



Vector Control with ITNs: The environmental footprint

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PMI

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Context - Malaria and climate

- Malaria remains one of the biggest global health challenges for LMICs and **climate change is fueling and exacerbating the spread of malaria**
- Countries that are the least responsible for carbon emissions are often the **most vulnerable** to its effects
- Although the **overall carbon emission is relatively small** (approx. 570 kt CO₂e across approximately 220M nets – equivalent to a mid-size pharmaceutical company), **the Global Fund and PMI recognize our responsibility in a carbon-neutral future**
- We are looking throughout the value stream to identify opportunities to reduce waste, improve efficiency, and plan for end-of-life management

Climate

By 2030, modeling estimates throughout Central, Eastern, and Southern Africa:

- **51-62 million** additional people may be at increased risk for endemic transmission
- **37-48 million** additional people may be at risk for seasonal transmission

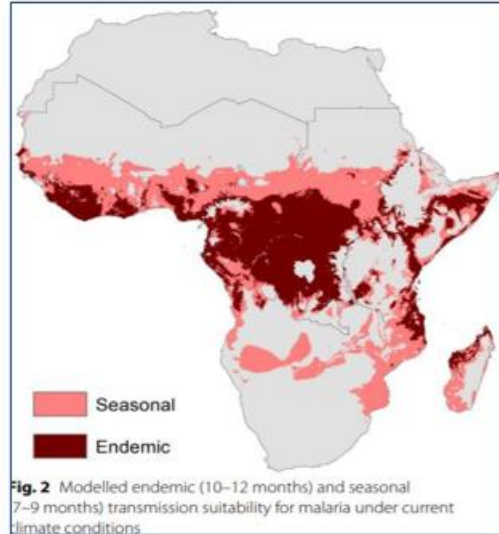
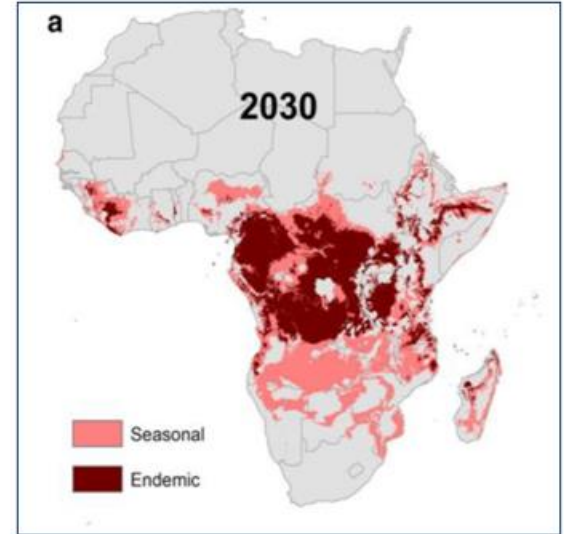


Fig. 2 Modelled endemic (10–12 months) and seasonal (7–9 months) transmission suitability for malaria under current climate conditions



Source: Ryan, S.J., Lippi, C.A. & Zermoglio, F. Shifting transmission risk for malaria in Africa with climate change: a framework for planning and intervention. *Malar J* 19, 170 (2020). <https://doi.org/10.1186/s12936-020-03224-6>

Climate

Extreme weather events:

- Damage health system infrastructure
- Limit access to medications
- Disrupt prevention campaigns
- Displace populations

Shifting seasonal patterns:

- Increased unpredictability and longer transmission seasons
- Outbreaks in new areas
- Displaced persons escaping from drought moving to malarious areas
- Potential risk of increased transmission rates



Warehouse with PMI-funded commodities in Beira, Mozambique after Cyclone Idai

USAID Climate Strategy

The USAID Climate Strategy intersects with sustainable manufacturing:

- Reducing greenhouse gas emissions
- Mitigating carbon emissions
- Promoting decarbonization & sustainable growth in manufacturing
- Fostering private sector engagement on sustainable supply chains
- Mobilizing finance to invest in the transition to a net-zero economy
- Increased adoption of Environmental, Social and Governance (ESG) standards





PMI and Climate: Adaptation and Mitigation

Developing a climate framework

- Reducing the impact of climate effects on malaria programs
- Reducing PMI's carbon footprint and environmental impact

Adjusting current programming

- Reduced transportation greenhouse gas emissions by 50%: transitioned supply chains from air to sea and land freight; overhauled packaging/loading to use fewer containers
- Supporting early warning systems to predict climate-based malaria outbreaks to optimally deploy malaria interventions
- Pre-position supplies so communities have continuous access during/after weather events

Exploring for future programming

- Developing and implementing models for safe recycling and repurposing waste
- Moving production closer to demand and incentivizing green manufacturing
- Strengthening end of life collection, recycling, safe disposal, and circular economy



“Best Value Criteria” and Sustainable Manufacturing and Procurement

Environmental Sustainability Impacts:

- Reduced packaging material volume that still maintain adequate product protection → reduce manufacture material and energy inputs
- Increased packing efficiency → contribute to lower fuel consumption, reduced emissions and less pollution from logistics activities
- Innovations in packaging material → contribute towards improved waste management
- On-time-delivery performance → reduces in-country emissions and waste associated with extended storage requirements or rapid deployment of transport
- Robust QA practices → reduce production of defective or substandard ITNs, reducing resource consumption and waste generation



Global Fund Climate Strategy

- The Global Fund is committed to promoting low-carbon, climate-resilient health systems and addressing the impacts of climate change on the fight against HIV, TB and malaria.
- We support countries that are the most vulnerable to the impacts of climate change – 71% of our new investments (2023-2025) will go to the 50 most climate-vulnerable countries.
- Global Fund endorses the “Guiding Principles for Financing Climate & Health Solutions”
 - Accelerating transformative climate and health solutions to save and improve lives now and in the future;
 - Creating equitable, inclusive, accessible, and holistic approaches to climate and health financing and solutions;
 - Building the core policymaking and implementation capacities of countries, communities, and financing institutions to deliver climate and health solutions.

We conducted a VSM and carbon footprint assessment to drive sustainable ITN value chains

A comprehensive value stream mapping and carbon footprint exercise of the ITN supply chain was conducted for Mozambique, Nigeria and Cameroon to:



Provide insights into cost, time and the environmental impact at each stage of the ITN value chain for four ITN producers



Improve the Global Fund's value for money in ITN procurement, delivery and distribution, through identifying existing deficiencies at each step and drawing recommendations



Drive sustainable ITN procurement and supply chains through identifying potential decarbonization levers to reduce emissions at each step of the ITN supply chain

The value stream mapping and carbon footprint exercise focused on a targeted set of key questions



A VSM and process visualization

1. What are the steps of the ITN planning, procurement and distribution process?
2. In what locations do the different steps of manufacturing occur?
3. How do the value streams differ in Nigeria, Mozambique and Cameroon?
4. What are practical challenges of the current process?



B Time analysis

1. What is the required time of every step in the ITN value stream?
2. What are the main factors leading to these times?
3. What are optimization and efficiency opportunities?



C Cost analysis

1. What is the cost of every step in the ITN procurement and distribution process?
2. What are the main factors driving the specific costs?
3. What are optimization and efficiency opportunities?



D Carbon footprint analysis

1. What is the carbon footprint for each step of the process?
2. How do these emissions compare to other supply chains?
3. What are different decarbonization options?



E Data flows

1. What is the data handling process of every step in the ITN distribution process?
2. Where might data get lost or result in inefficiencies?
3. Can data be leveraged further to optimize the process?



F Recommendations on opportunities to improve ITN campaigns

Carbon: On per unit base, a net emission can be relevant small



~3.7 kgCO₂e per mosquito net



~2.4 single used plastic bags

OR



~16.6km of driving

... with the procurement volume, comparable to private companies

146M nets a year creates emissions of ~570 ktCO₂e comparable to a medium size pharmaceutical company's annual emissions

7th largest Pharma Company in the world has 4x the total emissions

Baseline: ~2.3 MT CO₂e in 2021

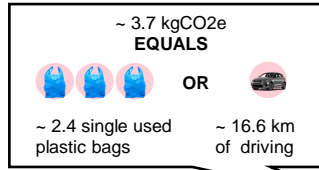
...and has made progress on decarbonization:

- In 2022, 8.2% reduction across scope 1, 2 & 3 compared to 2021
- Committed to be net zero by 2050

1. Halve their emissions by 2030, with the ultimate goal of reaching net zero emissions by 2050

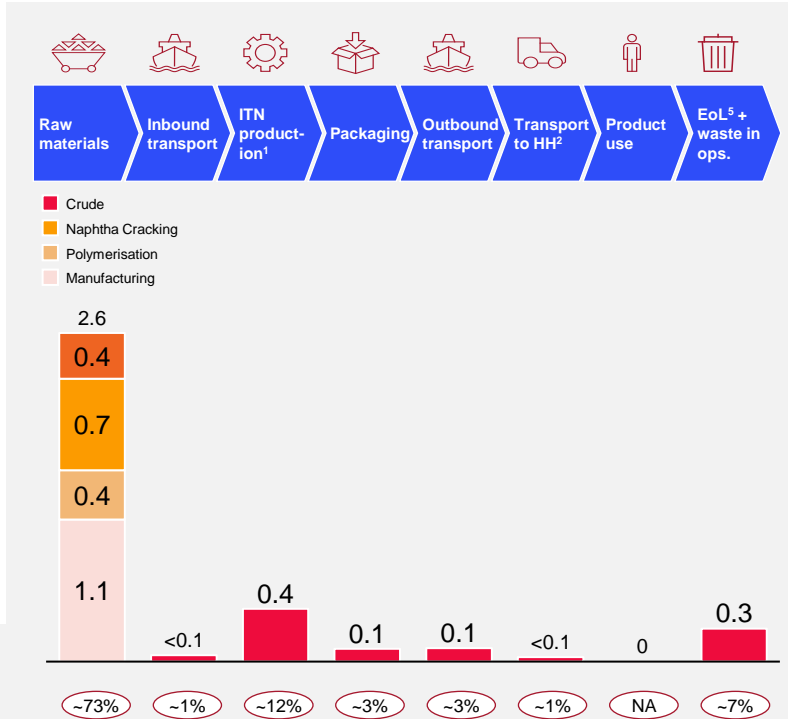
Source: Press research, biodiversity.org, epa.gov, fhwa.gov, co2everything.com; <https://www.bms.com/assets/bms/us/en-us/pdf/bmy-2021-esg-report.pdf>; <https://www.bms.com/assets/bms/us/en-us/pdf/bmy-2022-esg-report.pdf>

Carbon: Emissions of ~ 4kg per net driven by raw materials, manufacturing and EoL / waste management



Emission (kgCO₂e/unit net)

X % of total GHG emissions



Key Takeaways

Average GHG emissions from all 4 suppliers are ~4 kgCO₂e/net:

- **Raw materials and packaging** accounting for ~70-75% with maximum raw material being sourced from **India and China**
- **Manufacturing is ~16% for Supplier 2** i.e., ~2x of Supplier 3
- EOL and waste is ~6%-10% for all suppliers

1. Dyeing is not included in the assessment; 2. Includes transportation from ports to regional facilities; 3. Activity values for waste and EOL include primarily HDPE/LDPE and plastic packaging 4. Upstream breakdown on raw materials illustrative 5. Based on expert insights on 30% waste nets being incinerated/openly burned, 60% being landfilled and 10% recycled in Africa. Emission intensities taken from IPCC times the net weight and assumed split is used to arrive at the EOL numbers for different suppliers 6. Packaging assumed similar to (not enough information provided by) 7. green energy share is ~60%;

Recommendations: There are 3 near-term priorities, as well as additional opportunities in the long run for further carbon abatement

Near-term priorities		Long-term (with high impact on carbon abatement)
Objective	Execute “Quick win” levers which have a positive impact on cost and carbon, while others improve planning processes and in-country delivery	Influence the reduction of carbon emissions further , including setting expectations with manufacturers, working with partners on waste management, and looking for innovation – which would incur additional costs if done in the near-term
Priorities	<ol style="list-style-type: none">1 Implement policies fully for sustainable ITN ordering including standardizing specifications choices (e.g., artwork) and making bulk packaging standard option where possible2 Optimize ITN logistics from arrival at port from to 1st delivery including working with the WB and WTO to simplify customs and strengthening coordination for customs and early in-country logistics management with TA3 Digitize (in-country) campaign end to end e.g., <i>building on Red Rose platform in Nigeria, digital tracking tool being piloted with eGov (e.g., in Mozambique)</i>	<p>Improve EoL and waste management</p> <p>Advocate to manufacturers to improve emissions from energy use (e.g., joining CEBI consortium, including emissions as part of scoring for RPF¹)</p> <p>Manufacture ITNs with blended recycled/ virgin plastic</p> <p>Adopt alternative low-carbon production routes (e.g., e-cracker, Bio-based feedstock, CCS) and packaging material</p> <p>Increase ITN durability and lifetime to reduce emissions as less ITNs needed over long term</p>

1. Responsible procurement framework

LT Recommendations – Next steps on priority areas: Long-term (with high impact on carbon abatement)

Lever	Description	Supply operations owner	Other TGF teams involved	Next steps
<p>Improve EoL and waste management</p>	<p>Collect old nets retained by households (50% of households as per PoC conducted in 2023 with BASF) to reduce plastic waste and decrease carbon emissions</p> <p>Encourage governments to implement effective waste management strategies (e.g., recycling, mechanized recycling of HDPE nets) and measures to minimize the emissions coming from high emissive treatment methods such as incineration and open burning</p>	In-country supply chain	GMD TAP (Malaria and RSSH)	<p>Commence planning EoL ITN collection pilots with implementing partners including cost-effectiveness analyses on the different modalities, building on platform and lessons learned from BASF PoC exercise in Cross River State</p> <hr/> <p>Further work done for EoL waste management with C19 investments and resourcing opportunities (e.g., reprogramming, portfolio optimization)</p> <hr/> <p>Understand potential implications on arising from the Global Plastics Treaty on mandatory recycling rates and transition from incineration / landfill for recyclable plastics</p>
<p>Advocate to manufacturers to improve emissions from energy use</p>	<p>Influence suppliers to reduce the carbon emissions from energy use in raw materials production and manufacturing through use of on-premise renewables (e.g., solar panels) or leveraging green grid energy where possible</p>	Direct sourcing	Front Office	<p>Work with Clean Energy Buyers Institute (CEBI) to develop strategy on how to work with manufacturers</p> <hr/> <p>Implement Responsible Procurement Framework including GHG emissions in scoring for thresholds</p>



Key Takeaways

- ITNs continue to be an important vector control tool to prevent malaria; 3B nets have been delivered to date and mass campaigns in particular generate waste
- Significant amount of plastic generated through ITN packaging and end-of-life nets
- PMI and Global Fund have climate strategies and strive to reduce the carbon footprint and environmental impact of our interventions, across the ITN life cycle
- We have a shared responsibility to minimize and manage waste
- There are opportunities for innovation, mitigation and adaptation
- We are keen to learn from NMPs about your top concerns and priorities