SIERRA LEONE WASTE MANAGEMENT PROCESS

Presented by Philip Brewah

Introduction

In 2023, the Sierra Leone MoH/NMCP and partners began planning for a mass ITN campaign, which would be the country's first ever digitalized campaign, using digital devices to collect information for household registration, ITN distribution, in-country supply chain management, national and independent monitoring.

Using insecticide resistance monitoring data, the NMCP decided to distribute two types of nets – dual active ingredient (Dual AI) nets and ITNs with a piperonyl butoxide (PBO) synergist. Based on the mass campaign macro-quantification for ITN types, a total of 2,405,694 Dual AI nets were to be delivered, as well as 2,939,537 PBO nets.

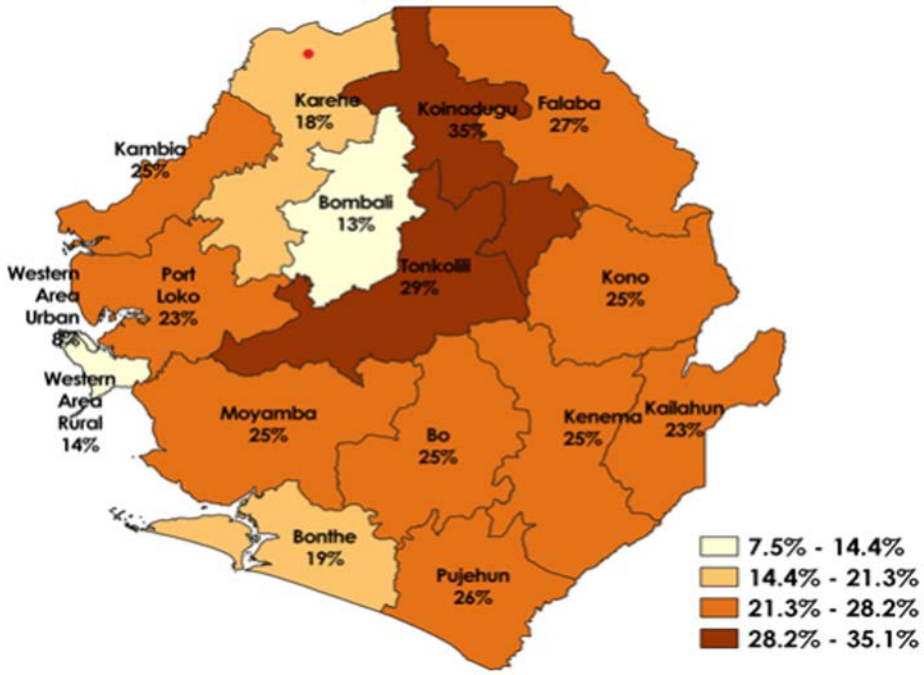


Fig 1. Prevalence map of malaria in children under five by district

Average weight of waste generated from the 2023/24 ITN mass campaign

- Given the inability to procure Dual AI nets without individual packaging, the NMCP recognized the importance of ensuring that a robust waste management plan was developed and costed early to ensure that the environ mental impact of the ITN distribution was minimized. The 2023/24 ITN mass campaign was estimated to generate over 70 metric tons of ITN plastic waste as shown in the table.

Districts	ITN distributed			Weight of ITN waste		
	Dual AI	PBO	ITNs (bales)	Dual AI waste (kg)	PBO waste (kg)	Tonnes (kg/1000)
Kailahun	378,357		7567	10442.46		10.443
Tonkolili	355,025		7100	9798.00		9.798
Pujehun	218,509		4370	6030.60		6.031
Kambia	243,228		4864	6712.32		6.712
Moyamba	224,285		4485	6189.30		6.189
Falaba	130,813		2616	3610.08		3.610
Koinadugu	140,682		2813	3881.94		3.882
Bonthe	145,523		2910	4015.80		4.016
Port Loko	384,913		7698	10623.24		10.623
Kono		349,755	6995		1650.82	1.651
Bombali		301,629	6032		1423.55	1.424
Western Area Urban		608,767	12175		2873.30	2.873
Western Area Rural		339,265	6785		1601.26	1.601
Karene		198,073	3961		934.80	0.935
Bo		408,256	8165		1926.94	1.927
Kenema		441,027	8820		2081.52	2.082
Total (tonnes)	2,221,335	2,646,772	97,356	61,303.74	12,492.19	73.797

Planning for waste management

All PBO nets were bulk packaged, all IG2 nets had individual packages

Initial planning to map incineration capacity in-country before/during microplanning

NMCP conducted a fact-finding mission to assess the availability of functional incinerators at facilities.

Findings revealed that most facilities lacked functional incinerators and could not therefore handle the volume of waste.

Incineration was not feasible due to the limited number of functional incinerators.

Waste recycling was considered as a more environmentally friendly and sustainable option.

Identification and assessment of private sector ITN waste recycling options

Engagement with private sector for waste recycling option.

Premier Enviro Solutions (PES) has been partnering with Vectorlink in the recycling of plastic waste from the IRS waste plastic for about three years.

PES was introduced to the NMCP for partnership in the ITN waste management process.

PES was then selected for their willingness to take on the waste without additional costs.

Detailed engagement with PES was done through an MOU signed with the MOH to ensure effective waste management.

Public-private sector partnership

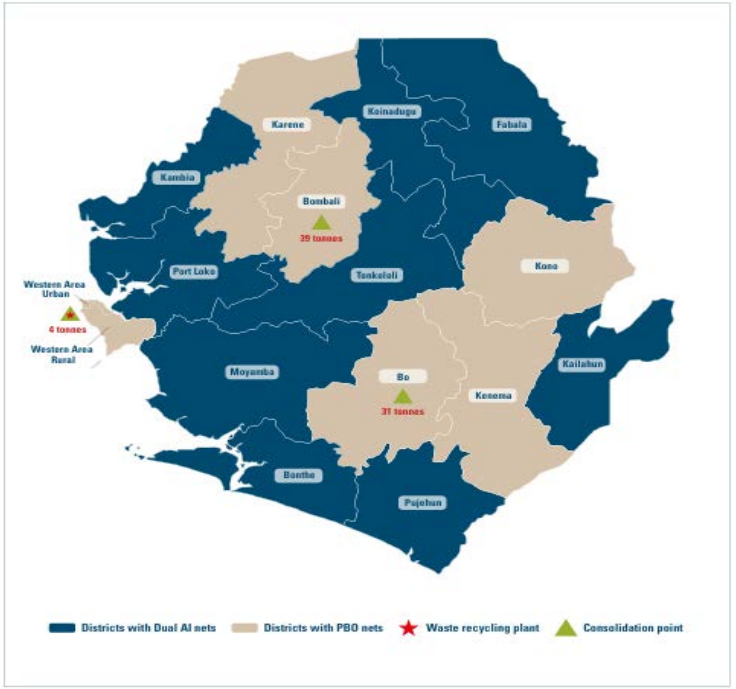
- Recycling was the waste management option adopted for the 2023/24 ITN mass campaign
- Premier Enviro Solutions Limited is a local company based in Sierra Leone that was started in response to an evident problem in the urban capital area.
- To be part of the solution to the plastic waste problem, PES started a “plastic to build” initiative to recycle plastic waste. The waste would be crushed into the form of flakes, which would then be blended with aggregate (a mix of sand and stone) in a recycling process to repurpose into building blocks and paving bricks
- The NMCP and PES collaborated in the planning and budgeting for the waste management process and an MOU was signed between the two parties

Consideration & assumptions that guided the planning and budgeting for ITN waste management

The following considerations and assumptions were made in the planning process (operational and financial)

Considerations	Assumptions
Waste to be generated	Empty bale sacks for all nets procured + plastic bale straps + individual net packaging for dual AI nets
Weight of empty bale sack	From the label of a bale of nets previously used for routine distribution (with individual packaging): Gross weight – Net weight = Weight of waste 28.46kg – 27.86kg = 0.60kg 
Transport	Trucks from District Medical Stores (DMS) to consolidation point (where waste would be crushed) and from the consolidation point to the recycling plant
Waste packaging after crushing	Jumbo bags
Waste packaging at DPs	Empty bale sacks
Waste collection and storage	ITN distributors and DP supervisors
Waste transport mode	• Vehicles of national monitors and supervisors during supportive supervision from DPs to DMS • MoH medical trucks from DMS to consolidation points and from the consolidation points to the recycling plant in Freetown
Waste tracking and verification	Waste tracker tool and waste crushing report
Waste sorting and separation	Manual labour at the time of crushing at the consolidation point
Waste crushing/consolidation points	Regional level consolidation points: Bo, Bombali and Western Area Urban (WAU) (see map in figure 2, for expected tonnage of waste to be crushed)
Waste recycling point	PES recycling plant, Freetown

Figure 2: Map of Sierra Leone showing the distribution of the types of ITNs



Budget development

- Initial macro budget covered the transport of waste from the DMS to the consolidation points, the crushing and transport to the recycling plant in Freetown.
  Total = **8,231.69 USD.**
- Pilot campaign took place in Oct/Nov 2023 and some gaps in the waste management process were identified.
  - The strategy to use vehicles of national monitors and supervisor to move waste from the fixed DPs (PHUs) they visit daily to the DMS was inadequate.
  - At the end of the mass campaign, over 70% of waste was estimated to still be left at the 1,281 fixed DPs.
- A supplementary budget to address the gap was developed (using the estimate of 70% of total bales of nets distributed during the campaign). Total = **40,733.11 USD.**

Training, monitoring and supervision

- Training sessions for implementation at all levels included waste management as a key theme for the distribution period
- Standard operating procedures (SOPs) were developed to guide the waste management process and were used as the training guide during training sessions at different levels
- Waste management was supervised as part of ITN distribution and post-distribution activities within the normal supervision structure
- National monitors also focused on waste management in the districts they were deployed to supervise.

PES findings from pilot waste management

Pilot waste crushing was test run in February 2024 in BO district using mobile crushers procured by PES

Findings

- The ITN waste were not properly tracked using the provided waste tracker as such the quantity of waste collected at the consolidation point were not recorded.
- A reverse calculation had to be done to estimate the quantity of waste collected.
- Waste sorting and source separation was not carried out
- 50% volume reduction was achieved by crushing of waste
- Research and development confirmed ITN waste can be recycled into building blocks and pavement bricks.

Waste management implementation - Summary of the pilot waste crushing process (extract from PES report)

Pilot Crushing Operation in Bo

Note:

This operation crushed only (PBO) outer bale bags NO individual package bags.

We did not have record of number of Bale bags returned to BO from pilot distribution

Determining average weight of Bale Bag:		weight Kg
Sample 1	20 Bale Bags	3.0
Sample 2	20 Bale Bags	3.5
Sample 3	20 Bale Bags	2.9
	60 Bale Bags	9.4
	Avg weight of Bale Bag	**0.16** Kg

Code:

CPMB Crushed Plastic Malaria Bo

PSMB Plastic Strap Malaria Bo

Crushed Plastic in Jumbo Bag No:

Date	CPMB1	CPMB2	CPMB3	CPMB4	CPMB5	CPMB6	CPMB7	CPMB8	Daily Total	
24/02/2024	113.00	47.00							**160.00**	**Kg**
25/02/2024		68.00	113.00	106.00					**287.00**	**Kg**
26/02/2024					100.00	118.00	118.00	87.00	**423.00**	**Kg**
Total	**113.00**	**115.00**	**113.00**	**106.00**	**100.00**	**118.00**	**118.00**	**87.00**	**870.00**	**Kg**
								Estimated No. Of Bale Bags Shredded		
								5,553	**units**	

PET Straps in Jumbo Bags No

PSMB51	PSMB52	PSMB53	PSMB54	PSMB55	Daily Total	
43.50					**43.5**	**Kg**
	52.00	44.30			**96.3**	**Kg**
			42.00	54.30	**96.3**	**Kg**
43.50	**52.00**	**44.30**	**42.00**	**54.30**	**236.1**	**Kg**

We could not crush with this machine but can with machine in Freetown

Diesel Consumption

Date	*B/F*	*Bought*	*Used*	*Balance*	
24/02/2024		15	11	4	provided by PES
25/02/2024	4	20	13	11	provided by Malaria Control unit Bo
26/02/2024	11	20	16	15	provided by Malaria Control unit Bo
			40		

Waste management process at DPs

- The DP team collected and bagged all the empty individual net packs and empty bale sack into one empty bale sack and tie up when filled. The process is repeated for all the waste and all the bagged waste are neatly packed into the DP store.
- When supervisors or national monitors visits, they are expected to carry as much waste as can be loaded into their vehicle and transport the waste to the DMS.
- All the waste, including the straps, was packed together.
- Most PHUs had only one type of net, either PBO or IG2 nets. So, there was no need to pack waste separately.

Successes

- Training of the DP supervisors and team members on the waste management process was well understood
- All DPs recorded huge stockpile of waste, well organized in their store, despite the limited storage space as the ITN waste is voluminous
- Pilot test run of the crushing process was successful recording up to 50% reduction in volume

Challenges

1. Absence of source separation plan
2. Inadequate waste transport plan
3. Insufficient waste management budget
4. No dedicated campaign personnel at the DMS
5. Insufficient budget for lifting the mobile waste crusher
6. Insufficient designated storage space:

Recommendations

- Proper planning and budgeting for ITN waste collection and transport from the DP through to the recycling plant as defined by the NMCP and the recycling partner(s) is required. Early engagement of the NMCP with the national environmental authority to identify private sector options for further assessment is critical to avoid delays in the waste management operations during and after the ITN distribution.
- Source separation process should be encouraged to save time during crushing and make waste tracking easier and accountable. The process should be communicated during training of DP teams and upper-level supervisors and standard operating procedures (SOPs) for DP teams should include detailed steps for waste management.
- Adequate storage space for storage of waste at DMS or extension of warehousing contract to accommodate waste storage for districts with limited or no indoor storage space should be provided. Alternatively, arrangements should be made for transport of waste from DPs directly to higher level storage levels.
- The role of district storekeeper or security personnel should be revised so that they are made responsible for documenting/ tracking waste brought into the DMS

COMMENTS
CONTRIBUTIONS
QUESTIONS

THANK YOU!

TENKI!

RECYCLING OF ITNS PLASTIC WASTES
LIBERIA 2024 ITN MASS DISTRIBUTION CAMPAIGN

Photos showing the volume of uncrushed Interceptor G2 bags pre and post transport.

Presented By:

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Outline

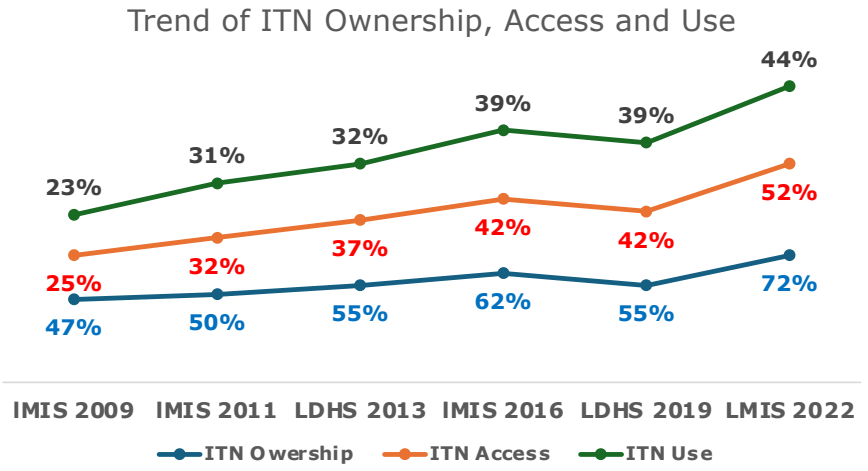
- Political Profile & Malaria situation
- Background
- Engagement of Waste Management Partners
- Methods
- Challenges & Lessons Learned/Achievements
- Recommendations

Political Profile of Liberia

- Liberia is a west African nation
- Liberia is divided into 15 political sub-divisions and 98 Health Districts
- Liberia has an estimated 2024 population of 5,569,923

Malaria Situation in Liberia

- Malaria is endemic in Liberia with the entire population at risk
- Malaria prevalence is 18% and 10% using mRDT and Microscopy, respectively (LMIS-2022)
- Core Malaria prevention intervention in Liberia is the distribution and use of insecticide-Treated Nets (ITNs)
- Four rounds of ITN mass campaigns have been conducted since 2015 with the recent (2024) wastes recycled



BACKGROUND

- During the last three mass distribution campaigns, the ITN wastes were disposed off in a nonenvironmentally friendly and non-acceptable standards (buried and/or burned in open air)

- Concerns were raised for the safety of the environment and the program was advised to find a better waste management strategy for future campaigns

- In adherence to the advice especially from the Environmental Protection Agency (EPA) of Liberia and the Alliance of Malaria Prevention (AMP), the campaign management team with support from the GF, decided to recycle the wastes of the 2024 ITN distribution campaign

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BACKGROUND CONT'D

Over 3 million ITNs were distributed throughout the country's 98 health districts in 2024

The distribution strategy was hybrid (door-door and fixed-sites with mobile and outreach teams)

In line with the campaign's plan of action, ITNs were given to beneficiaries without plastic wrap, and plastics were kept at distribution and prepositioning sites

HANDLING OF WASTES AT DISTRIBUTION SITES

- Individual packs were packaged into 50 pieces a bundle and tied in a bale
- All wastes (bags, straps and plastics) were transported daily from the distribution points to central locations in the districts' seats
- Subsequently, the wastes were transported to the counties' seats by the Service Providers (SPs)
- As part of the agreement with DuraPlast, (recycling company) the wastes were finally transported from the counties' to the recycling site in Monrovia by DuraPlast
- At the end of the distribution phases, 75,366.10 kg of wastes were generated

ENGAGEMENT WITH WASTES MANAGEMENT PARTNERS

Mapping of recycling companies (Abundant Rain, Evergreen, Green Cities, and Hysaa) was done but showed none of the identified companies had the capacity to manage the wastes or had the experience in recycling ITN plastic wastes

DuraPlast, a local company involved with the production of industrial materials using both virgin and recycled plastics, was then contacted

Materials were tested and DuraPlast accepted to recycle the wastes

A letter of nonobjection was sent to the GF for single sourcing, which was granted

A scope of procedures was developed with DuraPlast, and a final product of electrical conduits was agreed upon

Photos showing the volume of uncrushed Interceptor G2 bags pre and post transport.

Weighing of segregated materials

During the campaign planning, wastes management was budgeted for but with the intension of incineration

Based on discussions with the Liberia Medicine & Health Regulatory Authority (LMHRA), a minimum budget was allocated

During the campaign, it became evident that LMHRA did not have the capacity to incinerate the plastic waste which prompted the recycling option

The recycling budget provided by DuraPlast included the transportation of the wastes from the counties to Monrovia

The recycling budget was shared with the Global Fund Country Team for an approval

The budget was subsequently approved, and the gap was filled by the Global Fund

Plan International Liberia the principal Recipient (PR) led the discussion with DuraPlast not the NMCP

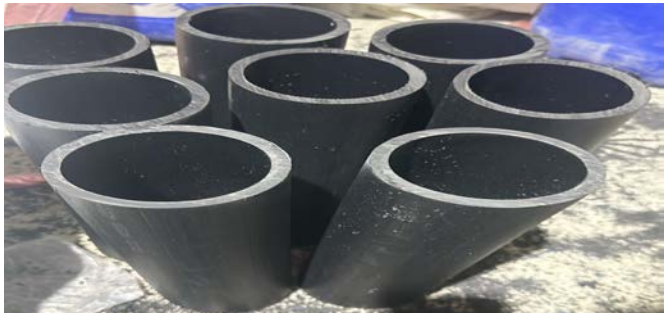
CRUSHING AND RECYCLING OF THE ITN WASTE

- The plastics were Crushed at DuraPlast using its stationary crusher and extruded into pellets

Crushed plastics being recycled into electrical conduits

Pellets ready for recycling

Final Products (Electrical Conduits)

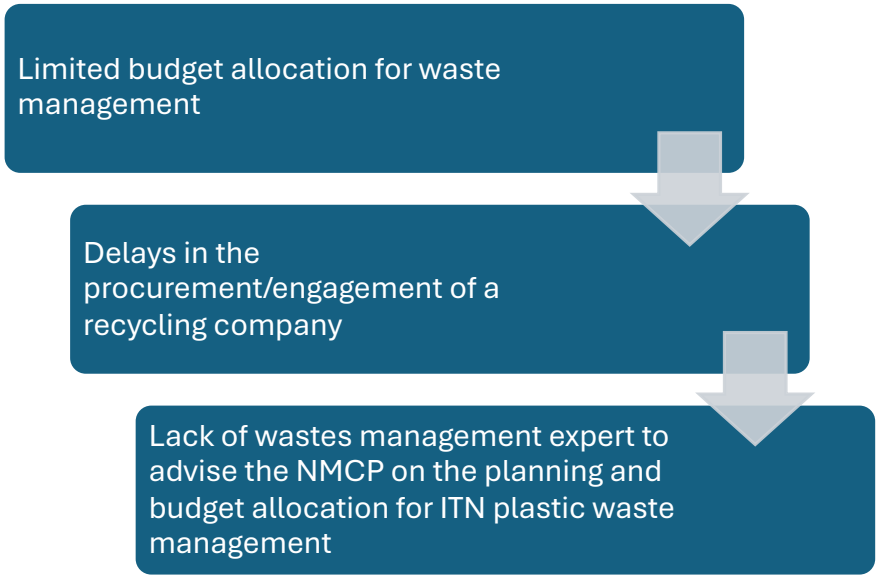


ACHIEVEMENTS AND CHALLENGES

ACHIEVEMENTS

- Effective coordination among partners
- Removal of all wastes from the communities
- Plastic wastes successfully recycled into household materials (electrical conduits)
- Availability of a local company with the capacity to recycle ITN plastic wastes

CHALLENGES



WASTE MANAGEMENT SHOULD BE PLANNED AND ADEQUATELY BUDGETED FOR AT THE PLANNING STAGE OF THE CAMPAIGN

WASTE MANAGEMENT EXPERTS SHOULD BE ENGAGED BY CAMPAIGN IMPLEMENTERS WITH SOPS TO ENSURE SMOOTH OPERATIONS

EARLY ENGAGEMENT OF RECYCLING PARTNER DURING FUTURE CAMPAIGNS

WASTE MANAGEMENT MUST BE CONSIDERED AS A PART OF SUPPLY-CHAIN AND PRIORITIZED WITH REVERSE LOGISTICS

ACKNOWLEDGEMENTS

THANK YOU