

# Mitigating Plastic Litter Will Significantly Reduce Mosquito-Borne Disease

Researchers have shown that in coastal Kenya the mosquito species *Aedes aegypti* — the primary carrier of viruses like dengue, yellow fever, chikungunya and Zika — breeds in plastic litter. By creating systems to remove this plastic pollution, policy makers can significantly reduce deadly mosquito-borne diseases, improving public health, the economy, and the environment.



## Executive Research Summary

On the Kenyan coast, litter is prevalent and abundant, accumulating in neighborhoods, open lots, gutters, around homes, and in public spaces. Plastics and some rubbers — a large portion of the waste — take centuries to decompose. Tires, buckets, jerrycans, soda bottles, and other similar materials remain as persistent forms of pollution, damaging ecosystems for decades. These environmental impacts are well known, but scientists now understand plastics have serious consequences on human health.

Over time, plastic litter accumulates water from rain showers and moisture in the air, creating small pools of resting water in bottles and other water-tight materials. Researchers from the Technical University of Mombasa and Stanford University recently discovered that these small pools are major breeding grounds for *Aedes aegypti*, the species of mosquito responsible for transmitting dangerous viruses like dengue, yellow fever, chikungunya, and Zika. Over 24 months, the researchers took 22,144 samples from water captured in plastic litter and found these small pools of standing water to contain significant numbers of mosquito larvae. These breeding grounds yield large numbers of mosquitoes — with close proximity to human-dwellings, they spread viruses and cause substantial, avoidable illness throughout Kenyan coastal communities.

“If we create systems to eliminate plastic litter, we will prevent a large number of unnecessary disease cases and deaths.”

Dr. Desiree LaBeaud

LEAD RESEARCHER, STANFORD UNIVERSITY

## Key Points

When water accumulates in plastic litter, it creates ideal breeding grounds for *Aedes aegypti*, the species of mosquito responsible for transmitting viruses like dengue, yellow fever, chikungunya, and Zika.

Because plastics do not decompose and there are no proper public disposal methods for them in coastal Kenya, plastic litter accumulates.

By creating ideal mosquito-breeding habitats, plastic litter substantially increases viral disease transmission.

Mosquito-borne viruses are a major public health concern, causing economic strain by resulting in fewer working members of society and an over-burdened health system.

Creating systems for proper plastics disposal solves two problems with one solution: improving public health by reducing disease transmission and eliminating local pollution.

## Mosquito-Borne Viral Diseases Have Major Health Impacts

DENGUE • YELLOW FEVER • ZIKA • CHIKUNGUNYA

- Over 50% of people in coastal Kenya are regularly exposed to dengue and chikungunya.
- Recent research shows these viruses will soon have a larger public health impact than malaria due to climate change.
- More than 10% of febrile illness in Kenya is due to mosquito-borne viral infections, but goes undiagnosed.

## Plastic in the Environment Is More Than Just Litter

In addition to spreading disease through mosquitoes, plastics damage the environment in a variety of ways, many of which have other human health consequences and affect various sectors, including the economy and tourism.

### OCEAN WILDLIFE & HABITATS

Most plastics eventually reach our oceans, resulting in biodiversity and ecosystem loss through wildlife ingesting plastics and becoming entangled in plastic films, as well as through habitat destruction that harms coastal breeding grounds.

### AIR QUALITY & CLIMATE CHANGE

Plastic waste is often burned, creating toxic fumes and air pollution, and because plastics are produced with fossil fuels, they are a major source of greenhouse gases and local air pollution where they are manufactured.

### WATER QUALITY

When plastics degrade, they do not break down — they just become smaller and smaller pieces of plastic that invade waterways. In a recent study, 83% of tap waters sampled around the world contained microplastics, which attract toxic pollutants and harm human health.

## Step by Step: How to Intervene



### PLASTICS DO NOT DECOMPOSE

Unlike paper or organics, plastics do not decompose on their own. Because they are watertight and do not degrade, they are a significant source of pollution and create many small pools of water.



### PLASTIC LITTER ACCUMULATES

Because of a lack of effective public disposal systems and various challenges in the plastic recycling industry, plastic waste accumulates near human dwellings.



### MOSQUITOES REPRODUCE IN PLASTIC LITTER IN GREAT NUMBERS

The small pools of water created in plastic litter are ideal breeding grounds for mosquitoes. With these convenient breeding grounds, mosquitoes reproduce in great numbers and infest urban areas.



### MOSQUITOES SPREAD DEADLY DISEASES

With mosquito populations increasing, particularly in densely populated urban areas, disease transmission increases dramatically and causes unnecessary illness and death.



### OPPORTUNITY: BOLSTER EXISTING WASTE DISPOSAL SYSTEMS

By easing restrictions and supporting already existing waste collection and recycling activities in the area, we can reduce plastic litter and eliminate human-made mosquito breeding grounds.



### OUTCOME: HEALTHY PEOPLE, CLEAN STREETS, AND ECONOMIC GROWTH

With less trash there are fewer mosquitoes, and with fewer mosquitoes comes reduced viral disease transmission, as well as more people able to work and contribute to the local economy.

“When we remove plastic litter, we not only improve local environments — we improve human health, beautify our community, support local entrepreneurs, and boost tourism. Everyone stands to gain.”

Dr. Francis M. Mutuku  
LEAD RESEARCHER,  
TECHNICAL UNIVERSITY  
OF MOMBASA