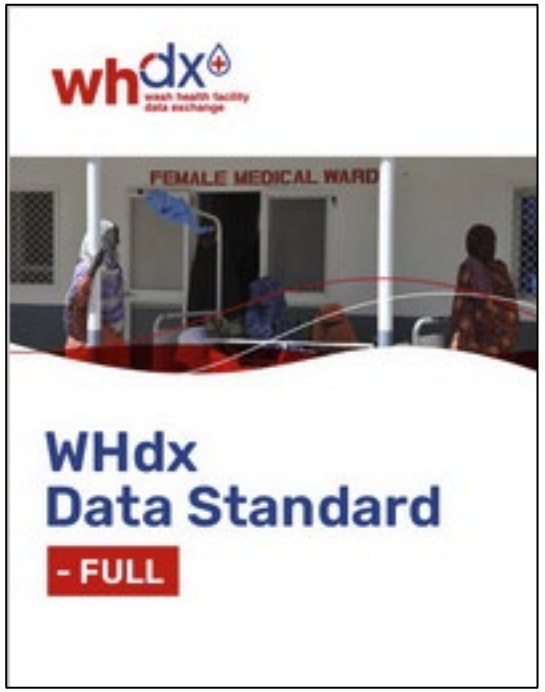
Chlorine-related WHdx standard parameters

Is the drinking water treated with chlorine? (#water_treatment1)

- **Water Treatment (#water_treatment1)**
  Description: Indicate quality of drinking water treatment with chlorine.
  Standard WASH FIT responses include: Drinking water is available with the appropriate free chlorine residual; Free chlorine residual exists, but is <0.2mg/L; Do not know residual/do not have capacity to test residual/no drinking-water available
  Format: Open text

Is there a budget available for WASH activities and personnel? (#budget)

- **Operations Budget (#budget)**
  Description: Describe the available budget for cleaners and maintenance staff, IPC/WASH training, IPC/WASH consumables (e.g. soap, chlorine) and all activities listed in the procurement protocol.
  Standard WASH FIT responses include: Budget exists and addresses staff/training and consumables/O&M; Budget exists for staff but not training / or for consumables but not O&M / or budget not sufficient to cover all costs; No budget exists
  Format: Open text



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Other relevant parameters for chlorine generator decision-making

Are cleaning protocols available? (#clean_protocols)

- **Cleaning Protocols (#clean_protocols)**
  Description: Indicate whether environmental cleaning policies or protocols are available at the healthcare facility.
  Standard JMP/WASH FIT responses include: Yes; No; Cleaning policy or protocol exists, is implemented and monitored; Cleaning policy/protocol exists but is not implemented or monitored; No cleaning policy/protocol exists
  Format: Open text

Have staff with cleaning responsibilities been trained? (#cleaner_training)

- **Cleaner Training (#cleaner_training)**
  Description: Indicate whether all cleaners at the facility have been trained
  Standard JMP/WASH FIT responses include: Yes, all have been trained; No, some but not all have been trained; No, none have been trained; No, there are no staff responsible for cleaning; All staff responsible for cleaning have received training; Some but not all staff have received training; No staff have received training
  Format: Open text

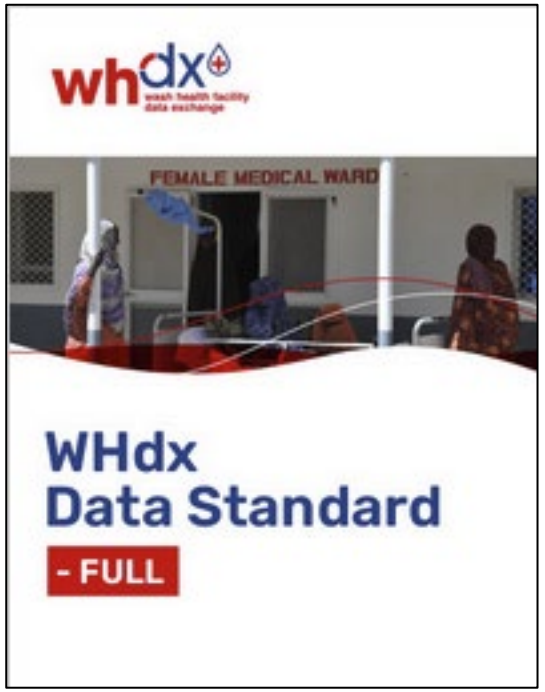
Does the facility have a functional electrical source? (#elec_source)

- **Electricity Source (#elec_source)**
  Description: Indicate whether the facility has a functional and well-maintained electricity source.
  Standard WASH FIT responses include: Electricity source exists, is functional and well-maintained; Yes, exists but not currently functional; No electricity exists
  Format: Open text

Is energy sufficient for all electrical needs of the facility? (#suff_elec)

- **Sufficient Electricity (#suff_elec)**
  Description: Indicate whether there is sufficient electricity to meet all the facility's electrical needs.
  Standard WASH FIT responses include: Energy of sufficient quantity at all times; Energy is sufficient to meet some but not all demand; No energy available
  Format: Open text

Others?



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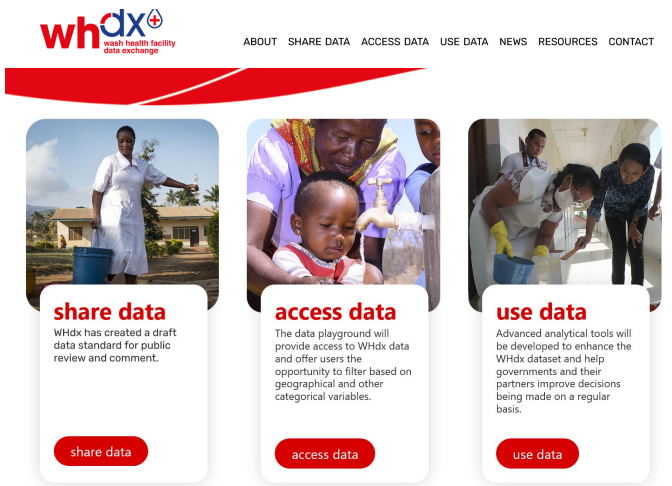
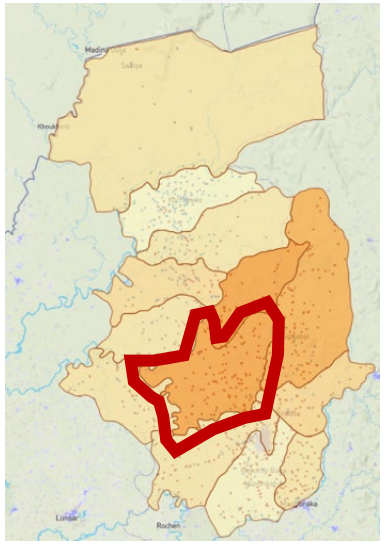
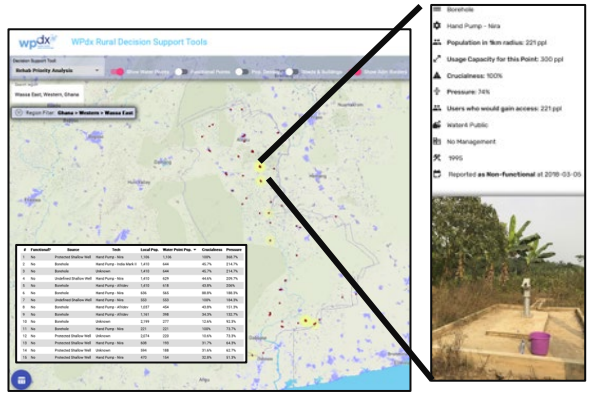
WHdx Platform Offerings

- Leverage data collected for other purposes to inform wider sector
- Provide stakeholder access to cleaned and harmonized data
- Support efforts around accountability and transparency
- Enable evidence-based decisions by:
  - Providing a more granular view compared to national datasets
  - Compiling individual HCF data for district planning
  - Highlighting gaps in facility service availability
  - Prioritizing and optimizing investments to reach those left behind







Adaptable platform based on country needs & interests

Use case #1:

Just starting to more actively collect data on WASH in HCF

- Set data standard
- Explore available sources of data
- Work with partners to support data sharing through uploads
- Engage with government to identify key questions to answer to improve decisions

Use case #2:

Have limited data available, looking to gather data from NGO partners

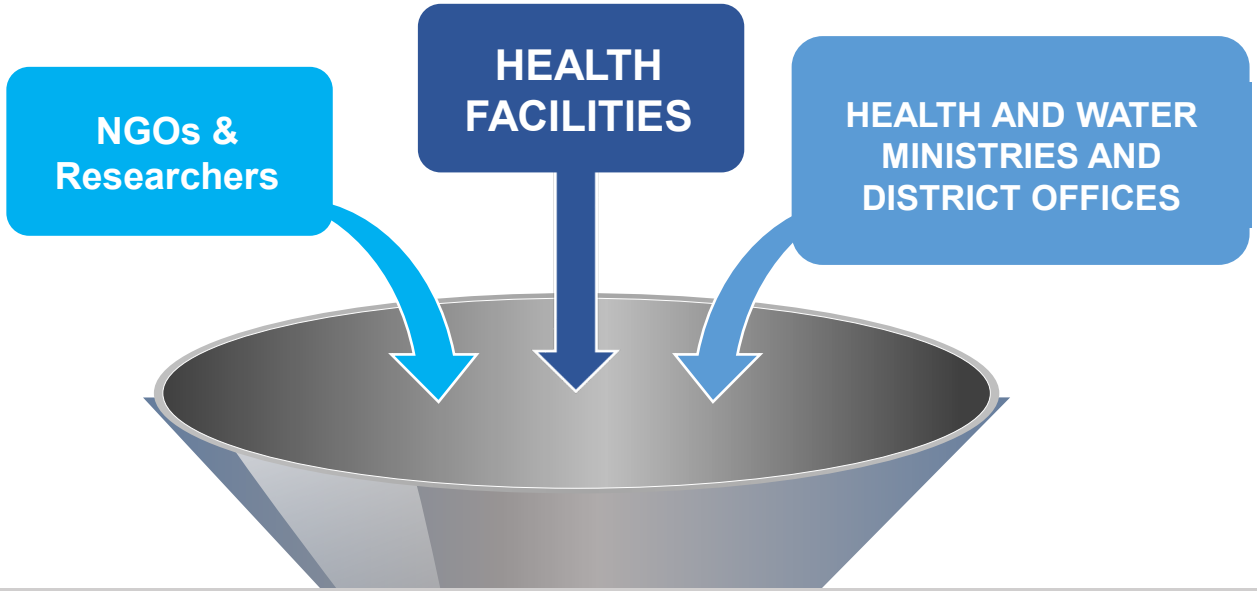
- Explore available sources of data
- Work with partners to support data sharing through uploads
- Engage with government to identify key questions to answer to improve decisions

Use case #3:

Have harmonized, widespread data available, focused on decision support

- Engage with government to identify key questions to answer to improve decisions
- Explore opportunities to integrate with existing HMIS

SHARE



ACCESS

FREE, OPEN AND STANDARDIZED DATA

TO IMPROVE OPERATIONAL PERFORMANCE AND INFORM INCLUSIVE AND SUSTAINABLE INVESTMENTS, PROGRAMS AND POLICIES

USE

Regional Governments

Objective data to:
- Inform regional strategies and focus investments
- Support regional leadership & coordination
- Inform independent evaluations

National Health, Water & Finance Ministries

Reliable data to:
- Inform national roadmaps & standards
- Regularly monitor indicators
- Integrate WASH into health sector planning
- Allocate/prioritize resources

District Health & Water Offices

Facility-level data to:
- Track/monitor/review service delivery levels
- Ensure sufficient, qualified staff and technical expertise
- Support training and capacity-building
- Prioritize services
- Allocate budget

INSIGHT & TOOLS FOR IMPACT

NGOs

Sub national data for:
- District and facility technical and programming decisions, approaches and implementation
- Alignment with government priorities

Donors

Better data to:
- Allocate resources
- Make better investments and prioritize action to increase reach, sustainable impact and data input

Private Sector

Credible data to:
- Guide corporate investments in technology and strategic marketing to expand and maintain services and influence behaviors

Summary: Necessary evidence and processes for using district-scale data to influence health system decisions

- Demonstration that harmonized data can be used effectively to:
  - Improve sector understanding
  - Enable evidence-based decision-making
  - Differentiate impact of different approaches to WASH at HCF
- Commitments from national and local governments on data sharing process to compile data from government and NGO entities
- Routine uploads from stakeholders working in HCFs to keep data fresh and relevant for specific planning events

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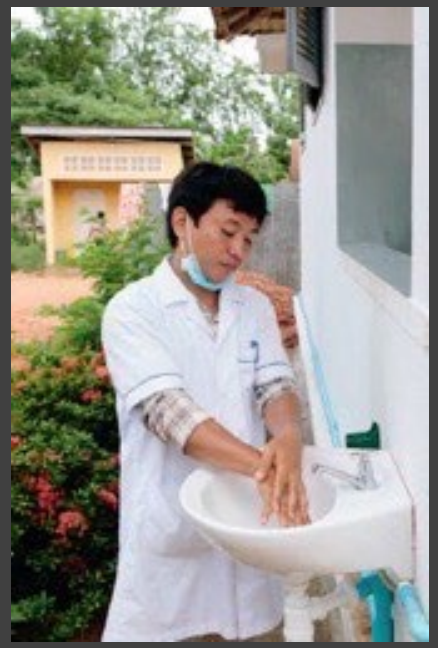

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Contact:

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1 Welcome and CoP introduction

2 Presentations

3 Discussion

Next call

July 2023

Focus TBD

Call for ideas! Send them to adrolet@path.org

Theme	Illustrative specific topics/questions
Technologies	• What technologies exist? • How do chlorine generators work • Efficacy & effectiveness • Advantages/disadvantages
Collaboration & learning	• Learn how other orgs are applying these technologies for IPC and water treatment • Synergies, establishing connections, exploring collaboration, and information exchange • Experience with piloting and government engagement • Research opportunities for young professionals
Implementation	• Study design and methodologies • Barriers and enablers to adoption • Training approaches • Large scale introduction and scale up strategies • Integration into and way to automate workflow processes • Indicators and monitoring approaches
Application and use cases	• Water treatment – with various water sources, complementary technologies, and community settings • Infection prevention and control – reduction of hospital acquired infections, AMR, and pandemic preparedness/outbreak control
Business/distribution models	• Decentralized chlorine production and distribution models • Business models for chlorine distribution (water tx or IPC) in rural/semi-urban areas


OXIDIZER
5.1
Manufactured by:
Sree Rayalaseema H.-Strength Hypo Ltd.
0·52 lit
Ready for use
Don't Dilute.

Thanks!