May 2021

Global Community of Practice (CoP) on decentralized chlorine production

Adam Drolet
Program Officer, PATH

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.
- We seek a diverse, inclusive, and equitable platform that **fosters open and honest communication** and encourages a broad range of views and backgrounds.
- 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.

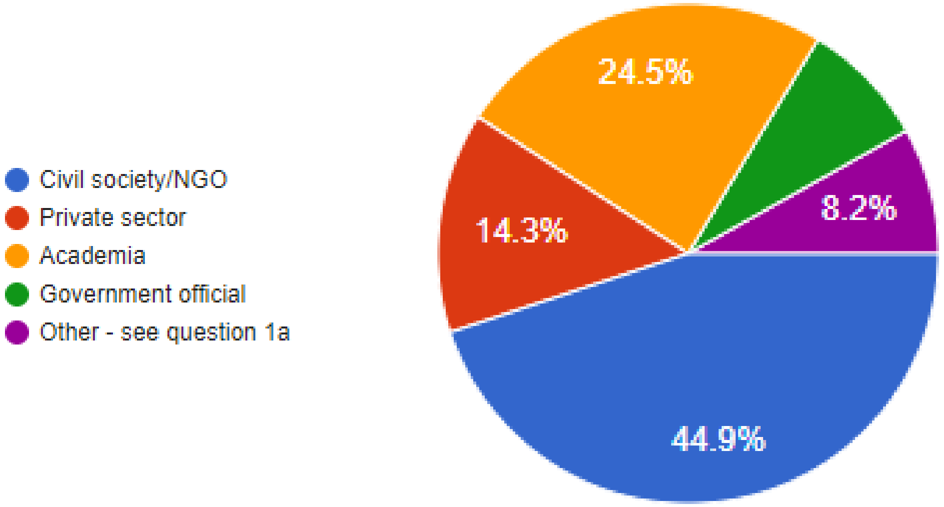
Impact

- **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.

Participants

What sector do you represent?



Benefits

+ Improved awareness, evidence sharing, and technical knowledge

+ Strengthened collaboration and network

+ Concerted advocacy and messaging

CoP Structure

How will this work?

- Voluntary & open to all
- Four quarterly meetings per year
- Rotating annual secretariat
- Meeting structure:
    - Manufacture presentation
    - Spotlight on use case
    - Innovation/evidence highlight
    - Discussion, discussion, discussion

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

1 Welcome and CoP introduction

2 Manufacturer presentation: STREAM

3 Spotlight: CRS No breach in chlorine supply

4 Innovation: Digital data transmission

AQUA
RESEARCH

Global Community of Practice

On-Site Chlorine Generation

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INTRODUCTION

Is one of the **greatest public health achievements** of the 20th century.

Beginning in the early 1900s the use of **Chlorine** in US drinking water **dramatically reduced typhoid, cholera and other water-borne diseases. Chlorine** continues to play the **central role in the disinfection** of drinking water in the US and **developing world.**

Standard for treating **drinking water around the world**. **Keeps** drinking water **safe** from the **treatment plant to the tap.**

Most widely used and effective product for **sanitizing and disinfecting** surfaces and instruments in healthcare services.

On-Site Generation of Disinfectants is Safe, Simple, and Effective

Salt | Water | Electricity | Liquid Chlorine

KEY ADVANTAGES:

- Lowest cost production of chlorine – Common salt is the key consumable, universally available - operates on any power source
- Independence from sources of liquid or solid chlorine – make as much as you need
- Minimal degradation issues - freshly made – make it as you need it
- Internet connectivity – easily monitor location, consumption, and performance

ADVANTAGES

- Simple and easy to use systems.
- Rugged – designed for abuse rather than use. Field proven.
- Independence from liquid or solid bleach commodities
- Systems in a variety of sizes
- Systems that support data gathering to validate and quantify applications for NGOs and ministers of health
- Communication and alarm reporting world-wide to support up time
- Solar power options to avoid dependence on unreliable power sources.
- Auto-ranging power supplies that operate on a wide range of voltages, and systems that ride through power upsets and always produce disinfectant at the correct concentration.

Aqua Research History

- Mr. Herrington was a founder in 1994 of MIOX Corporation – commercialized a full line of electro-chlorination systems from small communities to large cities, and markets in drinking water, aquatics, cooling towers, and industrial applications world-wide
- 1996 developed first briefcase size unit at MIOX for dealer demonstrations. Precursor to Stream
- 2000-2005 – MIOX awarded major contract with DARPA to develop man-portable system that could treat "any water anywhere to USEPA drinking water standards"
- Left MIOX in 2010 and started Aqua Access with family and angel funding.
- Started Aqua Research and Aqua Membranes in 2011 with funding from separate investors.
- Began developing product line in 2010.
- Stream initial launch in 2017 with field trials in Haiti. Merged Aqua Access in to Aqua Research.
- Launched larger AR and K series in 2018.

LINE OF PRODUCTS

A line of affordable products that are **safe, reliable, easy-to-use and feature low operating and maintenance costs. Internet connectivity for data collection and analysis.** Generators come in a **range of sizes and capacities** that can **treat** from **300 to 4,400,000 liters of water per day** at **2.5 PPM.**

H2gO

300 L/charge

Stream

230,000 L/day

AR Series

1.2 to 2 million L/day

K Series

2.8 to 4.4 million L/day

Certifications and Licenses

US EPA *Guide Standard and Protocol for Testing Microbiological Water Purifiers*

and

Registered under the EPA Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

Registered with the WHO *Household Water Treatment Scheme (HWTS)*

License Obtained
H2gO and Logo Trademark obtained

Patents and Patents Pending

H2gO Is Saving Lives in Haiti

A household in Haiti using the H2gO Purifier to treat drinking water

FRIAR SUPPLIERS

MAKE WATER SAFE for the WORLD

Aqua Research Haiti

Innovations in Water Technology

Make 10 gallons (40 liters) per day, every day, microbiologically safe for 10 years at a price of US$0.50 PER YEAR in common salt.

AQUA RESEARCH

STREAM™ Disinfectant Generator

Remote monitoring and data gathering to support NGO use cases.

Capacity	115 L per day (24h)
Flow rate	4.8 L per hour
Power	110/220 V AC, 12 V DC
Chlorine (FAC) concentration	0.5% or 5,000 mg/L
Chlorine generation mode	Continuous flow
System weight	8.2 kgs
Dimensions	42 x 33 x 17.3 cm
Ideal for	Small hospitals, health clinics, water utilities and food services

Can treat 230,000 liters of water at 2.5 PPM per day

Catholic Relief Services Banfora, Burkina Faso

Streams in Africa

Can treat 230,000 liters of water at 2.5 PPM per day

Ran a Stream 22-23 hours per day for 3 months to demonstrate, then purchased 10 systems. Making chlorine for health care facility sanitation.

PATH

PATH is working with Ghana Health Services to introduce, demonstrate, and gather use data in Ghana and also in Uganda

CRS CATHOLIC RELIEF SERVICES

Catholic Relief Services Banfora, Burkina Faso

Field Performance Evaluation and Evidence Building with Stream

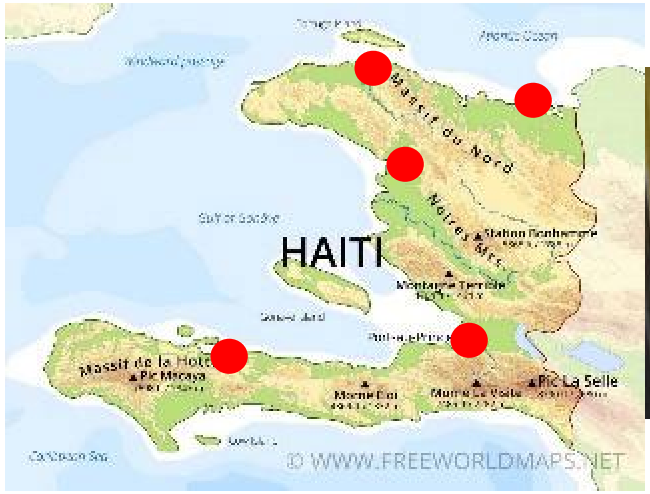
- Evidence building in several countries in Africa with PATH and Catholic Relief Services
- Will automatically collect location, production, and operating data to NGO databases
- Eliminates need for manual data collection
- GPS for position identification
- Wifi and Bluetooth communication to any cell phone within range of the system. Transmit to main data collection center.

HEALTH CARE FACILITY DISINFECTION IN HAITI

- Caris Foundation, via USAID Santé project, installed five commercial scale Aqua Research chlorine generators at major facilities in Haiti. 7 kg/day chlorine. Haitian technical team is doing all of the installations.
- Full capability to data collect, monitor, communicate, respond to alarms, troubleshoot and modify software as needed from Aqua Research office in USA.
- Caris is bottling and shipping disinfectant to 168 HCFs throughout the country. Also disinfect water for use in HCFs.

Stream Systems lined up on the tables making chlorine for HCFs in Haiti

K Series



Port au Prince

Cap Haitian

Les Cayes

Questions?

PATH

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No breach in chlorine supply for health care facilities in Burkina, Ghana and Liberia

By: Festus Barfi Fofie, Senior Project Officer – WASH, Catholic Relief Services Ghana

May 2021

Project Overview:

- Duration: June 1, 2020, to September 30, 2021 (Implementation was up to December 2020 & Monitoring up to September 2021)

- Total budget: USD 61,060

- Purpose / Goal: To ensure continuous supply of quality chlorine to achieve enhanced infection prevention and control (IPC) practices in targeted health care facilities in Burkina, Ghana and Liberia

- Target: Establishment of 16 decentralized chlorine production systems to serve 116 health facilities in Burkina, Ghana and Liberia

Background:

- COVID-19 pandemic has reinforced the need to support the capacity of health facilities to maintain effective infection prevention and control (IPC) practices on daily basis

- Disinfectants like chlorine are essential products that can enhance effective IPC practices and reduce risk of disease transmission at the health facilities

- Before covid-19, Some health facilities in Ghana reported interruption in chlorine supply forced them to procure bleach of unknown quality on the local market or to 'save existing stock' because of uncertainty with next supply from central medical stores

- Price inflation was also estimated to be a risk and affected chlorine supply *(price of chlorine was reported to have doubled in Liberia at the onset of the Covid-19 outbreak)*

- Health facilities using self-produced sodium hypochlorite were saving between EUR 2.7 and 5.3 per day depending on size of facilities as opposed to those who relied on other sources *(Antenna Foundation in Burkina, 2019)*

Needs analysis and chlorine consumption pre-project:

BURKINA FASO ***(Antenna Foundation)***

- Centre de Santé et de Promotion Sociale (CSPS): 5 to 40 liters per day
- Centre Médical (CM) : 15 to 50 liters per day
- Centre Médical avec Antenne chirurgicale (CMA) : 40 to 100 liters per day
- Centre Hospitalier Régional (CHR) - Centre Hospitalier Universitaire (CHU) : 60 to 200 liters per day

GHANA ***(CRS WASH Team)***

- CHPS compounds: 15 to 25 litres of 0.5% chlorine per week
- Health Centers and Clinics: 35 to 75 litres of 0.5% chlorine per week
- Health facilities expressed a willingness to pay an average of GHS 2.83 ($0.50) for 5-liter gallon 0.5% chlorine
- Health facilities proposed using IGF and NHIS funds to pay for chlorine

Project Setup & Structure: BF, Ghana, Liberia

Equipment:

- Chlorine Conc. = 0.5%
- Production rate = 5 L/hour

STREAM by Aqua Research

TOTAL OF 14 PURCHASED FOR THE PROJECT

- Chlorine Conc. = 1%
- Production rate = 3 L/hour

SafiStation by MSR Global

TOTAL OF 2 DONATED TO THE PROJECT

Complimentary supplies:

- 20/34-liter bucket with lid
- Wooden Stirring stick 90 cm long
- Power Stabilizer
- Plastic Funnels
- 5-liter jerry can / gallons
- White vinegar 5 liter
- 25 kg Sack of salt
- Safety plastic utility gloves
- Safety goggles
- Plastic reusable apron
- Disposable hand gloves (boxes)

Project Setup & Structure c'tnd:

Production and distribution Sites

BURKINA	GHANA	LIBERIA
• 6 STREAM devices • 2 SafiStation devices • 8 production sites • 41 distribution sites	• 5 STREAM devices • 5 production sites • 43 distribution sites	• 3 STREAM devices • 3 production sites • 19 distribution sites

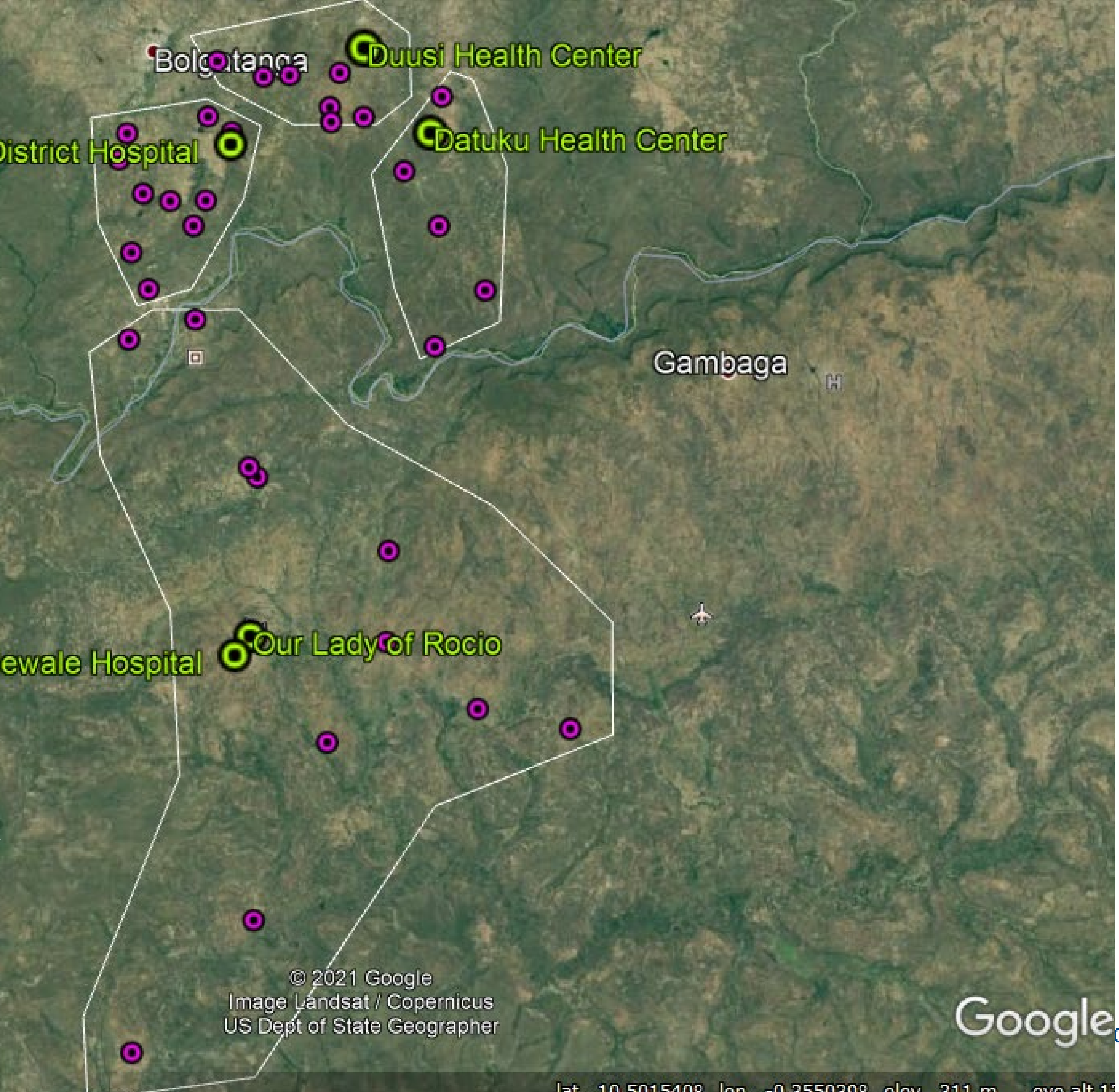
Production and distribution Sites – Ghana

- Production rate is 20 to 40 l/day

- Vinegar wash after every 200 litres of production

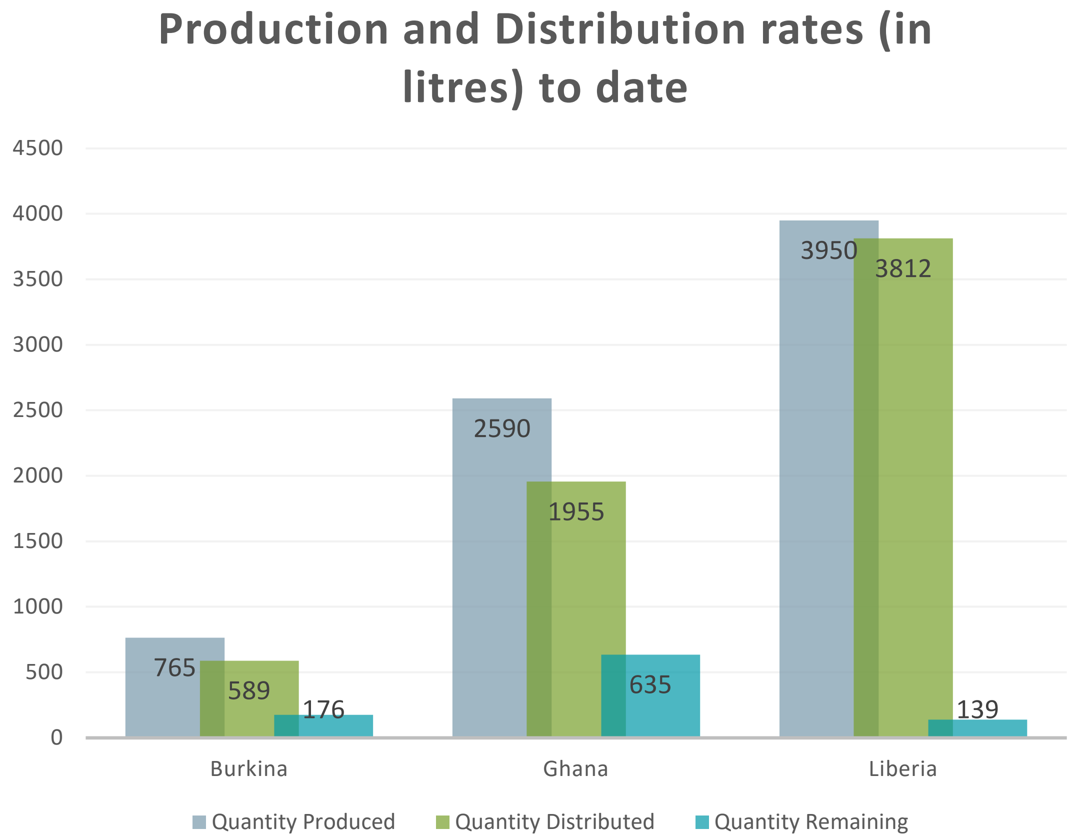
- Random chlorine quality check using test strips

- Paper-based recording (production, distribution and usage) at the HCF and transferred to CommCare



Achievements and milestones:

Chlorine production at Datuku Health Centre, Ghana



- 32 equipment operators trained in all 3 countries (16 Burkina, 10 Ghana, 6 Liberia)

- A total of 13 active production sites have been established

- 7,305 litres of chlorine had been produced as of April 2021, and 6,356 litres had been distributed for use in all 3 countries

Management and sustainability structures:

SUSTAINED MANAGEMENT

CAPACITY BUILDING

- At least 2 regular staff to run production sites

- Ensure adequate training and re-training of operators

- Ensure safe storage of chlorine

EFFECTIVE SUPPLY CHAIN

- Needs based production, to ensure at least 20% buffer stock at production sites

- Distribution based on requests submitted by health facilities to the production sites

- Establish transport systems for chlorine supply distribution

PLANNING AND BUDGETING

- Ensure availability of budget for purchase of production supplies

- Build consensus on sale and price of chlorine *(e.g., GHS 2.00 for 5ltr, 0.5% chlorine, Ghana)*

- In Ghana, DHMTs agreed to release NHIS funds for payment of chlorine

REGULATION AND MONITORING

- CRS to implement integrated monitoring using CommCare and GIS Maps (production, distribution and use)

- Support District authorities to monitor quality and quantity of chlorine produced

- Considerations for FDA approvals and labeling

Lessons (challenges and recommendations):

CHALLENGES:

- Hardware issues: 2 Stream devices and 2 SafiStation were faulty, requiring repairs for one and replacement of part (control box)
- Preconditions for logistical arrangements to ensure distribution to the distant recipients was largely not met by some health facilities
- Primary use of majority of chlorine distributed is cleaning and disinfection of surfaces while other uses are not practiced

RECOMMENDATIONS:

- Conduct continuous sensitization at beneficiary healthcare facilities to support adoption of other good IPC practices with chlorine
- Enforce preventative maintenance measures like system cleaning with white vinegar to prevent faults and breakdowns
- Conduct tests to verify chlorine concentration at production and clarify actual shelf life in local conditions.
- Calculate life-cycle costs to identify a cost-recovery model allowing to maintain long-term operations
- Assess potential to scale up and integration within national health system as a potential solution for chlorine supply in remote areas
- Explore the potential to privatized production


THANK YOU
CRS
CATHOLIC RELIEF SERVICES
faith.
action.
results.

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DIGITAL DATA TRANSMISSION & VISUALIZATION

Amanda Miner, Envicom

Introduction

DATA COLLECTION CHALLENGES

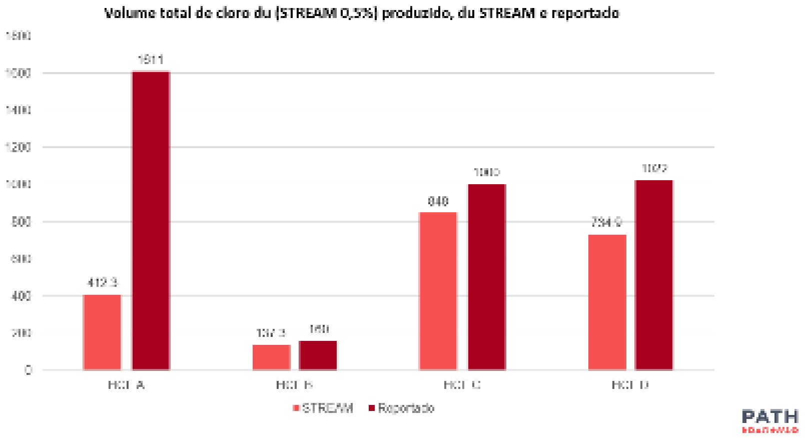
AUTOMATED DATA COLLECTION SOLUTIONS

IMPLICATIONS FOR KNOWLEDGE SHARING

Form-based data collection depends on (already busy) humans

Datasets are incomplete at best…hard to make meaningful inferences or comparisons

- Comparison of human vs. automated data

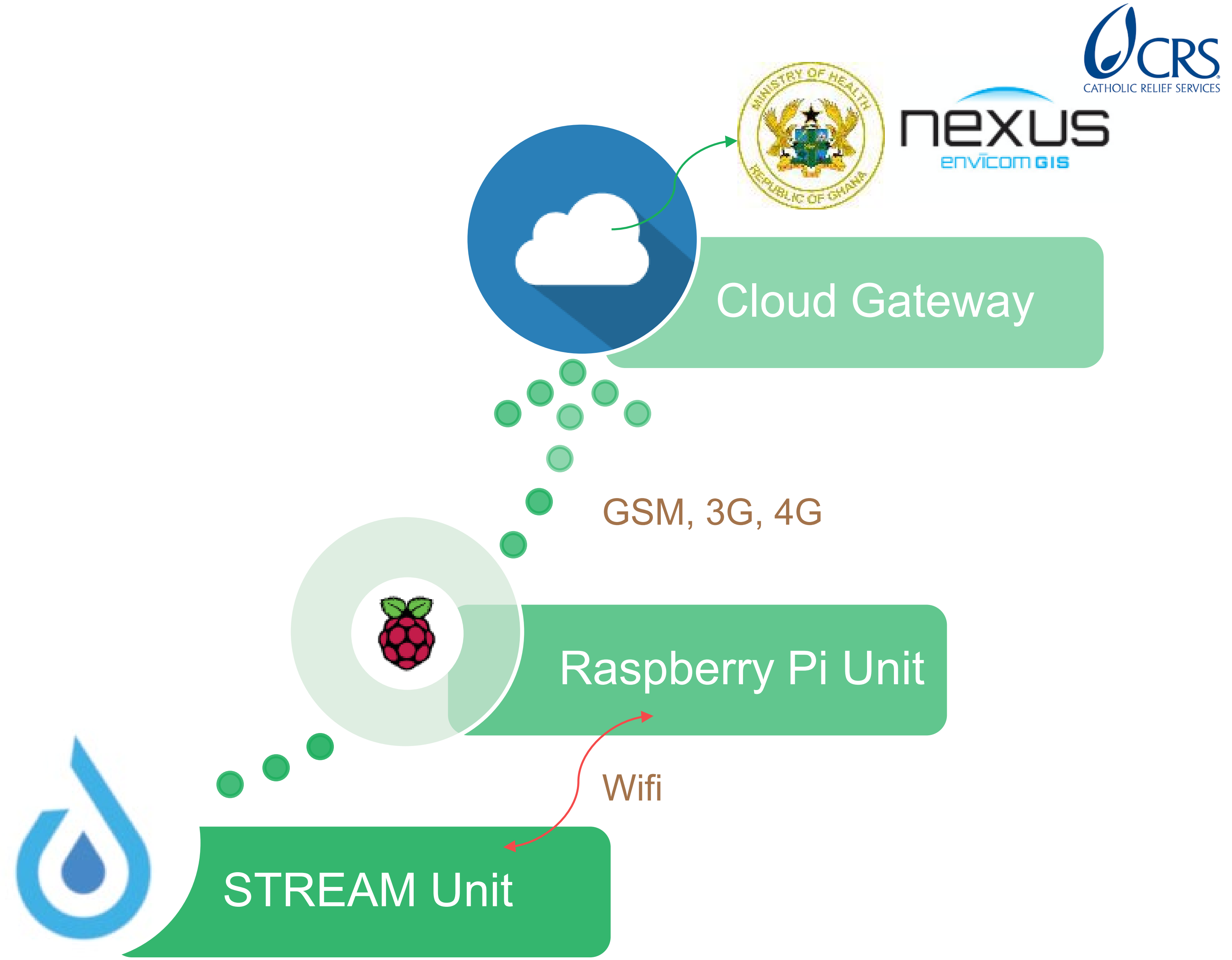


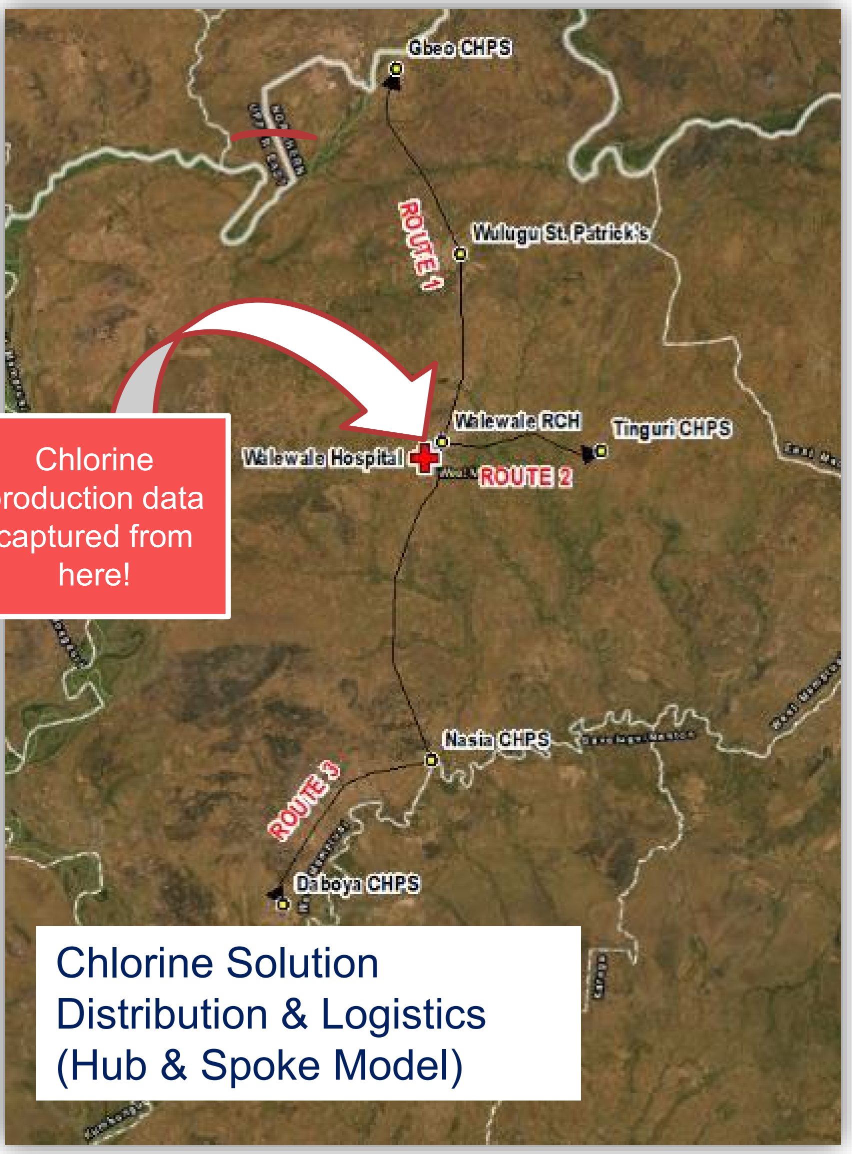
Hard to automate visualization or data sharing from form-based collection

- Non-standardized data
- Not obtaining real-time sector insights about patterns or correlations

DATA COLLECTION CHALLENGES

AUTOMATED DATA COLLECTION SOLUTIONS





Chlorine production data captured from here!

Chlorine Solution Distribution & Logistics (Hub & Spoke Model)

- Complete and meaningful datasets
- Standardized data – can be compared across locations & programs
- Not dependent on humans to do anything!
- We can visualize and share immediately
- Other data can be integrated and modeled (e.g. distribution & logistics in a GIS app)
    - Look for Distribution Patterns
    - Travel time/ Distance
    - Seasonal Road Access
    - Fuel Cost
    - When to buy additional units
    - Automate other metrics in the production & distribution model

IMPLICATIONS FOR KNOWLEDGE SHARING

Questions?

Next call

August 2021

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

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Technologies	• **What technologies exist?** • How do chlorine generators work • Efficacy & effectiveness • Advantages/disadvantages
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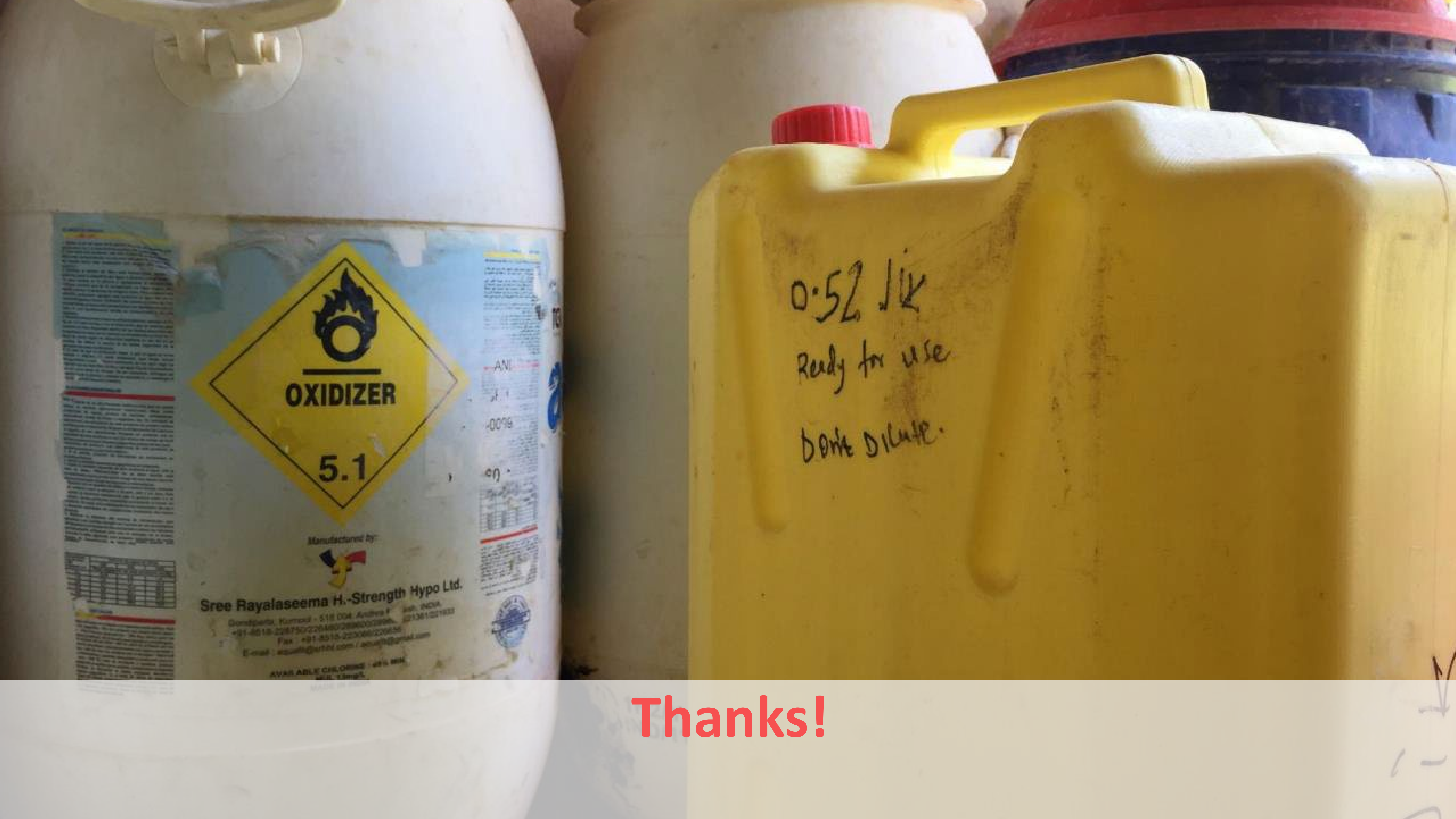
OXIDIZER
5.1
Manufactured by:
Sree Rayalaseema H.-Strength Hypo Ltd.
0·52 Jik
Ready for use
Don't Dilute.

Thanks!