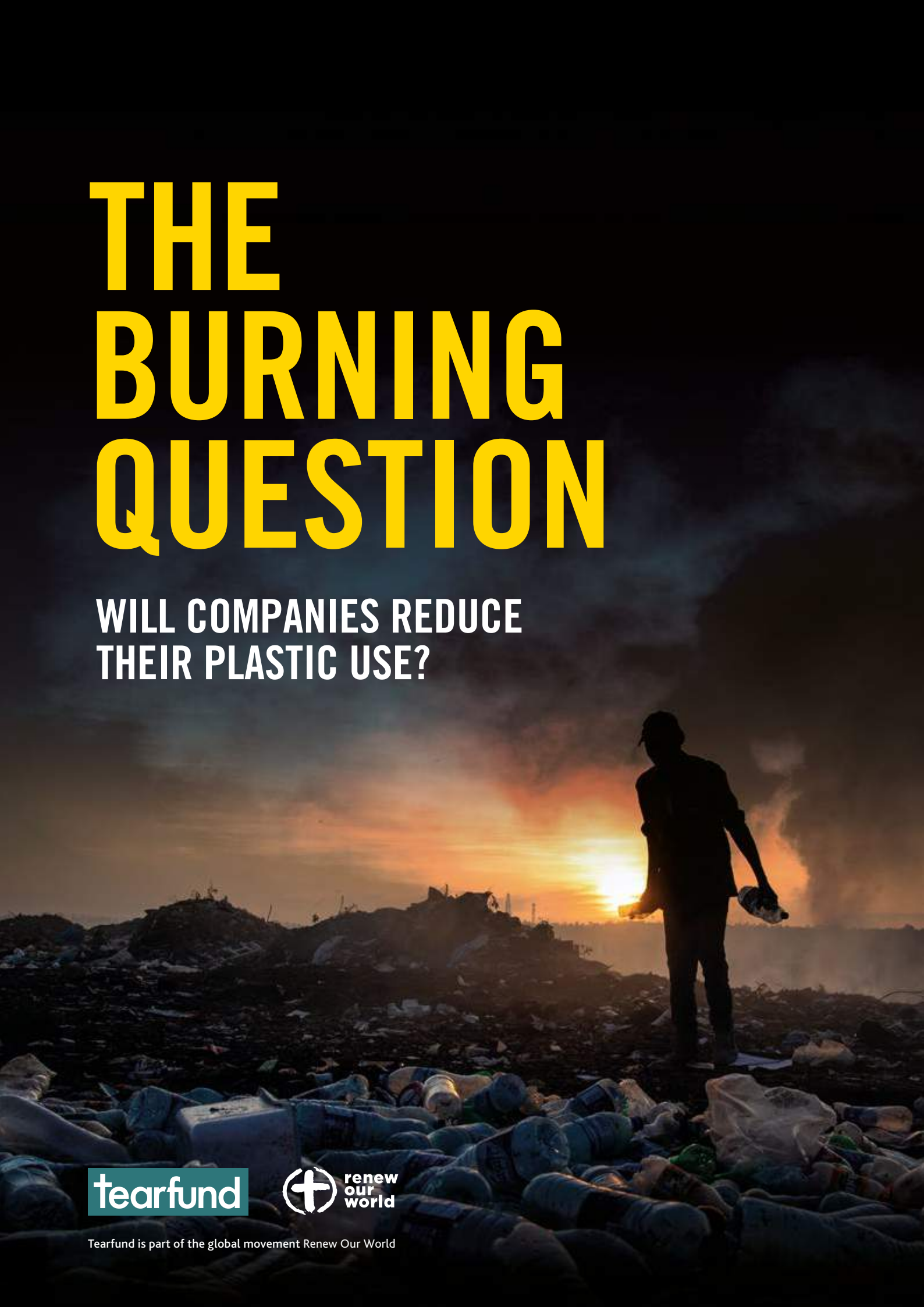


# THE BURNING QUESTION

## WILL COMPANIES REDUCE THEIR PLASTIC USE?

tearfund

renew our world

Tearfund is part of the global movement Renew Our World

# 4 PLASTIC POLLUTERS
# 6 COUNTRIES
# 1 BURNING QUESTION...

## WILL THESE COMPANIES REDUCE THEIR PLASTIC USE?

## GLOSSARY

**EPR** – Extended Producer Responsibility: voluntary or mandatory schemes which require manufacturers and retailers to pay for the costs of managing their products at the end of their life

**GHG** – Greenhouse gas: we use this as a catch-all term for all climate emissions, including the short-lived climate pollutant black carbon

**GWP** – Global warming potential

**HDPE** – High-density polyethylene: a type of plastic used to produce rigid cartons

**IPCC** – Intergovernmental Panel on Climate Change

**LDPE** – Low-density polyethylene: a flexible plastic often used for bags and wrap, and alongside PET in sachets

**MNC** – Multinational company

**PE** – Polyethylene: can refer to HDPE or LDPE and not to be confused with PET

**PET** – Polyethylene terephthalate: a plastic commonly used to produce plastic bottles and sachets

**PP** – Polypropylene: commonly used to produce bottle caps, as well as pots and tubs

**UNEP** – United Nations Environment Programme

# CONTENTS



tearfund

**Tearfund is a Christian relief and development agency working with partners and local churches to bring whole-life transformation to the poorest communities.**

**Tearfund is part of Renew Our World, a global movement of Christians calling for a more just and sustainable planet for all.**

**Cover image:** A smouldering open dumpsite in Dar es Salaam, Tanzania. **Photo:** Daniel Msirikale/Tearfund


Written by Rich Gower, Joanne Green and Mari Williams

Design by Helen Eldridge

Many thanks to Prof David Wilson, Dr Natalia Reyna-Bensusan and David Lerpiniere (Resource Futures) for reviewing the report and methodology. Thanks also to Paul Cook, Zoë Lenkiewicz (WasteAid), Sue Willsher, Melissa Barnston, Clare Lyons, Seren Boyd and Simon Martin for their contributions and comments.

All facts, figures and claims in this report are as at the last date they were checked.





**T** +44 (0) 20 3906 3906
**E** publications@tearfund.org

learn.tearfund.org

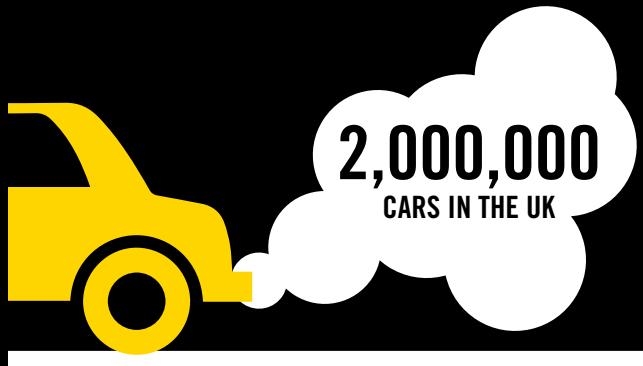
/tearfundlearn

# ACROSS JUST SIX COUNTRIES*
# COCA-COLA, NESTLÉ, PEPSICO AND UNILEVER
# CREATE ENOUGH PLASTIC POLLUTION**
# TO COVER 83 FOOTBALL PITCHES EVERY DAY***

## MORE THAN ONE FOOTBALL PITCH

EVERY
**20**
MINUTES

Open burning of their plastic pollution creates the same amount of $CO^2$ equivalent emissions as 2 million cars in the UK.




Emissions from open burning of Coca-Cola's plastic are as much as three-quarters of their global transport and distribution emissions.

**75%**


*China, India, the Philippines, Brazil, Mexico, Nigeria. ** Plastic dumped or burnt ***To a depth of 10cm

## EXECUTIVE SUMMARY

# PLASTIC POLLUTION SCARS LANDSCAPES, FILLS OUR OCEANS AND HARMS THE HEALTH OF THE WORLD'S POOREST PEOPLE.

**Nevertheless, global plastic production is still increasing,[1] and is set to double over the next ten to 15 years.[2] The steps being taken by companies and governments are a far cry from the action necessary to tackle a crisis of this magnitude.**

This report focuses on the actions and responsibilities of four of the world's biggest plastic polluters: Coca-Cola, Nestlé, PepsiCo and Unilever.[3] At the time of writing these companies continue to sell billions of products in single-use bottles, sachets and packets in developing countries.[4] And they do this despite knowing that: 1) waste isn't properly managed in these contexts; 2) their packaging therefore becomes pollution; and 3) such pollution causes serious harm to the environment and people's health. Such actions – with such knowledge – are morally indefensible. Tearfund launched the *Rubbish Campaign* in May 2019 to urge companies to act, and all but Coca-Cola have made new commitments related to our asks. However, so far only Unilever has committed to reduce its total plastic use.*

## PROGRESS ON COMPANY COMMITMENTS, SINCE MAY 2019

### COCA-COLA

Commitment to collect and recycle the equivalent of one bottle for every bottle sold by 2030 (on a country-by-country basis). However, no public commitments to reduce its overall or virgin use of plastic; also off-track on its collection commitment. Coca-Cola has however committed to disclose their global plastic footprint annually.

### PEPSICO

Commitment to reduce the use of virgin plastic in its bottles by 20 per cent (2018 baseline) by 2025. However, no commitment on collection and no public commitments to reduce its overall use of plastic. PepsiCo has however committed to disclose their global plastic footprint annually.

### NESTLÉ

Has made no clear public commitments to reduce its overall use of plastic but has committed to reduce virgin plastic by a third by 2025 and to invest 2 billion Swiss Francs in moving from virgin plastics to food-grade recycled plastic. It has committed to collect as much plastic as it sells in 12 countries, but at the time of writing the names of those countries are not publicly available. Nestlé has however committed to disclose their global plastic footprint annually.

### UNILEVER

Commitment to reduce virgin plastic by 50 per cent (2018 baseline by 2025), and total plastic by a sixth; commitment to collect at least as much plastic as it sells in each market by 2025; disclosure of global plastic footprint annually.

*See our campaign league table at tearfund.org/rubbishcompanies

# EXECUTIVE SUMMARY

## REUSE VS RECYCLING

Most of the companies focus on recycling, rather than reduction, as the way to address the problem. This is a mistake. Collection and recycling are an important part of the transition, but the right long-term approach is to replace single-use plastic with refillable and reusable alternatives. These are preferable for three key reasons:

**1** Reusable and refillable packaging preserves more of the value and natural resources embedded in each bottle and box. By contrast, recycled single-use plastic is typically downcycled into synthetic fabrics, which then become waste again. Furthermore, downcycling maintains a continued need for virgin plastic, with the associated environmental costs.

**2** From a technical and economic perspective, it is questionable whether it is possible actually to recycle such a large and ever-increasing volume of plastic. Only 14 per cent of plastic packaging is collected for recycling annually, and even in developed countries, recycling capacity often falls far short of total plastic use.

**3** The challenges associated with recycling such a large amount of plastic are instead likely to lead to an increased emphasis on incineration. This generates potentially harmful emissions, including greenhouse gases. It is not a cost-effective or safe solution in developing countries, where capacity to manage and regulate incinerators is low, and the potential for major pollution is therefore greatly increased.

> **“Only 14 per cent of plastic packaging is collected for recycling annually, and even in developed countries, recycling capacity often falls far short of total plastic use”**

## COCA-COLA, NESTLÉ, PEPSICO AND UNILEVER'S PLASTIC POLLUTION FOOTPRINT (THAT'S PLASTIC THAT IS DUMPED OR BURNT)

In 2019, Coca-Cola, Nestlé, PepsiCo and Unilever published their global plastic footprint. However, the companies have not yet disclosed their plastic packaging on a country-by-country basis (one of the calls of Tearfund's *Rubbish Campaign*). We have therefore attempted to do this for them for some countries. Our methodology has been independently reviewed by Resource Futures and leading academics in the field of solid waste management.

We have calculated a reasoned estimate of the plastic packaging used and sold by each company in six countries spanning three continents – China, India, the Philippines, Brazil, Mexico and Nigeria.[5] We shared this methodology with each company in December 2019 to give them an opportunity to respond.

We then use data collated by the World Bank and other sources to calculate the amount of the companies' plastic that is mismanaged – ie burnt[6] or dumped – in each country.

**We calculate that across all six countries, Coca-Cola, Nestlé, PepsiCo and Unilever are responsible for more than half a million tonnes of plastic pollution every year.** This is enough to cover 83 football pitches every day (to a depth of 10cm). That's more than one football pitch every 20 minutes. **This is the first time such estimates have ever been made.**

COCA-COLA, NESTLÉ, PEPSICO AND UNILEVER ARE RESPONSIBLE FOR MORE THAN HALF A MILLION TONNES OF PLASTIC POLLUTION (THAT'S PLASTIC DUMPED OR BURNT) EVERY YEAR


## COCA-COLA

200,000 tonnes per year, or 33 football pitches every day


## NESTLÉ

95,000 tonnes per year, or more than 15 football pitches every day

**83**

**FOOTBALL PITCHES COVERED EVERY DAY**


## PEPSICO

137,000 tonnes per year, or 22 football pitches every day


## UNILEVER

70,000 tonnes per year, or more than 11 football pitches every day

# THE PLASTIC CRISIS IS A CLIMATE CRISIS

A waste picker sorts waste on an open dumpsite in Tanzania.
**Photo:** Daniel Msirikale/Tearfund

# EXECUTIVE SUMMARY

## PLASTIC CRISIS, CLIMATE CRISIS

This massive plastic pollution footprint, while a crisis in and of itself, is also contributing to the climate crisis. New academic analysis suggests that the greenhouse gas emissions from the open burning of waste could be highly significant. In this report, we present the first estimates of these emissions for each company in our six focus countries. They give an indication of the scale of the problem. If all developing countries were included, the totals could be significantly higher.

The emissions quantities are calculated by estimating the proportion of each company's mismanaged plastic that is openly burnt, and combining these amounts with emissions factors for three different types of plastic. Emissions of both black carbon[7] and carbon dioxide are considered. This is because waste management experts view black carbon as a particular cause for concern. Our methodology is described in Appendix 2. It has been independently reviewed by the two lead authors of the academic paper we rely on for our emissions factors.

**Coca-Cola emerges as by far the worst polluter of the four, with emissions greater than the other three combined.** This is despite being the smallest company of the four in terms of sales revenue, and is largely because they use so much plastic per dollar of sales: more than twice as much as PepsiCo, and seven times as much as Unilever. In light of this, it is alarming that Coca-Cola have resisted calls to reduce their dependence on single-use plastic.

**Burning of Coca-Cola's plastic in these six countries creates emissions equivalent to 2.5 million tonnes of carbon dioxide. That's the same as three-quarters of their global transport and distribution emissions.**

**All together, across the six countries, 4.6 million tonnes of carbon dioxide equivalent emissions are produced from the open burning of Coca-Cola, Nestlé, PepsiCo and Unilever's plastic pollution. Preventing these emissions would equate to taking 2 million cars off the UK's roads.**

At present, the four companies make little or no mention of emissions from disposal of their products or packaging in their climate change commitments.

## PLASTIC CRISIS, HEALTH CRISIS: A FOCUS ON TANZANIA

The plastic pollution being caused by Coca-Cola, Nestlé, PepsiCo and Unilever also contributes to a waste crisis that directly harms people's health. In our 2019 report *No time to waste*, we presented evidence to suggest that between 400,000 and 1 million people die each year in developing countries because of diseases related to plastic and other mismanaged waste. At the upper end, that is one person every 30 seconds. In *The Burning Question* we look at the reality of the impact of mismanaged waste, including plastic pollution, on the health and lives of a number of people living in Dar es Salaam, Tanzania's largest city.

**Royda Joseph is 32 years old.** She has three children and lives with her family in a community situated next to the Pugu-Kinyamwezi rubbish dump. The dump is frequently on fire. It is very dusty, and litter – including plastic – is spread throughout the community, attracting huge amounts of flies.

'The dump is on fire every two days,' says Royda. 'Sometimes, when it is on fire, the smoke is so dark and huge that you can't see the person in front of you or the house next to you. Because of that smoke I get breathing problems and coughing, and eye problems too. The kids also get a lot of breathing problems: they cough a lot. When it is really bad, there is no way that you can deal with it without going to the hospital.

'The smoke and the fire come when the weather is very dry and the gases are coming out of the fire... When the dump is on fire, it can take one to two hours until they call the fire brigade to come here and try to stop it. It is that bad. Sometimes it can take two to three hours because of the traffic.'

The smoke is sometimes so thick that Royda needs to leave her home. 'Many times when the dump is on fire and really bad, when the smoke is so heavy, I shift to my relatives for a time,' she says. 'When it is so bad that you can't see what is in front or behind...'

Royda is concerned for her children's future. 'I am worried about my children's health because always when it is very dry, the smoke always comes. I am sure in the long run they will develop health complications.'

Royda Joseph with her son Victor.
**Photo:** Daniel Msirikale/Tearfund

## EXECUTIVE SUMMARY

**Pressure is building.** Out-dated packaging models will leave companies increasingly exposed. **The tide of public opinion has turned, and governments are legislating as a result.**

Refill and reuse delivery mechanisms are being adopted in some contexts. On the whole, however, examples of multinational companies adopting alternative delivery mechanisms in developing countries are still few and far between. There are a few positive cases showing what is possible, such as Unilever using Algramo's mobile dispensing delivery system to offer refills to customers in Chile and the use of returnable Coca-Cola PET bottles in Brazil being scaled up. **These examples show moving to refill and reuse models is possible when the solution is well tailored to the context** and there are decision-makers in companies who are willing to think outside the (single-use plastic) box.

**Citizens also want change.** A new survey of 2,000 adults in India conducted for Tearfund by Savanta ComRes in December 2019 found that:

**86%** 86 per cent of adults rated plastic pollution as a serious or very serious concern;[8]

**91%** 91 per cent say they are more concerned about plastic pollution now than they were three years ago; and

**90%** nine in ten respondents say they would be likely to buy their products in refillable or reusable containers if it led to significantly less plastic pollution in their community and if the cost was the same.

A 2019 international survey of customer attitudes (unfortunately excluding Africa) showed that **consumers believe manufacturers have the most responsibility to act on plastic waste in the environment and should take the lead.** Those surveyed asserted that 'making changes to account for this is clearly a matter of "when" rather than "if" for all businesses'.[9] It also showed that the majority of people surveyed globally were taking regular action to reduce their own use of single-use plastic.

More and more countries are introducing bans on various types of plastic packaging. As of July 2018, 127 countries globally had brought in some form of legislation to address the problem of single-use plastic bags. Increasing numbers of countries are also banning or taxing other types of single-use plastics. However, there are reports of companies lobbying against mandatory measures which would threaten their profit margins. Rather than spending their money on lobbying against inevitable legislative change, **it makes more sense for companies to invest in piloting and scaling up quickly refill and reuse delivery models that will reduce plastic pollution and future-proof their business.**

## RECOMMENDATIONS

Coca-Cola, Nestlé, PepsiCo and Unilever all claim to be concerned about global health and climate change. However, in order to honour these climate and health ambitions, companies need to reduce dramatically the production and selling of single-use plastic packaging, and switch to refillable and reusable packaging. We have produced a separate league table showing the latest progress companies have made towards our recommendations. See tearfund.org/rubbishcompanies

**Coca-Cola, Nestlé, PepsiCo and Unilever should:**

**REPORT**, by the end of 2020, on the number of units of single-use plastic products they use and sell in each country

**REDUCE** this amount by half, country by country, by 2025, and instead use environmentally sustainable delivery methods such as refillable or reusable containers

**RECYCLE** the single-use plastics they sell in developing countries, ensuring that by 2022 one is collected for every one sold, as part of adequate systems for collection, reuse, recycling and composting in communities that currently lack these systems [42]

**RESTORE** dignity through working in partnership with waste pickers to create safe jobs. Around the world, there are numerous examples of companies partnering with waste pickers to establish collection and recycling systems that are good for society and the environment.[43]

**THE CHALLENGE IS CLEAR:**
COMPANIES NEED TO STEP UP THE PACE AND SCALE OF THEIR ACTION ON PLASTIC

**THE BURNING QUESTION IS:**
ARE THEY UP TO IT?

“Plastic waste has increased. For the past 20 years I've observed it increasing in Tanzania. It has a lot of effects. One is that the cities and villages become very dirty because the plastic waste isn't easily decomposing, and people, children, just throw the waste down. So when you pass by, you can see the pile of waste, especially the plastic waste. Secondly, because we don't have a proper mechanism for the collection of waste, most people burn their waste at home. So you can imagine that each home, especially in villages, they burn the waste that they produce.”

GLORIA MAFOLE, ADVOCACY AND POLICY ANALYST,
COUNCIL OF CHURCHES OF TANZANIA

## INTRODUCTION

# WITHOUT A DOUBT, PLASTIC POLLUTION IS ONE OF THE MOST SERIOUS ENVIRONMENTAL CHALLENGES OF OUR TIME.

**The statistics are staggering:**

- An estimated 8.3 billion metric tonnes of plastic have been produced since the 1950s.[10] [11] That's one tonne for each of us born within the same timeframe.[12]
- Approximately 80 per cent has ended up in landfill, the oceans, loose in the environment, or being openly burnt. Less than a tenth has been recycled.[13]
- Globally, some 9–10 million tonnes of mismanaged post-consumer plastic waste ends up in the oceans every year.[14]
- About half the amount of plastic waste we produce globally is packaging material that is discarded after just one use.[15]

The world is waking up to the problem. The BBC's *Blue Planet II* documentary series, first screened in 2017, continues to make waves, shocking and inspiring people to speak out and act on marine plastics. And in May 2019, *No time to waste*, a report by Tearfund, WasteAid, The Institute of Development Studies and Fauna & Flora International, highlighted for the first time the growing public health emergency in many towns and cities around the world caused by plastic pollution. It revealed that between 400,000 and 1 million people die each year in low- and middle-income countries because of diseases related to mismanaged waste.[16]

Change is happening (see Chapter 4), with more countries enforcing bans on various types of plastic packaging, new delivery mechanisms being adopted in some contexts, more people adopting lifestyle changes and speaking out against the current 'take-make-dispose' models that dominate our economies, and new commitments being made by companies as a result (see below). The Collins Dictionary named 'single-use' as the word of 2018, as it is 'now being used more than ever before in light of universal efforts to combat the threats such plastics pose to the environment'.[17]

However, despite the increased awareness of the scale and impacts of plastic pollution, global plastic production is increasing,[18] and is set to double over the next ten to 15 years.[19] Despite some bright spots, the steps being taken by governments and companies are a far cry from the action necessary to tackle a crisis of this magnitude. Communities in low- and middle-income countries continue to be swamped by mismanaged waste, including plastic pollution, that causes environmental destruction, sickness and death.[20] Multinational consumer goods companies drive the production of single-use plastic packaging and currently do little to collect and sustainably manage the waste they have created across the world. Companies need to turn off the tap and dramatically reduce the production and sale of single-use plastic packaging.

A temporary dumpsite in Dar es Salaam, Tanzania.
**Photo:** Daniel Msirikale/Tearfund

# INTRODUCTION

## THE SCOPE OF THIS REPORT

In this report, we focus on the actions and responsibilities of four of the world's biggest plastic polluters.[21] All are multinational companies (MNCs)[22] who are responsible for perpetuating the plastic pollution crisis in low- and middle-income countries: Coca-Cola, Nestlé, PepsiCo and Unilever. These four companies have been the focus of Tearfund's *Rubbish Campaign* since May 2019. They all own multiple consumer goods brands and have enormous revenues in low- and middle-income countries.

Despite new commitments, particularly from Unilever, at the time of writing these companies continue to sell billions of products in single-use bottles, sachets and packets in low- and middle-income countries. They do this despite knowing that: 1) that waste isn't properly managed in these contexts; 2) their packaging therefore becomes pollution; and 3) such pollution causes serious harm to the environment and people's health. Such actions – with such knowledge – are morally indefensible.

These four companies scored the highest in the Break Free From Plastic (BFFP) 2019 global waste and brand audit.[23] Coca-Cola topped the list: almost 12,000 branded Coca-Cola plastics were recorded in 37 countries across four continents, followed by PepsiCo second, Nestlé third and, in terms of the number of products found, Unilever fourth.[24] To quote the BFFP report, 'It will be impossible for the world to reduce plastic pollution without these brands making major changes to how they deliver their products.'

In our analysis, we focus on the impact of these four companies in six countries across three continents: China, India, the Philippines, Brazil, Mexico and Nigeria. The first five countries represent some of the companies' biggest markets, and we selected one African country (Nigeria) to ensure geographical spread. Nigeria is a smaller market in terms of sales, but the impacts of plastic pollution are just as detrimental. We had hoped also to include Tanzania in this statistical analysis but were unable to access sales data for the companies here. We focus on Tanzania in Chapter 3 when we look at the impact of plastic pollution on the lives and health of people living in poverty.

In Chapter 1, we present the estimated plastic pollution footprint of each company in each of the six countries. This is the first time such calculations and estimates have been made.

In Chapter 2, we assess the impact of this plastic pollution footprint on climate change, estimating the greenhouse gas (GHG) emissions from the open burning of the companies' plastic waste. While other environmental impacts of plastic pollution (such as marine plastics) have been well documented in recent years, this is an area that has received little attention.

In Chapter 3, we examine the impact of this plastic pollution footprint on people's health. Building on the evidence of the plastic-induced public health crisis facing towns and cities around the world, as presented in *No time to waste*, we report on the lives of people suffering from the impacts of plastic pollution in Tanzania, one of the poorest countries in the world.

In Chapter 4, we explore the steps being taken by governments and citizens to tackle single-use plastics in the absence of adequate change by the MNCs, and the emergence of business models that are challenging throwaway packaging. We end with our conclusion and recommendations in Chapter 5.

In order to stop plastic pollution, we need actions far beyond just the four companies we focus on here. In *No time to waste*, we highlighted the wider actions we believe governments need to take. These include investing in waste management and limiting the worst forms of single-use plastic. All the recommendations for companies, governments and citizens are included in Appendix 1. Yet, as we lay out in this report, there is an irrefutable moral and business case for the world's largest companies to act and lead now to reduce dramatically their plastic footprint.

Plastic waste on a smouldering dumpsite in Tanzania.
**Photo:** Daniel Msirikale/Tearfund

## INTRODUCTION


Dr Tiwonge Gawa, the Vice Chair of the Malawi Creation Care Network, outside Coca-Cola's headquarters in the UK, as part of Tearfund's *Rubbish Campaign*.
**Photo:** Wilde Fry/Tearfund

### PROGRESS ON COMPANY COMMITMENTS

Since we launched our *Rubbish Campaign* in May 2019, more than 43,000 people have signed a petition to the companies, and some companies have responded better than others. (Please see Chapter 5 for what our campaign is calling for.) For up-to-date information on company progress against our asks, please see our separate league table online.[25]

Unilever has come the closest to meeting our campaign asks. They have committed to reduce virgin plastic by 50 per cent (2018 baseline) by 2025, and total plastic by a sixth. And they have also said they will collect at least as much plastic as they sell in each market by 2025. PepsiCo has committed to reduce the use of virgin plastic in its bottles by 20 per cent (2018 baseline) by 2025, which is a small but significant step in the right direction. However, they have made no commitment on collection. Coca-Cola has committed to collect and recycle the equivalent of every bottle sold by 2030, but has made no commitment on reduction. They are also off-track on their collection commitment,[26] and are replacing refillable glass bottles with single-use plastic in markets such as Tanzania that lack adequate waste management.[27] Nestlé has made no clear public commitments to reduce its overall use of plastic but has committed to reduce virgin plastic by a third (2018 baseline) by 2025, and to invest 2 billion Swiss Francs in moving from virgin plastics to food-grade recycled plastic. They have committed to achieve plastic neutrality[28] in 12 countries, but the names of those countries are not publicly available. All four companies are disclosing their global plastic footprint annually.

It's a worry that – apart from Unilever – none of the other companies has yet made public commitments to reduce its overall use of plastic. The box on page 14 explains why recycling alone is not the answer.

While all progress is welcome, the chasm between where we are now and where we need to get to is still immense. As this report shows, these same companies continue to churn out single-use plastic in quantities that outweigh the capacity of even high-income countries to manage and recycle,[29] and completely swamp low- and middle-income countries with limited resources for waste management.

> **I care about plastic pollution because we have one chance to change the way we are living. I want [Coca-Cola] to take responsibility for [their] plastic waste... I love Coke but recently I haven't been drinking it as I hate using plastic.**
>
> **FELICITY, AGE 10**

# INTRODUCTION

## RECYCLING VS REUSE

Most of the companies' commitments still focus predominantly on recycling. Collection and recycling are vital in the short and medium term while reusable and refillable alternatives are developed and mainstreamed. However, we believe that the main plank of the long-term response to the plastic crisis should be a switch away from single-use plastic and back to reusable and refillable alternatives. From refillable bottles to India's tiffin lunchbox system (see page 35), many of these approaches are already proven, while new methods (such as Algramo, page 34) are rapidly emerging.

**The reasons for preferring reuse to recycling are as follows:**

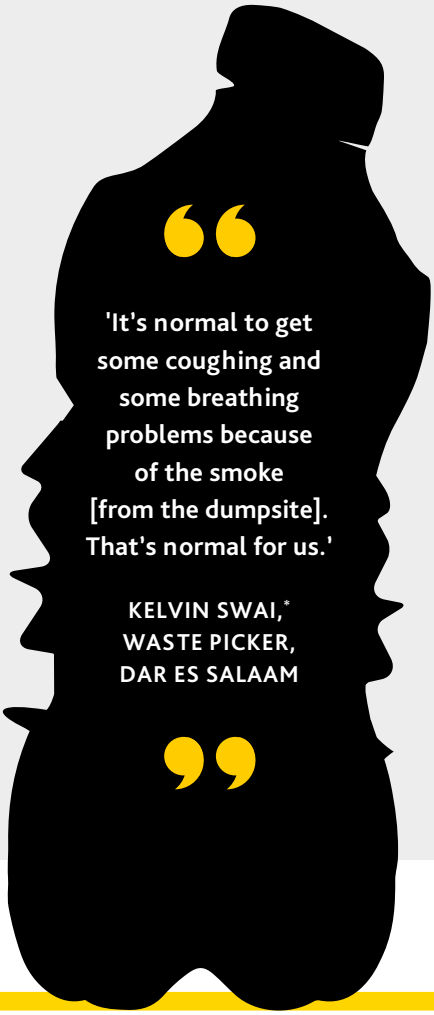
Reuse sits higher up the waste hierarchy[30] and therefore preserves more of the value and natural resources embedded in each bottle or box. By contrast, single-use plastic is typically downcycled into clothing, rope or upholstery. Once it has served this purpose, it often becomes waste again, and in many contexts will probably end up being burnt or dumped. This downcycling also maintains a continued need for virgin plastic, with the associated environmental implications. (Chemical recycling, which could potentially upcycle plastics, is still in its early stages of development and could raise new health concerns.)[31]

Synthetic materials such as those made from recycled plastic are one of the major sources of marine microfibre pollution. These tiny fibres find their way into the food chain, bringing with them any other pollutants that they have bonded with on their journey. These effects are poorly understood, but the precautionary principle suggests that we should be concerned. Constructing large amounts of plastic-to-fabric recycling capacity risks effectively locking in this microfibre pollution.

In addition to these environmental and health concerns, it is far from clear whether it would be possible from a technical and economic perspective to recycle an ever-growing amount of single-use plastic. Only 14 per cent of plastic packaging is collected for recycling annually,[32] and at present, even in high-income countries, the capacity to recycle is far lower than the amount of single-use PET consumed.

Instead, if we fail to switch to refillables and reusables, it is likely that we will see a much greater emphasis on incineration. Incineration is even further down the waste hierarchy than recycling, causes air pollution and climate change, and creates more demand for waste. It is not a cost-effective or safe solution and would be a disaster in many low- and middle-income countries,[33] where capacity to manage and regulate incinerators is low, and the potential for major pollution is therefore greatly increased.[34]

So while companies should take responsibility for the collection and recycling of their plastic (via Extended Producer Responsibility schemes, ideally set up in coordination with government), the emphasis should be on switching from single-use plastic to packaging strategies that are higher up the waste hierarchy. Humanity cannot recycle its way out of this problem.



**'It's normal to get some coughing and some breathing problems because of the smoke [from the dumpsite]. That's normal for us.'**

**KELVIN SWAI,* WASTE PICKER, DAR ES SALAAM**

*Name has been changed

## ARE PLANT-BASED PLASTICS THE ANSWER?

Three of the companies are promoting plant-based plastics as part of the answer to the plastic packaging pollution crisis. Nestlé and PepsiCo are part of the NaturALL Bottle Alliance,[35] while Coca-Cola has developed a PlantBottle technology.[36] Currently, the plant-based content of the bottles is a small percentage of the total. For example, Coca-Cola states that PlantBottles have up to 30 per cent plant-based material.[37]

However, in countries without adequate waste management systems and infrastructure, these bottles still become plastic pollution in the same way that fossil fuel-based plastic bottles do. Having some plant-based content does not affect the end-of-life fate of this plastic. It is still single-use, throwaway material.

While some plant-based plastics are compatible with conventional plastics (eg bio-based PET), many are not and increase the risk of disrupting the existing recycling supply chain. In particular, biodegradable plastics are typically not compatible with conventional plastics but are often difficult to distinguish and, as such, can significantly contaminate recycled plastics.

Plant-based plastics are made from plant material such as corn or sugar cane.[38] At least some of these plastics are made from plant residues.[39] However, according to Greenpeace: 'The majority of bio-based plastic is derived from agricultural crops, which compete with food crops, threatening food security and driving land use change and agricultural emissions.'[40]

If the use of plant-based content were to increase significantly, this would inevitably further impact land use change and have consequent impacts on emissions and food security.

The solution to the plastic pollution crisis is not to source throwaway packaging from plants. Rather, it is to switch to refillable and reusable packaging.

## NOT ALL PLASTIC IS PROBLEMATIC

It is important to acknowledge the benefits of some plastics. Plastic has played – and continues to play – a vital role in ensuring access to modern medicine. Plastic preserves and protects food, and so can play a role in reducing food waste. It has facilitated the development of many of our domestic household appliances, and has helped reduce energy costs by making products more lightweight.[41]

Plastic water sachets and bottles have also enabled some communities to access clean water. However, communities should not have to choose between access to clean water or overwhelming plastic pollution caused by empty water bottles and sachets.

The obvious longer-term solution is for governments and donors also to increase investment in water, sanitation and hygiene (WASH), which will mean people can access safe water without having to buy it in plastic sachets. However, even in contexts where this is not yet available, water can be delivered in refillable packaging.

**Photo:** Layton Thompson/Tearfund

CHAPTER 1

# COCA-COLA, NESTLÉ, PEPSICO AND UNILEVER'S PLASTIC POLLUTION FOOTPRINT

CHAPTER 1

# COCA-COLA, NESTLÉ, PEPSICO AND UNILEVER HAVE A PHENOMENAL REACH ACROSS THE GLOBE.

'More than 1.9 billion servings of our drinks are enjoyed in more than 200 countries each day.'

COCA-COLA [44]

'Our products reach more than 1 billion consumers every day across the world…'

NESTLÉ [45]

'We bring smiles to our consumers – currently more than 1 billion a day…'

PEPSICO [46]

'On any given day, 2.5 billion people use Unilever products…'

UNILEVER [47]

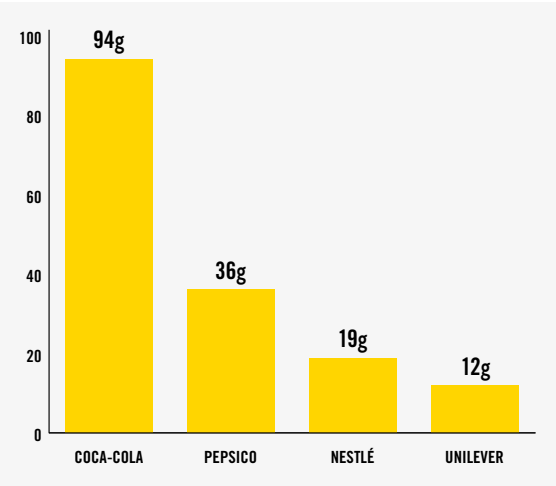
**The products of Nestlé and Unilever are sold in more than 190 countries. For Coca-Cola and PepsiCo, it's more than 200 countries. From the world's largest mega-cities to the smallest, most remote African villages, their products are consumed by billions of people, day after day. But many of these products, once consumed, leave a lasting footprint in the form of single-use plastic packaging waste.**

For decades, Coca-Cola and PepsiCo sold their drinks in returnable glass bottles. It is a completely feasible – a tried-and-tested – business model. In the 1970s, Coca-Cola's own research showed that no other packaging system could match returnable glass bottles on energy efficiency and reducing waste and pollution. However, in country after country, they have largely abandoned this approach in favour of cheaper, throwaway plastic.[48] [49] To do this in countries with little or no waste management capacity is irresponsible and immoral.

In 2019, for the first time ever, Coca-Cola, Nestlé, PepsiCo and Unilever published their global plastic footprint.[50] It is interesting to compare these figures with their global sales.

As the diagram below shows, **Coca-Cola uses more than twice as much plastic per dollar of sales than PepsiCo, and seven times more than Unilever. Coca-Cola appears as a significant outlier in the extent of its dependence on single-use plastics.**

**Grams of plastic per $ sales**




As part of our *Rubbish Campaign*, Tearfund has called for Coca-Cola, Nestlé, PepsiCo and Unilever to publicly disclose their plastic packaging on a country-by-country basis. This is needed so that we can see the scale of the problem and the progress that is being made in low- and middle-income countries. As of March 2020, all have failed to do so. We have therefore attempted to do this for them.

# CHAPTER 1

## CALCULATING THE PLASTIC FOOTPRINT

We have calculated a reasoned estimate of the plastic packaging used and sold by each company in six countries (China, India, the Philippines, Brazil, Mexico and Nigeria) spanning three continents.

To do this, we accessed published global and national sales data from a variety of sources[51] and the amounts of plastic packaging used globally by each company.[52] As well as sales, Coca-Cola also publishes figures for 'unit case volume' (a measure of sales volume) globally and for key markets.[53] This is a more accurate measure of plastic use across markets than sales, as plastic per unit case volume is more likely to be constant across different countries, whereas plastic per dollar earned is more variable.

Indeed, a comparison of Coca-Cola's unit case volume and revenue across regions shows that its plastic intensity in low- and middle-income countries is much greater than in high-income countries. (For example, North America accounts for 20 per cent of global unit case volume, but 37 per cent of its net revenue, while Latin America accounts for 27 per cent of unit case volume but only 12 per cent of net revenue.)[54]

We also asked the companies to provide their own data regarding sales vs volume. Unilever shared with us confidential data regarding its regional plastics footprint, which indicates that it uses a larger amount of plastic per Euro of sales in low- and middle-income countries than its global average, although to a lesser extent than Coca-Cola. We have therefore adjusted our calculations for PepsiCo, Nestlé and Unilever to account for this pattern.

As a separate factor, we have also taken into account the greater use of refillable delivery systems (glass bottles) for Coca-Cola and PepsiCo in some low- and middle-income countries compared to globally. This has enabled us to estimate, in tonnes, how much plastic each company uses and sells in each country every year.

We shared this methodology with each company in December 2019 to give them an opportunity to respond. PepsiCo said they did not have a point-of-view on our methodology but were looking forward to reading our study with interest. Coca-Cola and Unilever provided comments that we have taken on board (see Appendix 2). We had not heard back from Nestlé by the deadline, nor before this report went into production.

We also had the methodology independently reviewed by Resource Futures and the editor of UNEP's *Global Waste Management Outlook*, Professor David Wilson.

## CALCULATING THE PLASTIC POLLUTION FOOTPRINT

Low- and middle-income countries often lack waste management capacity. Huge amounts of waste remain uncollected, or are collected and then deposited at communal dumpsites where some of the waste is burnt or washed into oceans or river systems.

Once we have accounted for company-led recycling schemes, we use World Bank figures and other credible sources to calculate the amount of plastic appropriately dealt with by national waste management systems, thereby arriving at the remaining amount of plastic that is mismanaged. As a starting point, we use the World Bank categories 'open dump' and 'unaccounted for' to calculate mismanaged waste. This is a conservative assumption, as figures included in a further category of 'landfill unspecified' (rather than controlled landfill or sanitary landfill) may well include waste that is openly burnt – ie mismanaged. We then use other data and studies to refine this analysis (see the methodology in Appendix 2 for more details).

We then convert these figures from weight into volume. Converting the weight of mixed plastic waste to volume is not straightforward. Different types of plastics have different densities and therefore the conversion ratio differs between plastic types. It also differs depending on whether the plastic waste has been crushed or not.

To convert the weight of plastic waste to volume, we used the same ratio as that used by the Everyday Plastic report,[55] which converts plastic as it is thrown from the household, so before being mechanically crushed. In this report, 35kg of uncrushed plastic waste was equivalent to 1.5m³. We used the same ratio to convert kilograms into cubic metres.

**“A comparison of Coca-Cola's unit case volume and revenue across regions shows that its plastic intensity in low- and middle-income countries is much greater than in high-income countries”**

**We calculate that across all six countries, Coca-Cola, Nestlé, PepsiCo and Unilever are responsible for more than half a million tonnes of plastic pollution every year. This is enough to cover 83 football pitches every day (to a depth of 10cm). That's more than one football pitch every 20 minutes. This is the first time such estimates have ever been made. If all of the world's 178 low- and middle-income countries were included in our analysis, these figures would be much higher.**

## PLASTIC POLLUTION FOOTPRINT (THAT'S PLASTIC DUMPED OR BURNT) ACROSS 6 COUNTRIES...

- Coca-Cola's plastic pollution footprint is more than 200,000 tonnes per year, that's the equivalent of eight billion bottles,[56] enough to cover 33 football pitches every day.
- PepsiCo's plastic pollution footprint is 137,000 tonnes per year, enough to cover 22 football pitches every day.
- Nestlé's plastic pollution footprint is 95,000 tonnes per year, enough to cover more than 15 football pitches every day.
- Unilever's plastic pollution footprint is 70,000 tonnes per year, enough to cover more than 11 football pitches every day.[57]

Of the four companies, Coca-Cola emerges as having the biggest plastic pollution footprint: almost 50 per cent greater than PepsiCo, and more than Nestlé and Unilever combined.

### MEXICO
**PepsiCo's plastic pollution footprint is more than 59,000 tonnes per year, enough to cover almost 10 football pitches every day**

### NIGERIA
**Coca-Cola's plastic pollution footprint is more than 15,500 tonnes per year, more than 2.5 football pitches**

### INDIA
**Unilever's plastic pollution footprint is more than 32,000 tonnes per year, enough to cover 5 football pitches every day**

### PHILIPPINES
**Nestlé's plastic pollution footprint is more than 35,000 tonnes per year, enough to cover almost 6 football pitches every day**

OUR FULL COUNTRY-BY-COUNTRY FINDINGS ARE IN APPENDIX 3

CHAPTER 2

# PLASTIC CRISIS, CLIMATE CRISIS

Jumana from Dabkere, Chad, collects grass seeds to eat from the dry ground. Climate change is hitting Chad hard with erratic and exceptionally high temperatures and a lack of rainfall.
**Photo:** Peter Caton/Tearfund

CHAPTER 2

# OUR WORLD IS FACING A CLIMATE EMERGENCY.

'The Coca-Cola System is... striving to reduce emissions... Recognizing the role we play as an industry leader, we have regularly opted for setting demanding targets to drive fundamental change.'

COCA-COLA [124]

'As a major global business, it's crucial that we provide leadership on climate change.'

NESTLÉ [125]

'Climate change is important to the future of our company, customers, consumers and our shared world.'

PEPSICO [126]

'Climate change is one of the greatest challenges we face, as a society and as a business.'

UNILEVER [127]

**Alarmingly, current country pledges to reduce greenhouse gas (GHG) emissions put us on course for a 3.2°C future by the end of the century.[58] Every day, Tearfund works with farmers facing more erratic rainfall, with city dwellers who are more exposed to flooding, and with school children who have to cope with scorching temperatures.**

The huge wildfires and frequent floods of 2019 are just two signs of the unfolding climate crisis and a stark reminder of the need for greater ambition towards a 'net-zero' emissions future. We need to reverse the rising global emissions trend and urgently make the necessary deep cuts in emissions to give us any chance of limiting warming to 1.5°C.

Coca-Cola, Nestlé, PepsiCo and Unilever have all made ambitious commitments to halt or reduce their contribution to climate change. For example, Unilever has promised to halve the climate footprint of its products by 2030,[59] while Coca-Cola promised to cut the footprint of each drink by a quarter by 2020. (As of 2018, Coca-Cola claimed a 21 per cent reduction against 2010 levels.)[60] With the devastating impacts of the climate emergency already felt across the world, the consensus for action has never been stronger.

**Yet these commitments sit uneasily alongside these four companies' dependence on throwaway plastic.**

Throwaway plastic is intrinsically connected to the climate crisis. Plastic is made from fossil fuels, and its use thereby supports the extraction of oil and gas, with associated emissions. Its manufacture is both energy-intensive and emissions-intensive, releasing GHGs directly through an industrial process called cracking, and through the energy this process requires. Coca-Cola suggests that 25 to 30 per cent of the emissions along its whole supply chain are associated with packaging.[61]

However, the problem is even more serious than this, because of the emissions caused by plastic after it has been thrown away. Burning is particularly concerning since plastic is, after all, made from a fossil fuel. There is also evidence to suggest that plastic left in the environment gradually breaks down into methane and ethylene, further increasing plastic's emissions footprint.[62]

Unfortunately, emissions from open burning in low- and middle-income countries have been largely ignored until now, and new academic analysis suggests that they could be highly significant. **Here, we present the first estimates of these emissions for each company.** These estimates are intended to give an indication of the scale of the problem. Following on from analysis in Chapter 1, they are based on calculations for just six of the world's 178 low- and middle-income countries. If all were included, the totals would be significantly higher.

CHAPTER 2

# COCA-COLA EMERGES AS BY FAR THE WORST POLLUTER OF THE FOUR, WITH EMISSIONS GREATER THAN THE OTHER THREE COMBINED.

This is despite Coca-Cola being the smallest company of the four in terms of sales revenue, and is largely because they use so much plastic per dollar of sales: more than twice as much as PepsiCo, and seven times as much as Unilever.[63] In light of this, it is alarming that Coca-Cola have resisted calls to reduce their dependence on single-use plastic.

**Burning of Coca-Cola's plastic in these six countries creates emissions equivalent to 2.5 million tonnes of carbon dioxide. That's the same as three-quarters of their global transport and distribution emissions. The amount of plastic that is burnt is equivalent to 4.8 billion bottles each year.**

**All together, across the six countries, 4.6 million tonnes of carbon dioxide equivalent emissions are produced from the open burning of Coca-Cola, Nestlé, PepsiCo and Unilever's plastic pollution. Preventing these emissions would equate to taking 2 million cars off the UK's roads.**

At present, the four companies make little or no mention of emissions from disposal of their products or packaging in their climate change commitments. Unilever estimates that less than one per cent of its total emissions arise from disposal of its products or packaging,[64] and PepsiCo just 1.7 per cent.[65] Coca-Cola does not publish separate figures for emissions from end-of-life disposal of its packaging[66] and Nestlé's website and sustainability reports rarely mention emissions down its supply chain.

A waste picker holds a Coca-Cola bottle at an open dumpsite in Dar es Salaam, Tanzania.
**Photo:** Daniel Msirikale/Tearfund

## CHAPTER 2

### BLACK CARBON

Emissions from open burning in backyards, streets and dumps are significant because of one particularly powerful pollutant: black carbon. Black carbon is a short-lived climate pollutant that remains in the atmosphere for just one or two weeks, but has a warming effect so powerful that it heats the globe 2,200 times more than an equivalent amount of carbon dioxide.[67] Its short-lived nature strengthens the case for control, since efforts to reduce emissions would have immediate benefits for the climate.

Emissions of black carbon from open burning have been a cause for concern among waste management experts for several years. In 2015, the United Nations Environment Programme's (UNEP's) *Global Waste Management Outlook* argued that 'control of... black carbon from open burning requires urgent attention. Obtaining better data on black carbon emissions from open burning is a key priority.'[68] However, emissions of black carbon are still not included in most carbon footprints for waste, including those calculated by our four companies.

Our new estimates of GHG emissions from open burning of plastics are produced by combining data on mismanaged plastics footprints, allowing for company and national collection schemes (from Chapter 1), with guidance from the Intergovernmental Panel on Climate Change (IPCC) for the proportion of mismanaged waste that is burnt.[69] We also use new academic data for emissions factors quantifying the amount of black carbon (and carbon dioxide) produced by open burning of different types of plastic – PET (commonly used to produce plastic bottles and sachets), HDPE (used to produce rigid cartons) and LDPE (a flexible plastic often used alongside PET in sachets). We also account for other plastics as described in Appendix 2, where we also fully set out our methodology. Our approach has been independently reviewed by the two lead authors of the paper we rely on for our emissions factors.

The results for each company in each country are shown in Appendix 3.

### COKE PRODUCE THE MOST SMOKE

Coca-Cola emerges as by far the worst polluter of the four, with emissions greater than the other three combined. This is the case even though they are the smallest company of the four. This is for two principal reasons:

- They use the most plastic. As we highlight in Chapter 1, per dollar of sales, Coca-Cola uses more than twice as much plastic as PepsiCo, and seven times more than Unilever.
- They are heavily reliant on a type of plastic called PET. This produces more black carbon when it's burnt than other types of plastic packaging such as HDPE and LDPE.

In light of this, it is alarming that Coca-Cola has resisted calls to reduce its dependence on single-use plastic. While others such as Unilever – who are already using much less plastic per dollar of sales – have made commitments to reduce their overall use of plastics by a sixth, and reduce virgin plastic by half, Coca-Cola shows no signs of making any such commitment.[70]

**THE AMOUNT OF COCA-COLA PLASTIC THAT IS BURNT IS EQUIVALENT TO 4.8 BILLION BOTTLES EACH YEAR**

Coca-Cola justifies this stance by suggesting that it can collect and recycle the equivalent of every item of plastic that it produces. This is an ambition that we support, but its 2030 deadline is a long way off, and it is currently moving in the wrong direction. Its (global) collection rate (or percentage of bottles or cans it 'refilled or helped recover' equivalent to what it introduced into the marketplace) of all packaging formats was lower in 2018 (58 per cent) than in 2014 (61 per cent), according to its *2018 Business and Sustainability Report*.[71] For plastic specifically, its collection rate was just 52 per cent of non-returnable PET.[72]

This underlines the importance of switching from single-use to refillable and reusable alternatives that won't be burnt. It also makes clear that achieving 100 per cent plastic collection will be much easier in a world where total plastic use is falling, not rising.

CHAPTER 3

# PLASTIC CRISIS, HEALTH CRISIS

## A FOCUS ON TANZANIA

'Coca-Cola Hellenic cares about the health of its consumers.'

COCA-COLA HELLENIC [129]

'Nestlé's purpose is enhancing quality of life and contributing to a healthier future. We want to help shape a better and healthier world. We also want to inspire people to live healthier lives.'

NESTLÉ [130]

'PepsiCo's Performance with Purpose strategy aims to help create a healthier relationship between people and food. This represents not only part of our strategy for a sustainable business, but we believe it will also help to address some of the world's public health challenges.'

PEPSICO [128]

'By 2020 we will help more than a billion people to improve their health and hygiene. This will help reduce the incidence of life-threatening diseases like diarrhoea.'

UNILEVER [131]

A waste picker sorts waste on a smouldering open dumpsite in Tanzania.
**Photo:** Daniel Msirikale/Tearfund

CHAPTER 3

# COCA-COLA, NESTLÉ, PEPSICO AND UNILEVER ALL CLAIM TO BE CONCERNED ABOUT THE HEALTH OF THEIR CONSUMERS.

**However, their huge plastic pollution footprint across the globe contributes to a waste crisis that directly harms people's health.**

In *No time to waste*, we presented evidence to suggest that between 400,000 and 1 million people die each year in low- and middle-income countries because of diseases related to plastic and other mismanaged waste. At the upper end, that is one person every 30 seconds.[73]

In this chapter we look at the reality of the impact of plastic pollution on the health and lives of a number of people living in Dar es Salaam, Tanzania. Tanzania is one of the poorest countries in the world, in a region where the total quantity of waste generated is expected to more than triple by 2050.[74]

**“There are different types of problems here because of the dump. Especially when the fire comes, some people around here get a heart attack, some get asthma. People often get asthma because of the smoke. Sometimes pneumonia, cough, flu… We also have malaria”**

IRENE KANYUGWA,
NURSE MIDWIFE

**Mismanaged waste, including plastic pollution, harms people's health in low- and middle-income countries in several ways:[75]**

- Mismanaged waste is openly burnt, releasing pollutants that increase the risk of diseases such as respiratory ailments, skin and eye diseases, nausea and headaches, and damage to the reproductive and nervous systems, and heart disease and cancer.
- Living among mismanaged waste doubles the incidence of diarrhoeal disease. Diarrhoeal disease is the second leading cause of death in children under five years old globally.
- Mismanaged waste creates a breeding ground for disease-carrying flies, mosquitoes and vermin. Mosquitoes spread malaria and dengue. Flies carry and transmit a number of diseases such as typhoid fever and tuberculosis, while rats spread rabies and plague.
- Mismanaged waste blocks waterways and drains, which causes flooding, resulting in waterborne diseases and death by drowning.

As a low-income country, many of these diseases are common in Tanzania (in part because of mismanaged waste). For example, respiratory diseases accounted for 13 per cent of all causes of hospital deaths in Tanzania between 2006 and 2015,[76] and respiratory tract infections were the second highest cause of death in 2017.[77] Diarrhoea accounted for eight per cent of all under-five deaths in 2016.[78] About 10 to 12 million people in Tanzania contract malaria every year and 80,000 of them die, the majority children.[79] The cause of these diseases are many and varied, but it is clear that the plastics crisis is harming the health of some of the world's poorest people.

## CHAPTER 3


## COCA-COLA, NESTLÉ, PEPSICO AND UNILEVER IN TANZANIA

Coca-Cola and PepsiCo have a strong presence in Tanzania. In Dar es Salaam, their products are marketed on billboards, shop fronts, trucks, lorries and buses, and on TV and radio channels. Their drinks are consumed by people of all ages, from all socio-economic backgrounds, in workplaces, restaurants, homes and on the go.

Coca-Cola Kwanza, one of Coca-Cola's bottlers in Tanzania, sold 30 million 'unit cases' in 2018, with a turnover of USD 83 million.[80] Coca-Cola has two other bottlers in Tanzania: Nyanza Bottling Company,[81] and Bonite Bottlers Limited[82] who produce Coca-Cola's Kilimanjaro Pure Drinking Water, the leading water brand in Tanzania.[83] These three bottlers distribute millions of plastic bottles in the country year on year, a trend that looks set to increase significantly. According to Bonite Bottlers Limited's website, 'In order to meet its growing demand while maintaining its international packaging standards, IPP [who own Bonite Bottlers] is currently installing a cutting edge PET bottle blowing / filling line which will triple its bottling capacity.'

We have not been able to find sales figures for PepsiCo in Tanzania, despite asking the company for this information. However, it is clearly a popular and visible brand, and its website boasts 'exponential growth... achieved year on year'.[84]

Nestlé and Unilever are not as visible as Coca-Cola and PepsiCo at first glance, but their presence is still significant. Nestlé's Nido milk powder and Unilever's OMO laundry soap, for example, are household names. Nestlé and Unilever's sales data for Tanzania was unobtainable.

As Tanzania is a low-income country, the World Bank estimates that 93 per cent of household waste there is mismanaged – ie subject to open dumping or burning.[85] Despite some collection and recycling of plastic bottles, plastic pollution is a huge part of the waste problem in Tanzania, a problem to which the four companies are contributing.

Dar es Salaam is Tanzania's largest city. There is only one authorized site in Dar es Salaam for the disposal of solid non-hazardous and hazardous wastes, the Pugu-Kinyamwezi dumpsite.[86] It was originally planned as a sanitary landfill, but 'due to weak governance and financial, among many other constraints, it has operated since inception as an open dumpsite...'[87]

A baseline report written for the World Bank in 2012 describes the site in this way: 'The site is operated as an open dump with wastes scattered across the 65 hectares. No cover material was available on site or was being applied on a daily or even monthly basis. Compaction was limited. The bulldozer on the site was simply spreading the wastes after it had been picked over by waste pickers. Open fires were burning across the site.'[88] More recent research papers from 2017 and 2019 show this still to be the case.[89] And our case study below (Royda Joseph) confirms that open fires still burn across the site.

Only 40 per cent of solid waste generated in the city is collected.[90] Of the collected waste, 30–40 per cent is disposed of at Pugu-Kinyamwezi.

Products from all four companies can be seen in waste dumped in Dar es Salaam.

This waste crisis impacts the lives and health of people living in poverty in Tanzania in significant ways.

**Above:** All four companies market and sell their plastic-packaged products in Tanzania.
**Photos:** Daniel Msirikale/Tearfund

## BEHIND EVERY STATISTIC OF THE PLASTIC POLLUTION CRISIS, THERE ARE REAL PEOPLE.

Royda Joseph is 32 years old. She has three children and lives with her family in a community situated next to the Pugu-Kinyamwezi rubbish dump. The dump is frequently on fire. It is very dusty, and litter – including plastic – is spread throughout the community, attracting a huge amount of flies.

'The dump is on fire every two days. Sometimes, when it is on fire, the smoke is so dark and huge that you can't see the person in front of you or the house next to you. Because of that smoke, I get breathing problems and coughing, and eye problems too. The kids also get a lot of breathing problems: they cough a lot.

'When it is really bad, there is no way that you can deal with it without going to the hospital.

'The smoke and the fire come when the weather is very dry and the gases are coming out of the fire… When the dump is on fire, it can take 1–2 hours until they call the fire brigade to come here and try to stop it. It is that bad. Sometimes it can take 2–3 hours because of the traffic.'

The smoke is sometimes so thick that Royda needs to leave her home. 'Many times when the dump is on fire and really bad, when the smoke is so heavy, I shift to my relatives for a time,' she says. 'When it is so bad that you can't see what is in front or behind…'

Royda is concerned for her children's future: 'I am worried about my children's health because when it is very dry, the smoke always comes. I am sure in the long run they will develop health complications.'

> **"The dump is on fire every two days… Because of that smoke I get breathing problems and coughing…"**

Royda Joseph with her son Victor
**Photo:** Daniel Msirikale/Tearfund

## CHAPTER 3

# TABATA IS IN THE ILALA DISTRICT OF DAR ES SALAAM. HERE WE HEAR FROM THREE RESIDENTS OF TABATA ABOUT HOW PLASTIC POLLUTION IMPACTS THEM AND THEIR FAMILIES.

**Miriam Abdalah* is 38 years old and has five children. She earns a living by baking and selling small cakes. Her house is located next to the Msimbazi River.**

Plastic bags, sachets, tubs and bottles line the banks of the river. On the other side of the Msimbazi lies a disused waste dump. New waste is no longer dumped here, but the waste of previous years remains. Particularly visible are plastic water sachets. These were banned in Tanzania in 2009, but ten years on, they remain, and according to some studies, it could be thousands of years before they decompose.[91] Other sachets are still a popular choice for companies in Tanzania, particularly multi-layered ones used for laundry powder such as OMO and other cleaning products.

Miriam pays for waste collection, but it's an unreliable service and so she often has to dispose of her rubbish herself. Like countless others in Tanzania without adequate waste collection and disposal, Miriam sometimes has to resort to burning plastic waste: 'When I finish using it, I sometimes just throw it, sometimes I burn it, I use it to make fire, I burn it in the charcoal, I use the sachets for lighting in the cooking.'

However, she immediately feels the impact. 'When I burn the plastic to light the fire, there is a choking smell that comes and it will affect us sometimes in our lungs and we get a bit of a cough.'

It's not only Miriam who suffers. Her children also get stomach upsets and fevers. Miriam blames the plastic waste: 'The plastic containers get full of water, the water keeps the mosquitoes so they come much in the surrounding areas and then kids can get fever and other diseases.'

Without health insurance Miriam has to use her own money to cover her medical expenses – for both the diagnosis of the illness, and the treatment. Even just an initial visit with tests to diagnose the illness costs 10,000 Tanzanian shillings (equivalent to around 70% of what an average household would have to live on each day[92]), money she would otherwise spend on ingredients for her business. This directly impacts the amount of food she is able to buy for her family.

> **"When I burn the plastic to light the fire, there is a choking smell that comes and it will affect us sometimes in our lungs and we get a bit of a cough"**

Miriam has a clear message for the companies responsible for the plastic waste: 'I think the companies should find another way so that they can reduce the plastics in the community. If they come up with a new innovation, it would be useful for the environment and the people living around in the community... I would be very happy if we could use reusable [containers] because it would be easier for us to get more and our environment would be very clean.'

**Photos:** Daniel Msirikale/Tearfund

*Names have been changed

## CHAPTER 3

**Pascal Oswardi also lives in Tabata. He works collecting sand from the river to be used by building companies.**

Like Miriam, Pascal and his wife use plastic sachets to light charcoal for cooking. He describes the way plastic is affecting his community: 'Plastic is a problem around here. We have so many plastics around us and especially around the river when the rains are heavy…'

He describes the health problems affecting his community. 'The most common diseases that we get are typhoid or dysentery – the stomach problems. Children get diarrhoea.'

> **“Plastic is a problem around here. We have so many plastics around us and especially around the river when the rains are heavy…”**

He feels that the companies responsible for the plastic should be doing more. 'I think they should really reduce completely the plastics so that we can have a better living environment, protect our children from being sick and the families and also keep the area clean and neat without all these plastics. So if they could reduce or come up with a new way of packaging, that would be good… I am ready to use refillable products because they would be easy to use and also protect the environment.'

**Agness Zakayo*, is 47 years old, and has lived in Tabata for 11 years. She has two children.**

She describes the changes she's seen in her community since moving here: 'The plastic use is increasing year after year. As I stay here, I can see the difference… Ten years back, there weren't many bottles, especially bottled water, plastic bottled sodas: it wasn't much. But now everything has increased. People have increased, the kiosks have increased. And people using the bottled water, bottled sodas – plastic usage has gone up compared to where we started ten years ago… The increase is really bad and people just throw the bottles and the plastic things just outside and in the river.'

Agness also burns plastic as a lighting fuel for charcoal. She describes the impact. 'When we burn it, we all get the choking smell from the smoke, so you get a bit of coughing like something choking in your throat. So when you use it continuously, you get some effects sometimes.

'If I met the Coca-Cola manager, I would tell him that using plastic bottles is dangerous because it pollutes the environment… I would be very happy to use reusable products because it would be helpful and good for the environment and that would be useful for us.'

Behind every statistic of the plastic pollution crisis, there are real people. People such as Royda, Miriam, Pascal and Agness, whose lives and health are being harmed by mismanaged waste. None of these stories of illness and suffering can be directly attributed to any of the four companies. However, the plastic pollution footprint of the four companies in Tanzania is contributing to a waste crisis that is severely harming people's health and well-being. If the companies want to truly benefit global health, as their reports and websites suggest, they need to reduce their dependence on single-use, throwaway plastic.

CHAPTER 4

# THE DEMAND FOR CHANGE

**In correspondence with Tearfund, Coca-Cola, Nestlé, PepsiCo and Unilever have accepted that they have a responsibility or a significant responsibility for plastic pollution. Throughout this report we have demonstrated that the moral case for ambitious and swift action to reduce plastic footprints is even stronger than previously thought in low- and middle-income countries.**

In this chapter we explore the rapidly expanding global portfolio of legislation on single-use plastics, the increasingly vocal demands of consumers and citizens, and the disruptive business models challenging throwaway packaging. Despite the challenges that many low- and middle-income countries face when implementing legislation to limit single-use plastics, there is compelling evidence of their concerns regarding plastics, with widespread legislation being adopted across the world and countless examples of communities mobilising to take action. This is a compelling reason from a business perspective for companies to deliver on their words and create 'a world without waste' [93] by 'winning with purpose'[94] and moving 'beyond the bottle'.[95]

## CHAPTER 4

## GOVERNMENTS ARE LEGISLATING

As we argued in *No time to waste*, voluntary action is not enough. Low- and middle-income country governments will need to legislate to limit or ban single-use plastics and to introduce mandatory Extended Producer Responsibility (EPR) systems. EPR requires companies to take responsibility for collecting the waste they generate and pay the full costs of the environmental impact of plastic packaging, including disposal.

Increasingly, governments are legislating along these lines. Stakeholders, including companies, should work together to introduce well designed legislation that incentivises genuinely sustainable alternatives, and ensures people in poverty aren't losing out. Companies should welcome and support the levelling of the playing field.

Legislators around the world set their sights initially on single-use plastic bags. As of July 2018, 127 countries globally had brought in some form of legislation to 'address the problem of single-use plastic bags'. This includes some of the poorest countries in the world such as Zimbabwe, Uganda, Madagascar, Bangladesh and Haiti. Of those countries which have taken action, there are 37 in Africa, 32 in Asia and 17 in Latin America and the Caribbean.[96] And more are being added every year.

Africa has also gone the furthest in its legislative ambitions, with more countries (34) than in any other region introducing legislation to limit the production, importation and retail distribution of single-use plastic bags.[97] Some countries have implemented bans successfully, with Rwanda and Kenya being among the most successful. Other African countries have had legal challenges and difficulties in enforcing bans.

Increasing numbers of countries are also banning other types of single-use plastics (27) or taxing them (29). Following the success of Kenya's single-use plastic bag ban, the president has vowed to introduce a complete ban on single-use plastic by 2020.[98] In 2019, Rwanda banned all types of single-use plastics, making it illegal to import, manufacture, use and sell them.[99] It may only be a matter of time before other African countries follow suit and seek to ban other types of single-use plastic.

The scourge of plastic pollution in China has led its government to announce that it will phase out single-use plastic straws, bags and cutlery by 2025.[100] The Chinese province of Hainan, which currently uses about 120,000 tonnes of plastic a year, is intending to go further, implementing a ban on all non-biodegradable single-use plastics by 2025.[101]

While in low- and middle-income countries governments are acting to reduce the mountains of plastic piling up, there are reports of companies lobbying against mandatory measures which would threaten their profit margins.

India is a huge market for Coca-Cola, Nestlé, PepsiCo and Unilever, but plastic pollution there is also completely out of control. The Indian government at national and state level has made clear its concern over the scale of plastic pollution and has made several attempts, some successful, some not, to outlaw single-use plastic. In August 2019, the prime minister of India announced his intention to introduce a ban on many types of single-use plastics[102] but then several months later postponed implementation.[103] An Indian news website reported that Hindustan Unilever, PepsiCo and Coca-Cola had met with the Indian government to express their concerns with the proposal.[104]

In Maharashtra state in India, the government introduced a ban on many single-use items in 2018, including straws, bags, cups, plates and small PET bottles. Exempted items included PET bottles containing over 200ml, and multilayered sachets, ensuring all the big MNCs could continue to sell their products unaffected. Reuters and Standard and Poors Global reported that Coca-Cola and PepsiCo (as well as Amazon and H&M) had lobbied against the single-use plastic ban in the Indian state and had been successful in relaxing the proposals.[105] And meanwhile the plastic waste mountains will only continue to grow, pressuring the government to reconsider national legislation.

As well as seeking to limit the manufacturing and selling of single-use plastics, the Indian government wants to improve existing EPR legislation. The aim is that new guidelines will ensure sub-national government bodies can more effectively implement existing legislation.[106] However, in a meeting held in India this year to discuss these proposals, as we know from a source who was present, Coca-Cola clearly expressed that it was not supportive of mandatory EPR, favouring a voluntary EPR approach instead.

It is vital that governments incorporate measures to ensure the poorest and most vulnerable groups in society are not negatively affected by single-use plastic legislation. They must also take steps actively to support genuinely sustainable alternatives and industries for those employed in the plastics sector. Rather than spending their money on lobbying against inevitable legislative change, it makes more business sense for companies to invest in piloting and quickly scaling up refill and reuse delivery models that will reduce plastic pollution and make their business future-proof.

## CHAPTER 4

### CITIZENS WANT CHANGE

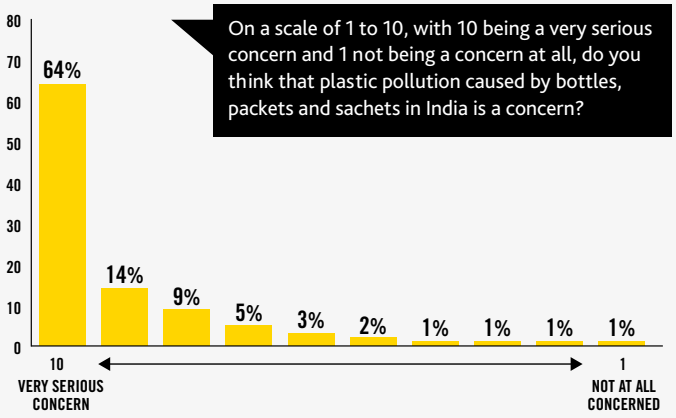
It is not only in the UK and Europe that citizens and customers are concerned about plastic pollution and agitating for change. By way of defence for their reliance on single-use plastic, companies have argued that customers want these products in this format. However, our research shows this is not the case in key markets.

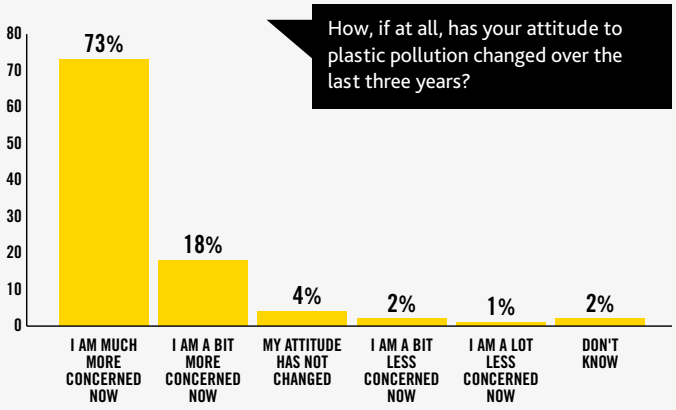
In India, one of the biggest markets for all four companies, we found a huge and growing concern about plastic pollution and a massive appetite for change.

A new survey of 2,000 adults aged between 18 and 64 in India conducted for Tearfund by Savanta ComRes from 10 to 18 December 2019 found that 86 per cent of adults rated plastic pollution as a serious or very serious concern.[107] Of those surveyed 91 per cent say they are more concerned about plastic pollution than they were three years ago and nine in ten respondents say they would be likely (68 per cent say 'very likely') to buy their products in refillable and reusable containers if it led to significantly less plastic pollution in their community and the cost was the same.

In response to a question about which brands people saw most frequently as litter, Coca-Cola and PepsiCo score the highest. This is in line with the 2019 global brand audit from Break Free from Plastic which also found Coca-Cola and PepsiCo, as well as Nestlé, to be the top three.[108]

**Savanta ComRes survey on attitudes to plastic, India**




## CHAPTER 4


Demanding change outside the Unilever headquarters in the UK as part of Tearfund's *Rubbish Campaign*.
**Photo:** Wilde Fry/Tearfund

A 2019 international survey of customer attitudes (unfortunately excluding Africa) showed that consumers believe manufacturers have the most responsibility to act on plastic waste in the environment and should take the lead. Those surveyed asserted that 'making changes to account for this is clearly a matter of "when" rather than "if" for all businesses'.[109] Only 12 per cent of consumers could name one company doing a good job on this. This is a sad indictment as well as an opportunity.

The majority of people surveyed globally were taking regular action to reduce their use of single-use plastic[110] such as taking a reusable bag or water bottle out with them, although the reusable water bottle was less popular in countries where access to potable water is lower. The survey suggests that most people will choose a non-single-use plastic option when they can. However, if it is too inconvenient, they usually won't. This suggests that the system needs to change to enable it to become a more convenient option. Manufacturers and retailers need to step up and innovate, confident that primarily it is the right thing to do but also there is demand for change.[111]

A separate but less comprehensive survey found that in China, an important market for all four companies, an enormous 93 per cent of Chinese customers are seeking to buy fewer single-use plastics.[112]

In the Philippines, a 2020 survey commissioned by GAIA found that seven out of ten Filipinos favour a ban on single-use plastics and six out of ten would use refillable and reusable containers for 'food condiments' (such as oil).[113]

**“The majority of people surveyed globally were taking regular action to reduce their use of single-use plastic such as taking a reusable bag or water bottle out with them, although the reusable water bottle was less popular in countries where access to portable water is lower”**

# CHAPTER 4

## SUSTAINABLE MODELS ARE [RE]EMERGING

Many organisations, ranging from Greenpeace[114] to the Ellen MacArthur Foundation,[115] have already made compelling cases for the need for companies to place much more attention on new delivery systems such as reuse and refill (see pages 14 and 15).

Some companies, such as Nestlé, which recently opened its Institute of Packaging Science,[116] are hoping alternative materials will make the difference. Alternative materials include paper, bioplastics, compostable and biodegradable packaging. They do have a role to play, but each alternative material presents its own challenges. There are particular concerns with introducing novel materials into waste systems in low-income and middle-income countries where waste management systems cannot deal with existing waste streams. Thus, alternative materials are not a panacea and they should not be a distraction from packaging-less models (sometimes referred to as 'naked packaging') and reuse and refill models.

**“Until the last couple of decades, many bottles sold in low- and middle-income countries were returnable. Companies have moved away from this, to the detriment of the environment and people living in poverty”**

As we highlighted in Chapter 1, until the last couple of decades, many bottles sold in low- and middle-income countries were returnable. Companies have moved away from this, to the detriment of the environment and people living in poverty. As a result, MNC reuse and refill models, especially in low- and middle-income countries, are too few and far between. Compared to recycling and alternative materials, companies have spent little time and money really investing in pilots and scaling up reuse and refill in low- and middle-income countries. However, there are a few very positive cases that show what can be achieved when this solution is taken seriously, including some examples from Coca-Cola, Nestlé and Unilever.

Refillable glass bottles such as these are being replaced by single-use plastic bottles in many countries. **Photo:** iStockphoto.com

At the time of writing, Unilever has made the most ambitious commitments to reduce its reliance on single-use plastic packaging through reducing its use of virgin plastic by 50 per cent by 2025 and its total use of plastic by 16 per cent. Encouragingly, they have said that they are 'determined to reduce our use of single-use plastics by investing in alternative models of consumption which focus on refills and reusable packaging. Our internal framework recognises the importance of recycling but we know it's not the only solution. In some cases, “no plastic” may be the best solution – and this is one of the most exciting parts of our strategy for plastic. As a business we have already conducted a number of dispensing trials with our retail partners, however, we are still working to overcome some of the key barriers linked to consumer behaviour, commercial viability and scale.'[117] They have also said they will explore plastic-free solutions such as naked products and alternative materials (with sustainability provisos).

Six years ago, in the poorest neighbourhoods in Chile, Algramo, a small start-up, began selling food and household items by the gram from dispensers in mobile units. Customers have to buy one of their containers initially, but then they can choose how much they get to take home. As the co-founder José Manuel Moller explained, 'No big brand tells someone how much to put in the container, and consumers get credits and discounts toward future purchases loaded onto a mobile app with information linked to an RFID chip on the container. You can even drop off a container for refill and pick it up later.'[118] Unilever is now partnering with Algramo to deliver some goods, such as its brand OMO, in Chile.

It is vital that as Unilever establishes its leadership in this area, delivers on this promise to move away from single-use plastic and becomes even more ambitious – and that other companies follow its lead.

## CHAPTER 4

Reusable tiffin boxes are delivered all over India.
**Photo:** Joe Zachs from Pune, India/Wikimedia Commons

Coca-Cola Brazil is investing over USD 23 million into rebooting a returnable PET bottle system.[119] Customers return empty bottles to the store and receive a discount on a newly filled bottle; each bottle is refilled 25 times before being recycled, avoiding 200 million new PET bottles being introduced. It begs the question, 'Why isn't this model being adopted elsewhere?'

Of course, many so-called new models are actually old ones with modifications. Companies looking to develop genuinely sustainable packaging options could learn a lot from local and traditional approaches. The tiffin box in India is one such example. In some cities, Indian fast food, including snacks, afternoon tea and main meals, has been reliably delivered in reusable tiffin boxes for over 100 years and the system continues to be very popular all over India.[120] For example, in the busy streets of Mumbai, every day cyclists deliver 200,000 meals on time by bike to busy workers who work far from home. Those operating tiffin businesses have a very high success rate of 99.9 per cent due to their 'strong values of punctuality, teamwork, honesty and sincerity'.[121]

There are lots of different types of refill and reuse[122] and no one size fits all; models have to be tried and tested according to local conditions and cultures. There need to be clear incentives and a good understanding of the habits and lives of the customers being reached. A recent Unilever shampoo refill pilot in the Philippines failed because it was targeting low-income groups who usually buy the shampoo in single-use sachets, but it placed the refill dispensers at upmarket Manila shopping malls that these groups rarely visit.[123]

> **“Companies looking to develop genuinely sustainable packaging options could learn a lot from local and traditional approaches”**

CHAPTER 5

# CONCLUSION AND RECOMMENDATIONS

**THE CHALLENGE IS CLEAR:**
**COMPANIES NEED TO STEP UP THE PACE AND SCALE OF THEIR ACTION TO ADDRESS THE PLASTIC POLLUTION CRISIS.**

**THE BURNING QUESTION IS:**
**WILL THEY ACCEPT THIS CHALLENGE, AND TAKE THE BOLD AND AMBITIOUS STEPS NECESSARY?**

CHAPTER 5

# THIS REPORT HAS OUTLINED A CLEAR CHALLENGE TO COCA-COLA, NESTLÉ, PEPSICO AND UNILEVER. IT HAS PRESENTED EVIDENCE OF THE SIGNIFICANT AMOUNTS OF PLASTIC POLLUTION EACH COMPANY IS RESPONSIBLE FOR...

This report has estimated the shocking GHG emissions released by the burning of a proportion of each companies' plastic, emissions that are their responsibility but are not yet included in their carbon footprint calculations. And it has presented harrowing stories of the impact of plastic pollution on the lives and health of poor communities.

The companies cannot recycle their way out of this crisis. Governments are legislating to restrict single-use plastic packaging and mounting public pressure is likely to overwhelm corporate objections. At the time of writing, only Unilever shows real signs of being willing to transform its business model. We argue now that if all of these multinationals want to have longevity, they need to change. They need to invest and innovate, and as the world's leading brands and companies, they need to lead.

Coca-Cola, Nestlé, PepsiCo and Unilever all claim to be concerned about global health and about climate change. Their websites and annual reports make grand commitments to contribute to better health and environmental goals. However, as this report has established, in order to fulfil these climate and health ambitions, companies need to reduce their plastic footprint and switch to refillable and reusable packaging.

**We've posed the burning question: companies must now give their answer, and take action.**

**As called for by Tearfund's *Rubbish Campaign*, Coca-Cola, PepsiCo, Nestlé and Unilever should:**

**REPORT,** by 2020, on the number of units and volume[132] of single-use plastic products they use and sell in each country

**REDUCE** this amount by half, country by country, by 2025, and instead use environmentally sustainable delivery methods such as refillable or reusable containers

**RECYCLE** the single-use plastics they sell in low- and middle-income countries, ensuring that by 2022 one is collected for every one sold, as part of adequate systems for collection, reuse, recycling and composting in communities that currently lack these systems[133]

**RESTORE** dignity through working in partnership with waste pickers to create safe jobs. Around the world, there are numerous examples of companies partnering with waste pickers to establish collection and recycling systems that are good for society and the environment.[134]

APPENDIX 1

# TEARFUND RECOMMENDATIONS FROM *NO TIME TO WASTE* [138]


## MULTINATIONAL CORPORATIONS SHOULD:

**REPORT,** by 2020, on the number of units and volume[135] of single-use plastic products they use and sell in each country

**REDUCE** this amount by half, country by country, by 2025, and instead use environmentally sustainable delivery methods such as refillable or reusable containers

**RECYCLE** the single-use plastics they sell in low- and middle-income countries, ensuring that by 2022 one is collected for every one sold, as part of adequate systems for collection, reuse, recycling and composting in communities that currently lack these systems

**RESTORE** dignity through working in partnership with waste pickers to create safe jobs. Around the world, there are numerous examples of companies partnering with waste pickers to establish collection and recycling systems that are good for society and the environment.

**REIMAGINE** the way their products are delivered. Innovate and explore business models that won't harm people, the earth or the ocean

**Photo:** Nathan Dumlao/unsplash.com

# APPENDIX 1

## HIGH-INCOME GOVERNMENTS SHOULD:

- phase out the use of fossil fuel subsidies, including fiscal support and public finance, which help drive the increasing production of virgin plastic
- increase the volume of aid for waste management from 0.3 per cent to three per cent, which could allow all 2 billion people currently without waste collection to be reached. Official Development Assistance (ODA) should focus on building government capacity to reduce the generation of unnecessary single-use plastic packaging, and to extending waste collection and management services to all.
- avoid investment in 'white elephant' projects in low- and middle-income countries, such as incineration, that threaten waste picker livelihoods, are not suited to waste streams with high organic content and require high levels of institutional capacity to manage effectively
- prioritise technical assistance to low- and middle-income country governments to:

  – develop and implement legal and fiscal measures to ban or reduce unnecessary, problematic and non-recyclable plastic

  – implement locally appropriate EPR schemes to ensure businesses benefiting from single-use plastic contribute to its management

  – improve waste management governance and the enabling environment for effective waste management

  – scale up contextually relevant community-based recycling approaches
- ensure that export of domestic waste from their nations is minimised and, where any residual plastic waste is exported, that appropriate recycling facilities are in place in the receiving countries
- support low- and middle-income countries to develop national strategies for plastics and waste, with goals and policy instruments for each area of the waste hierarchy. This should include support for dedicated plastics action plans to prevent pollution and help reduce the production of problematic, non-essential and non-recyclable plastics.

## LOW- AND MIDDLE-INCOME GOVERNMENTS SHOULD:

- set out a national strategy for plastics and waste, with goals and policy instruments for each area of the waste hierarchy
- limit the worst forms of single-use plastic and incentivise innovative product design that reduces plastic use
- work with business to ramp up their responsibility for collecting and processing the waste they create (EPR), and require them to publish data on the amount of plastic packaging they are distributing
- set up an inclusive framework for waste management, which should:

  – clarify the roles of government agencies, local government, businesses and society, and set out measures to promote transparency and accountability

  – partner with informal waste pickers, providing the instruments and technical support required for local government to contract with these groups and offering support for waste pickers to organise together as associations and cooperatives

  – include mechanisms for local communities to monitor and become involved in waste collection
- increase the political and financial resources available for waste management at both municipal and national level and work with donors to allocate more funding to this area. The focus should be on pioneering low-cost, inclusive solutions (as several nations are already doing).

## CITIZENS SHOULD:

- hold companies and governments to account for their responsibilities in tackling the plastic pollution crisis, starting by signing up to support Tearfund's campaign, which asks MNCs to take responsibility for the plastic they produce in low- and middle-income countries – tearfund.org/rubbish
- write to their elected representative (in the UK via writetothem.com) telling them their concerns regarding plastic waste and asking them to take action
- take part in community initiatives to tackle plastic waste, such as community litter collections or local beach clean-ups
- reduce usage of single-use plastics where possible, for example by:

  – using a reusable water bottle, reusable shopping bags and reusable cup when buying hot drinks 'on the go'

  – cutting out non-essential items such as cotton buds, glitter, plastic cups, plates and cutlery, and plastic straws[136]

  – buying groceries and toiletries with less or no packaging where possible, eg loose vegetables rather than those packaged in plastic, unwrapped soap etc[137]

  – buying from ethical companies who are committed (genuinely) to reduce plastic use

## APPENDIX 2 - METHODOLOGY

# HOW THE STATISTICS IN THIS REPORT WERE CALCULATED

**This report includes statistics of the amount of mismanaged plastic waste (ie waste that is dumped or burnt) that Coca-Cola, Nestlé, PepsiCo and Unilever are responsible for in six countries: China, India, Brazil, Mexico, the Philippines and Nigeria. We had hoped to also include Tanzania in this statistical analysis but were unable to access sales data for the companies there.**

A significant part of these calculations relates to estimating each company's plastic footprint on a country-by-country basis. This is something that we asked the four companies to declare publicly as part of Tearfund's *Rubbish Campaign*, but so far none has chosen to do so.

In the absence of companies producing this data, we are attempting to calculate these quantities. We do so using the best available information and assumptions. We requested additional data from Coca-Cola, Nestlé, PepsiCo and Unilever in December 2019. We also shared our methodology with them. PepsiCo said they did not have a point-of-view on our methodology but were looking forward to reading our study with interest. Coca-Cola said: 'There are multiple inaccurate assumptions in [the model], such as the assertion that [Coca-Cola] use a constant percentage of glass, aluminum and PET globally,' but it did not provide any additional data on country-by-country variations in its packaging mix.

Nevertheless, we have sought to clarify below that this is absolutely not our assumption: we explicitly account for higher rates of refillable (glass and plastic) bottles in low- and middle-income countries. Coca-Cola also told us it plans to increase its transparency by including additional data to help us understand better its progress in achieving its World Without Waste goals. But they added: 'However, our sales volumes vary widely country-by-country, and just as we only release global sales data, we are not able to release packaging volumes by country.'

They also provided specific examples of PET collection and reuse in particular countries, and we refer to this information in the relevant sections below. Unilever described our methodology as 'interesting and challenging' but noted that it only publishes revenue data at a regional level, and questioned the accuracy of our national revenue figures, requesting that we reference them as unofficial estimates. They also provided us with a (confidential) regional breakdown of their plastic footprint, as well as further information on the types of plastic they use, and their collection, refill and reuse schemes. We had not heard back from Nestlé, either by the deadline, or before this report went into production.

Because of the assumptions and gaps that remain, our estimates should be interpreted as giving an indication of the scale of the plastic pollution associated with these companies. Our estimates are based on six countries. They are all middle-income countries, with a stronger capacity for waste management than most low-income countries. Thus the total mismanaged plastic waste caused by the companies across all low- and middle-income countries would be significantly larger.

Our methodology and assumptions have been independently reviewed by an expert at the consultancy Resource Futures, and by the editor of UNEP's *Global Waste Management Outlook*, Professor David Wilson. Our methodology to calculate GHG emissions was independently reviewed by the two lead authors of the paper we rely on for our emissions factors (one of whom was Professor Wilson).

We believe these statistics represent fair and reasonable estimates based on the information that is publicly available at the present date. We will, of course, be delighted to revise and improve these statistics still further if and when the companies make public the relevant data.

We estimate the plastic footprint of each company in each country, and then the amount of this plastic that ends up as mismanaged waste. We use our mismanaged waste figures to calculate the amount of greenhouse gases (GHGs) released by the burning of a proportion of this waste – ie GHGs that the companies are responsible for.

APPENDIX 2

# 1. MISMANAGED WASTE CAUSED BY A COMPANY'S PACKAGING IN A PARTICULAR COUNTRY

## HOW MUCH PLASTIC PACKAGING DOES EACH COMPANY USE AND SELL IN EACH OF THE SIX COUNTRIES?

The companies all published their global sales figures in their annual reports.[139] Coca-Cola also publishes its 'unit case volume'.[140]

We accessed the national sales figures for each company in each country, although in some cases, these were not available in the company accounts, and have been sourced from subsidiary accounts, financial media or other compilers of corporate information. The box below sets out the data source for each figure. We shared these with each of the companies. In its response to us, Unilever said that it only publishes revenue data at a regional level, and that any national figures should be regarded as unofficial estimates. We could only access data on PepsiCo's beverage sales in Nigeria, rather than on its whole portfolio. Where national sales figures were in a different currency to the global figures, we used exchange rate dates to align with the source data.

Coca-Cola also publishes its 'unit case volume' regionally and, for some countries, nationally. As Coca-Cola's plastic packaging is primarily PET,[141] the unit case volume is a more accurate way of estimating the proportion of plastic per country than sales.

**The four companies have also published their global plastic packaging footprint.[142]**

For PepsiCo, Nestlé and Unilever, we worked out the national sales as a percentage of global sales:

**national sales figure ÷ global sales figure = X %**

For Coca-Cola, we worked out the national unit case volume as a percentage of global unit case volume.

We applied this percentage to the global plastic packaging figure, to work out the amount of plastic packaging distributed in each country by each company:

**(eg Coca-Cola:) 3,000,000 tonnes plastic x X % = Y tonnes of plastic**

## ASSUMPTIONS AND ADJUSTMENTS

We recognise that this methodology makes a number of assumptions, and therefore we have adjusted the basic calculations accordingly. These adjustments differ between companies. We address each company in turn.

## COCA-COLA

We know that in some of Coca-Cola's low- and middle-income markets a higher percentage of refillable bottles are used than the global proportion, and our approach accounts for this. According to Coca-Cola's *2018 Business and Sustainability Report*, 13.3 per cent[143] of the global packaging mix is refillable glass or plastic bottles. However, according to the Coca-Cola India website, for example, in India, 30 per cent of beverages are sold in returnable glass bottles.[144] Therefore, for Coca-Cola India, instead of working out what percentage of the global unit case volume the national figures represent, we have used figures for 86.7 per cent of the global volume and 70 per cent of the national volume, thus allowing for the difference in the percentage of bottles refilled at global and national level.

We were able to find evidence of the actual percentage of refillable bottles sold by Coca-Cola in India[145] and Brazil,[146] but not in China, the Philippines, Nigeria or Mexico. However, on the assumption that none of the 13.3 per cent refillable bottles were used in high-income countries in 2018, and knowing the number of 'unit cases' refilled in India and Brazil, we were able to calculate that a 20 per cent refill rate across other countries was a reasonable assumption.[147]

Our approach also includes the assumption that the mix of non-refillable packaging formats remains constant across countries. For example, aluminium and steel bottles and cans account for 23.5 per cent of Coca-Cola's global packaging mix. We invited Coca-Cola to share its figures for non-refillable packaging formats across our six countries but it failed to do so. Our assumption is that this figure will be similar or lower in low- and middle-income countries. We have not been able to find evidence to the contrary.

# APPENDIX 2

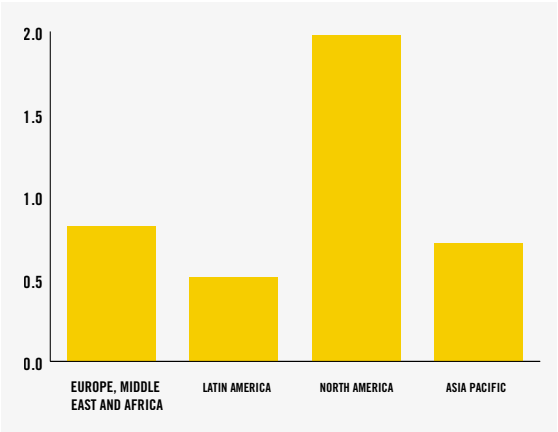
## PEPSICO

As with Coca-Cola, we assume that in some low- and middle-income markets PepsiCo will sell a higher percentage of refillable bottles than are used globally. We therefore take a conservative approach in adjusting the calculations to allow for this. We were unable to find evidence of PepsiCo's refill rates globally or in any of the six countries. We therefore assumed the same rates as Coca-Cola, and applied this to 46 per cent of PepsiCo sales (as according to its annual report, 46 per cent of its global net revenue was from beverages, the other 54 per cent from food).

Again, we were unable to find data on the volume of sales (as opposed to the revenue from sales), and so we apply some assumptions from Coca-Cola's data.

For Coca-Cola, we compared its data on regional unit case volume with regional net revenue – see graph below, showing the revenue it earns per unit case volume in each region. While North America represents only 20 per cent of Coca-Cola's unit case volume, it is responsible for 36.7 per cent of sales revenue. Yet Latin America represents 27 per cent of unit case volume, but only 12.7 per cent of sales revenue. In other words, Coca-Cola has to use around four times as much plastic to deliver a dollar of revenue in Latin America, as it does in the US. Similarly for Asia Pacific, and the regional grouping that includes Africa, net revenue is much lower than what it represents in unit case volume.[148]

**Coca-Cola's revenue per unit case volume ($)**




Coca-Cola and PepsiCo are direct competitors in these markets and we therefore think it is reasonable to assume that this regional difference in revenue per unit is also the case for PepsiCo – across both its beverage and food portfolios. As with Coca-Cola, its beverages are mostly packaged in PET, the volume and weight of which is consistent across markets. And its food sold in low- and middle-income countries is mostly in packets of similar sizes and weights across regions. We calculate the Coca-Cola unit case volume per dollar at the global level, and at regional level, and use the ratio of these figures to adjust PepsiCo's plastic footprint in each country. We assume that – in line with Coca-Cola – PepsiCo uses more plastic to deliver a dollar of revenue in these regions than the global average. We therefore scale its plastic footprint by the following amounts:

| Country | Region | Increased by a factor of |
|---|---|---|
| China | Asia Pacific | 1.5 |
| India | Asia Pacific | 1.5 |
| The Philippines | Asia Pacific | 1.5 |
| Mexico | Latin America | 2.1 |
| Brazil | Latin America | 2.1 |
| Nigeria | Europe, Middle East and Africa | 1.3 |

# APPENDIX 2

## NESTLÉ AND UNILEVER

We are not aware of any large refill schemes by Nestlé or Unilever in our focus countries[149] (as is the case when Coca-Cola and PepsiCo use refillable glass bottles).

Unilever provided us with confidential data on its regional plastics footprint, which indicated that it uses more plastic per Euro of sales in low- and middle-income countries than in high-income countries (although to a lesser extent than Coca-Cola). We have used this to scale Unilever's plastic footprint in low- and middle-income countries, in a similar way to PepsiCo above.

Nestle did not provide us with any additional data, and since it uses large amounts of flexible packaging in the Global South (like Unilever), we have used the same scaling factors as for Unilever.

## HOW MUCH OF THIS PLASTIC PACKAGING IS MISMANAGED?

The World Bank's *What a Waste* report provides figures for waste treatment and disposal by country using a wide range of literature and studies to inform its statistics. Its categories include openly dumped, plus three types of landfill – 'unspecified', 'controlled' and 'sanitary' – as well as recycling, composting, anaerobic digestion, incineration, advanced thermal treatment, waterways, 'other' and also 'unaccounted for'.[150]

**The average percentage of waste (including plastic) that is 'mismanaged' according to country income level (World Bank, *What a Waste*)**


(As context, in upper-middle-income countries and lower-middle-income countries, the World Bank suggests that 11 per cent of waste is plastic. For low-income countries, the figure is 6.4 per cent.)

Where the World Bank's comprehensive survey reveals recent country-specific data, we use this percentage as a starting point. We use the figures for 'open dump' and 'unaccounted for' to calculate 'mismanaged waste'. This is a conservative assumption, as figures included in 'landfill unspecified' may well include waste that is openly burnt – ie mismanaged. Where the country-level data was incomplete or more than 20 years old, we use the percentages provided by the World Bank for countries according to income group.

The World Bank data relates to mismanagement of all waste, and we therefore consider the possibility that less plastic might be mismanaged than other types of waste. This would occur if larger amounts of plastic were being collected for recycling by the informal sector than other types of waste, or if a company-sponsored initiative supplemented municipal collection efforts.

Data on the extent of plastic collected by the informal sector is patchy and often only available at a sub-national level. However, several recent reports allow us to summarise the overall situation regarding plastics mismanagement: the World Economic Forum, Ellen MacArthur Foundation and McKinsey report that globally 32 per cent of plastic packaging 'leaks out of the collection system — that is, either it is not collected at all, or it is collected but then illegally dumped or mismanaged'.[151] This is despite very low leakage rates in high-income countries (of approximately two per cent), according to World Bank data.[152] As a result, leakage rates for plastic in low- and middle-income countries must be substantially higher (on average) than 32 per cent.

# APPENDIX 2

Waste pickers collect a variety of plastics, but PET is widely regarded as the most collected form, when all informal waste sector activities are considered (door-to-door, street pickers, and waste picking at dumpsites). This is evidenced by overall recycling rates[153] and country-specific studies of plastic collection.[154] But even in the case of PET, at a global level, only half is collected for recycling.[155] Similarly in low- and middle-income countries, large amounts of PET slip through the collection net: a Coca-Cola sponsored study in 2019 for the six largest countries in South-East Asia[156] found that, despite the combined efforts of the informal waste sector and municipal authorities, between 21 per cent and 69 per cent of PET bottles leaked into the environment across these six countries.[157] The estimated average collected-for-recycling rate across the six countries studied was just 26 per cent. The report concludes that the informal sector does not collect more because 'incentives for PET are simply not high enough to incentivise further collection'. They also find that informal waste collection reduces as a country's income per capita increases. This is intuitive and well documented: waste picking becomes less attractive relative to other occupations as incomes rise.[158]

Nevertheless, we make specific, country-based adjustments for the recycling of PET bottles (see below). After PET, the next most-collected plastics are other forms of rigid packaging (such as some types of HDPE and to a lesser extent LDPE).[159] Where collection of PET appears to be higher than for other waste, we also consider making a (smaller) adjustment for other types of plastic.

These assumptions are summarised and explained in more detail below. They are conservative. For example, all our PET leakage rates are below or within the range given by GA Circular in its report on South-East Asia for Coca-Cola.

**We applied these percentages to each company's plastic footprint to estimate the amount of plastic per company that is 'mismanaged' in each country.**

| Country | % of plastic mismanaged | Rationale |
|---|---|---|
| China | 8.2% | The World Bank report cites 8.2% 'open dump' in China. |
| India | 37% for PET and 43% for other plastics | The World Bank report cites 77% 'open dump' in India. However, we are adjusting the figures to account for high levels of PET bottle collection and other plastics (see below). |
| Brazil | 17.4% for PET and 23.2% for other plastics | The World Bank report cites 15.6% 'open dump' and 7.6% 'unaccounted for' in Brazil. We reduce this by a quarter for PET bottles (see below). |
| Mexico | 21% | The World Bank report cites 21% 'open dump' in Mexico. We considered a lower rate for PET but expert opinion was against it. |
| The Philippines | 69% | The World Bank data suggests that 72 per cent of waste is 'unaccounted for' in the Philippines. GA Circular suggests a leakage rate of 69% for PET.[202] We assume 69% leakage for all forms of plastic. |
| Nigeria | 66% | Given the lack of recent data for Nigeria (the Nigeria figures in the World Bank report were based on data from 1995), we use the World Bank estimate for lower-middle-income countries. |

# APPENDIX 2

As noted previously and explained below, we recognise that in some countries, some forms of plastic (and particularly PET bottles) enjoy higher collection rates than waste in general. Where appropriate, we therefore estimate specific collection rates for PET and 'other plastics'. When applying these collection rates to companies' plastic footprint (see below), we assume the following packaging mix for each company.

| Assumed packaging mix for each company | PET bottles | Other plastics | Reasoning |
|---|---|---|---|
| Coca-Cola | 90% | 10% | Coca-Cola states that its plastic bottles are 'primarily PET', and does not give details of any other plastic used in its 'packaging mix'.[203] |
| Nestlé | 10% | 90% | Nestlé has a bottled water business, but it is focused largely in high-income countries. Beyond this, its products do not appear to be commonly packaged in PET bottles. |
| PepsiCo | 41% | 59% | We assume that PepsiCo's use of PET bottles mirrors the share of beverage sales in its global sales figures (46 per cent), less five per cent to account for other types of plastic bottle (and bottle caps, which are not PET). |
| Unilever | 10% | 90% | Unilever is focused predominantly in sectors that use LDPE and HDPE (and other plastics) rather than PET bottles. |

## MORE DETAIL ON COLLECTION RATES

As mentioned above, we consider the possibility of additional collection of PET bottles (and where this is common, also other types of plastic). Here we describe these adjustments on a country-by-country basis.

**China**

For China, we use the World Bank estimate (for all waste) of 8.2 per cent mismanaged waste for PET and other plastics. We believe this is a conservative figure. Although waste collection and plastic recycling are well established in urban areas, the latest UN statistics show that more than 40 per cent of the population still lived in rural areas in 2018.[160] Wang et al carried out a representative survey of villages and reported that 'only 55% of the villages in our sample reported transporting waste [beyond the village]. This is very low and indicates that much of the rural solid waste that is collected is still being dumped, buried in a ditch, or burnt illegally'.[161] Additionally, 43 per cent of villages reported open burning of their waste.[162]

**India**

In the case of India, we rely on a recent study by National Chemical Laboratory Innovations, NCLI.[163] The study was funded by PACE (PET Packaging Association for Clean Environment) – an industry body that represents various PET manufacturers, bottlers, processors and recyclers in India. There is therefore a risk that the estimates it contains could present an overly rosy picture of the plastic recycling industry in India. The report suggests that 63 per cent of PET is collected and recycled at legal facilities in India, as well as suggesting that more could be recycled at illegal or informal facilities. We also rely on a news article which is also part of the source data used in the World Bank's calculations. This quotes India's Central Pollution Control Board as saying, 'Total plastic waste which is collected and recycled in the country is estimated to be 9,205 tonnes per day (approximately 60% of total plastic waste) and 6,137 tonnes remain uncollected and littered.'[164] Thus 40 per cent of plastic waste is mismanaged. Combining this figure with the NCLI study, we therefore assume that 63 per cent of PET is collected, and that 57 per cent of other plastic is collected.

# APPENDIX 2

**The Philippines**
As stated above, the World Bank data suggests that 72 per cent of waste is 'unaccounted for' in the Philippines. GA Circular suggests a leakage rate of 69 per cent for PET.[165] We assume 69 per cent leakage for all forms of plastic.

**Brazil**
For Brazil, we make an adjustment for PET, reducing the World Bank estimate (for all waste) by a quarter, and therefore assume that 17.4 per cent of PET is mismanaged. A study on municipal solid waste in Brazil found that 'in Brazil, plastics recycling is mainly related to polyethylene terephthalate (PET) bottles, which are abundant in the rubbish generated in Brazilian cities, and there are many waste pickers who work in the separation of this type of recyclable material. Currently, 51% of this material is recycled in Brazil.'[166] Coca-Cola suggested in its response to us that in Brazil, the current PET collection rate was 54 per cent. This is significantly lower than the 77 per cent collection rate indicated by the World Bank figures, but the World Bank figure includes waste collected and safely managed at a landfill, as well as recycled.

The question is therefore to what extent PET recycling is diverting plastic from open burning and dumping, either by removing plastic from collected waste streams destined for open dumps, or by collecting plastic that would otherwise have been uncollected. From a report by CEMPRE, it seems that large amounts of PET are collected through segregated collection services, replacing or supplementing traditional collection in the big cities (often including cooperatives of waste pickers), and probably in the highest-capacity municipalities.[167] In this case, the bulk of this collection is probably diverting plastic that was destined for landfill (which is indeed the stated target) rather than diverting plastic that was destined for open dumps. Nevertheless, we reduce our estimate of mismanaged PET by a quarter to account for additional plastic collection.

**Mexico**
In Mexico, there is a significant Extended Producer Responsibility recycling initiative: PetStar. PetStar, which is 'part of the Mexican Coca-Cola Industry', claims to collect 66 per cent of PET containers that its shareholders put on the market.[168] In its response to our methodology, Coca-Cola highlighted the success of PetStar, and stated it had achieved an estimated 75 per cent PET collection rate in-country. We consulted an expert on waste management in Mexico, who recommended that we assume that at least 20 per cent of PET in Mexico was mismanaged. This was on the basis that detailed national assessments of waste management indicate that the final disposal method for almost 30 per cent of solid waste is either unknown or open dumping (after accounting for recycling), and that disposal sites classified as 'landfills and controlled disposal sites' are sometimes similar to open dumpsites. We therefore use the World Bank figure of 21 per cent mismanaged waste for both PET and other plastics. This is consistent with (and perhaps more conservative than) Coca-Cola's figure of 75 per cent PET collection, which could suggest that 25 per cent of PET is mismanaged.

**Nigeria**
In Nigeria, plastic recycling markets are relatively poorly developed.[169] We use the figure the World Bank provides for lower-middle-income countries for Nigeria (66 per cent).

## CONVERTING THE WEIGHT OF PLASTIC INTO VOLUME

Converting the weight of mixed plastic waste to volume is not straightforward. Different types of plastics have different densities and therefore the conversion ratio differs between plastic types. It also differs depending on whether the plastic waste has been crushed or not.

To convert the weight of plastic waste to volume, we used the same ratio as that used by the Everyday Plastic report.[170] Note that this is based on plastic as it is thrown from the household, so before being mechanically crushed. In this report, 35kg of uncrushed plastic waste was equivalent to 1.5m$^3$. We used the same ratio to convert kilograms into cubic metres.

## CALCULATING HOW MANY FOOTBALL PITCHES THIS VOLUME OF WEIGHT WOULD COVER

Not all football pitches are the same size, but the preferred size for many professional teams' stadiums is 105 by 68 metres. We used these measurements, and assumed that to 'cover' the pitch with plastic would require a depth of 0.1 metres (10 centimetres). This creates a volume of 714 cubic metres per football pitch.

We use this to calculate how many pitches would be covered per year by plastic waste. From this, we also work out how many would be covered per day/hour/minute.

APPENDIX 2

# 2. GREENHOUSE GAS EMISSIONS

When plastic is burnt, it releases a number of GHG emissions, notably black carbon and carbon dioxide. The UN's *Global Waste Management Outlook* suggested in 2015 that black carbon from burnt waste could be particularly significant, because its global warming potential (GWP) is so high: more than 2,000 times that of carbon dioxide over a 20-year period (according to an average of academic estimates).[171]

We follow the Intergovernmental Panel on Climate Change (IPCC)[172] and other researchers such as Wiedinmyer et al[173] in assuming that 60 per cent of mismanaged waste (in this case plastic) is burnt, and 40 per cent is dumped. We have already accounted for both company-sponsored and national collection schemes in arriving at the amount of plastic waste that we consider to be mismanaged, as outlined above.

## BLACK CARBON EMISSIONS FROM BURNT WASTE

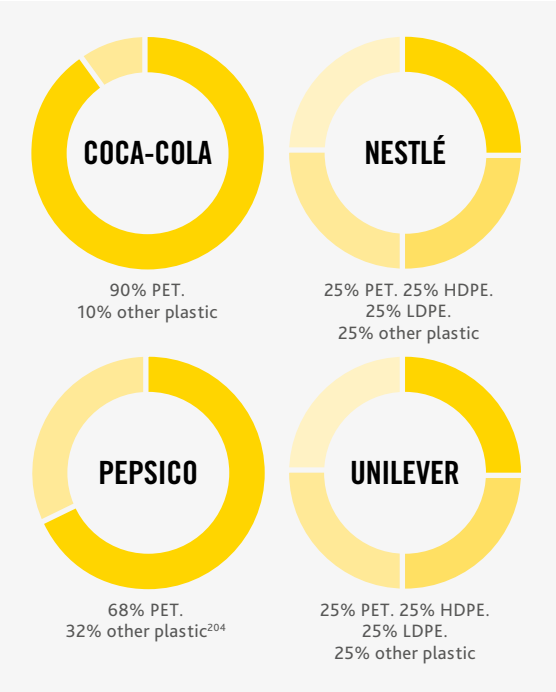
When plastic is burnt on open dumps, in backyards or the street, it produces black carbon. Reyna-Bensusan et al (2019) provide emissions factors for black carbon produced by burning different types of waste, including four types of plastic: PET, LDPE, HDPE and polystyrene.[174] The first three are commonly used in plastic packaging by fast-moving consumer goods companies, but we know that other types of plastic, notably PP (polypropylene), are also used in plastic packaging, and we account for this below.

Reyna-Bensusan et al (2019) also provide a conversion factor, to be used to calibrate these emissions factors when the plastic is burnt as part of mixed waste rather than on its own. (This appears to increase the efficiency of combustion by allowing more oxygen to be present, which reduces black carbon emissions by 80 per cent, compared with burning plastic on its own.)

We use this data to calculate black carbon emissions arising from the burnt portion of mismanaged plastic attributed to each company. To do so, we assume that:

(i) All plastic is burnt as part of mixed waste. This reduces emissions by 80 per cent compared with a scenario where plastic is burnt in isolation.

(ii) We assume the following plastic mix for each company:




Note that these are different ratios to those used in our plastic packaging collection calculations above. At that point, we were interested in the proportion of PET bottles only, whereas we now include PET used in sachets and other packaging formats.

PET emits much more black carbon than HDPE or LDPE when it is burnt, so the proportion of PET in the plastics mix is an important determinant of emissions.

Of the four types of plastic studied in Reyna-Bensusan et al (2019), LDPE emits the smallest amount of black carbon, and we therefore assign 'other plastics' the same emissions factor as LDPE. This is thus a conservative assumption.

# APPENDIX 2

Black carbon has a much more powerful climate-warming effect than carbon dioxide. There is some uncertainty in the literature regarding its precise global warming potential (GWP), but over a 20-year time horizon, estimates suggest it is between 1,200 and 5,100 times as powerful as carbon dioxide. We follow Reyna-Bensusan et al (2019) in using a GWP of 2,200, which is an average of recent academic estimates.

When black carbon is emitted, there also tend to be small amounts of other particulate matter emissions, some of which have a warming effect and some of which have a cooling effect on the climate. We follow Reyna-Bensusan et al in setting aside these other less significant particulate matter emissions, although we do consider the production of carbon dioxide itself (see below).[175]

## CARBON DIOXIDE EMISSIONS FROM BURNT WASTE

In addition to black carbon, burning plastic produces significant amounts of carbon dioxide. The emissions factors presented by Reyna-Bensusan et al (2019) suggest that only a fraction of the total carbon content of each type of plastic is released as black carbon. We assume that the remainder is released as carbon dioxide, less two per cent, to account for incomplete combustion (following the assumption made in Kistier and Muffett et al [2019])[176] for incomplete combustion). We use data from the US Environmental Protection Agency for the carbon content of PET, HDPE and LDPE,[177] and also rely on the fact that one kilogram of carbon combines with oxygen to form 3.67kg of carbon dioxide (based on their atomic weights).[178]

## GREENHOUSE GAS EMISSION COMPARISONS

We compare our greenhouse gas estimates from the burnt portion of the four companies' mismanaged plastic, to cars on UK roads. In 2018, the average car in use in the UK had emissions of 149g per km[179] (242g per mile). In 2019, there were 32 million cars in the UK, and collectively they drove 255 billion miles.[180] Total carbon dioxide emissions from cars were thus: total distance driven multiplied by average emissions per mile, giving a total of almost 62 million tonnes. However, since our calculations for plastic include black carbon emissions, we also add black carbon emissions from cars to the 62 million figure, to make them comparable.

Jezek et al[181] measured black carbon emissions factors for petrol and diesel vehicles in Slovenia in 2011.[182] Their findings suggested that the average (median) diesel car emitted 0.79g of black carbon per kilogram of fuel burnt, and the average petrol car 0.28g per kilogram of fuel burnt. However, emissions were much lower in cars less than five years old, which they suggest is because of the entry into force of Euro Standards 4 and 5.[183] These standards dramatically reduced the acceptable level of particulate matter emissions from cars in the EU. Since their data is now itself nine years old, we estimate that average emissions factors will have fallen by at least 50 per cent, and therefore use emissions factors of 0.4 and 0.14 for diesel and petrol cars respectively.[184]

The Department for Transport's 'Energy and environment data tables' provide figures for total fuel consumption for petrol and diesel cars in 2017 (they used 11 million tonnes each).[185] This allows us to quantify total emissions of black carbon from UK cars (5,900 tonnes). Using the same GWP for black carbon as above (2,200), this equates to approximately 13 million tonnes of $CO_2$ equivalent emissions. This makes the total carbon footprint of the UK car fleet 75 million tonnes of $CO_2$ equivalent, or 2.3 tonnes per car per year.

We also compare our estimates for Coca-Cola to the emissions from its global distribution fleet (for vehicles controlled by both the Coca-Cola Company and its bottling partners worldwide). These emissions are declared in their submission to the Carbon Disclosure Project[186] as:

**fleet emissions from direct operations: 164,581 tonnes of $CO_2$ equivalent**

**fleet emissions from indirect operations: 2,914,685 tonnes of $CO_2$ equivalent**

This gives a total of more than 3 million tonnes of $CO_2$ equivalent. These emissions do not include black carbon, so we add ten per cent to account for this and make them more comparable with our figures. (Historically, heavy goods vehicles have been significant emitters of black carbon, but a progressive tightening of regulations means that modern and retrofitted older vehicles have dramatically lower emissions of particulate matter, including black carbon.)[187]

# APPENDIX 2

**Data sources for country unit case volume and sales figures**

| Company & country | Unit case volume or sales | Source of raw data | Comments |
|---|---|---|---|
| Coca-Cola | | | |
| China | Unit case volume | Coca-Cola's *2018 Business and Sustainability Report*[188] | |
| India | Unit case volume | Coca-Cola's *2018 Business and Sustainability Report* | |
| Brazil | Unit case volume | Coca-Cola's *2018 Business and Sustainability Report* | |
| Mexico | Unit case volume | Coca-Cola's *2018 Business and Sustainability Report* | |
| The Philippines | Unit case volume | Coca-Cola's *2018 Business and Sustainability Report* | |
| Nigeria | Unit case volume | Coca-Cola Hellenic Bottling Company *2018 Integrated Annual Report*[189] | |
| Nestlé | | | |
| China | Sales | Nestlé's *2018 Annual Report*[190] | Nestlé's report has figures for 'Greater China Region'. |
| India | Sales | Nestlé's *2018 Annual Report* | |
| Brazil | Sales | Nestlé's *2018 Annual Report* | |
| Mexico | Sales | Nestlé's *2018 Annual Report* | |
| The Philippines | Sales | Nestlé's *2018 Annual Report* | |
| Nigeria | Revenue | Nestlé Nigeria Unaudited Financial Statements[191] | Nigeria revenue figures are for the period ending 31 March 2019, whereas Nestlé global sales data is for year ending December 2019, but we feel it is reasonable to compare these two 12-month timeframes. |
| PepsiCo | | | |
| China | Net revenue | This is a reasoned guess. PepsiCo's *2018 Annual Report*[192] states 'Our operations outside of the United States generated 43% of our consolidated net revenue in 2018, with Mexico, Russia, Canada, the United Kingdom and Brazil comprising approximately 20% of our consolidated net revenue in 2018.' In the three quarterly reports published in FY 2019, China replaces Brazil in the list of the top 5 markets outside of the US. We therefore assume that China was its 6th biggest market outside of the US in 2018, and estimate sales 10% less than Brazil's. | |
| India | Net revenue | News article[193] | Sales data is for year ending March 2017. We therefore used the 2016 global sales figures for comparison. |
| Brazil | Net revenue | PepsiCo's *2018 Annual Report* | |
| Mexico | Net revenue | PepsiCo's *2018 Annual Report* | |

# APPENDIX 2

| | | | |
|---|---|---|---|
| The Philippines | Sales volume | News article[194] | We assume 'sales volume' will be very similar to 'net revenue' and therefore it is reasonable to use to find the national percentage.<br>Filippino sales for Jan–Dec 2018, whereas PepsiCo global sales data is for year ending March 2019, but we feel it is reasonable to compare these two 12-month timeframes. |
| Nigeria | Revenue – for beverages only | We do not have data for all of PepsiCo's sales in Nigeria. However, we were able to find a financial statement[195] for the quarter and nine months ending 31 December 2017 for the SevenUp Bottling Company who produce and distribute PepsiCo soft drinks in Nigeria. | The SevenUp Bottling Company data is for a 9-month period so we divide by 9 and multiply by 12 to make it comparable with the global annual report. |
| **Unilever** | | | |
| China | | News graphic[196] | |
| India | Revenue from operations | Hindustan Unilever Limited's *2018-2019 Annual Report*[197] | India revenue figures are for the period ending 31 March 2019, whereas Unilever global sales data is for year ending 31 December 2018, but we feel it is reasonable to compare these two 12-month timeframes. |
| Brazil | Revenue | Unilever Brasil Ltd revenue figures on Statista website[198] | |
| Mexico | Annual revenue | D&B Hoovers website[199] | |
| The Philippines | Annual sales | News article[200] | |
| Nigeria | | Unilever Nigeria Financial Statement[201] | |

# APPENDIX 3 - DATA TABLES

### Coca-Cola

| Country | Sales – USD | Mismanaged waste – kg | Number of football pitches covered daily |
|---|---|---|---|
| China | 2,587,040,000 | 19,838,893 | 3.26 |
| India | 953,120,000 | 29,325,398 | 4.82 |
| Brazil | 1,678,320,000 | 28,220,512 | 4.64 |
| Mexico | 3,836,160,000 | 75,338,408 | 12.39 |
| The Philippines | 544,640,000 | 35,144,637 | 5.78 |
| Nigeria | 251,680,000 | 15,534,350 | 2.55 |
| **Total across six countries** | **9,850,960,000** | **203,402,197** | **33.45** |

### Nestlé

| Country | Sales – CHF (Swiss Francs) | Mismanaged waste – kg | Number of football pitches covered daily |
|---|---|---|---|
| China | 7,004,000,000 | 11,959,017 | 1.97 |
| India | 1,529,000,000 | 13,499,224 | 2.22 |
| Brazil | 3,683,000,000 | 18,439,282 | 3.03 |
| Mexico | 2,813,000,000 | 13,069,334 | 2.15 |
| The Philippines | 2,476,000,000 | 35,574,205 | 5.85 |
| Nigeria | 193,068,367 | 2,653,326 | 0.44 |
| **Total across six countries** | **17,698,068,367** | **95,194,387** | **15.65** |

### PepsiCo

| Country | Sales – USD | Mismanaged waste – kg | Number of football pitches covered daily |
|---|---|---|---|
| China | 1,200,000,000 | 5,026,474 | 0.83 |
| India | 1,020,599,251 | 20,564,744 | 3.38 |
| Brazil | 1,335,000,000 | 20,212,731 | 3.32 |
| Mexico | 3,878,000,000 | 59,217,272 | 9.74 |
| The Philippines | 656,567,631 | 23,141,789 | 3.81 |
| Nigeria | 310,984,681 | 8,837,325 | 1.45 |
| **Total across six countries** | **8,401,151,562** | **137,000,336** | **22.53** |

### Unilever

| Country | Sales – Euros | Mismanaged waste – kg | Number of football pitches covered daily |
|---|---|---|---|
| China | 4,700,000,000 | 5,926,672 | 0.97 |
| India | 4,964,155,844 | 32,367,597 | 5.32 |
| Brazil | 3,059,370,000 | 11,307,139 | 1.86 |
| Mexico | 1,074,157,895 | 3,685,662 | 0.61 |
| The Philippines | 1,394,000,000 | 14,791,461 | 2.43 |
| Nigeria | 222,959,926 | 2,262,924 | 0.37 |
| **Total across six countries** | **15,414,643,664** | **70,341,455** | **11.57** |

## APPENDIX 3

## PLASTIC POLLUTION IN $CO_2$ EQ (T)

| Country | Coca-Cola | PepsiCo | Nestlé | Unilever |
|---|---|---|---|---|
| China | 244,174 | 49,048 | 57,168 | 28,332 |
| India | 360,933 | 200,668 | 64,531 | 154,729 |
| Brazil | 347,334 | 197,233 | 88,146 | 54,052 |
| Mexico | 927,255 | 577,834 | 62,476 | 17,619 |
| The Philippines | 432,556 | 225,814 | 170,057 | 70,708 |
| Nigeria | 191,195 | 86,233 | 12,684 | 10,818 |
| **Total across six countries** | **2,503,448** | **1,336,831** | **455,063** | **336,257** |

**GRAND TOTAL 4,631,599**

A waste picker sorts waste on a smouldering open dumpsite in Tanzania.
**Photo:** Daniel Msirikale/Tearfund

# ENDNOTES


1 Senet S (2019) 'Plastic production on the rise worldwide but slowing in Europe', *Journal de l'environnement*, 5 Jun 2019

https://www.euractiv.com/section/energy-environment/news/while-global-plastic-production-is-increasing-worldwide-it-is-slowin-down-in-europe/

2 UNEP (2018) *Single-use plastics: a roadmap for sustainability*, https://wedocs.unep.org/handle/20.500.11822/25496

3 In order to stop plastic pollution, we need actions far beyond just the four companies we focus on here. In *No time to waste* (Tearfund, 2019), we highlighted the wider actions we believe governments and citizens need to take. These include investing in waste management and limiting the worst forms of single-use plastic. Yet, as we lay out in this report, there is an irrefutable moral case for the world's largest companies to act and lead now to reduce dramatically their plastic footprint.

4 In the executive summary of this report we use the terms 'developing countries' and 'developed countries'. We recognise the limitations with these terms – not least the wide range of economic circumstances included when grouping low-income, lower-middle income and upper-middle income countries as 'developing' – but think that on balance these are the best terms to use in order to keep the language of the executive summary clear and accessible. In the rest of the report we use the terms low-income, middle-income and high-income, because much of the analysis we have used (for example from the World Bank) uses these descriptors for country grouping.

5 We only have PepsiCo figures for its beverage sales in Nigeria.

6 In this context, burning does not refer to incineration, but burning in backyards, streets and dumpsites.

7 Black carbon is a short-lived climate pollutant that remains in the atmosphere for just one or two weeks, but has a warming effect so powerful that it heats the globe 2,200 times more than an equivalent amount of carbon dioxide.

8 Rating this 8 or above on a 10-point scale (where 1 = not at all a concern and 10 = very serious concern)

9 Kantar and Europanel (2019) *Who cares, who does? Consumer response to plastic waste*, https://www.kantarworldpanel.com/global/News/Who-Cares,-Who-Does-Consumer-response-to-plastic-waste#downloadThankyou

10 Geyer R et al (2017) 'Production, use, and fate of all plastics ever made', *Science Advances* 3 (7), http://advances.sciencemag.org/content/3/7/e1700782

11 Post World War II is when the production and use of plastic really became mainstream in industrialised countries.

12 According to the Population Reference Bureau, 8,425,614,944 people were born between 1950 and 2017. https://www.prb.org/howmanypeoplehaveeverlivedoneart

13 Geyer R et al (2017) 'Production, use, and fate of all plastics ever made', *Science Advances* 3 (7), http://advances.sciencemag.org/content/3/7/e1700782

14 Wilson D and Mavropoulos A (2019) 'Facts and myths on the origins of plastics entering the oceans – Dispersing the "10 rivers myth"', ISWA blog, https://www.iswa.org/media/publications/presidents-blog/prezsezmore/article/facts-and-myths-on-the-origins-of-plastics-entering-the-oceans-dyspersing-the-10-rivers-myth/1383/

15 UNEP (2018) *Single-use plastics: a roadmap for sustainability*, https://wedocs.unep.org/handle/20.500.11822/25496, p vi

16 Tearfund (2019) *No time to waste: tackling the plastic pollution crisis before it's too late*, www.tearfund.org/notimetowaste

17 Petter O (2018) '"Single-use" officially named as word of the year', *The Independent*, https://www.independent.co.uk/life-style/single-use-word-of-year-2018-collins-dictionary-plastic-pollution-environment-a8621406.html

18 Senet S (2019) 'Plastic production on the rise worldwide but slowing in Europe', *Journal de l'environnement*, https://www.euractiv.com/section/energy-environment/news/while-global-plastic-production-is-increasing-worldwide-it-is-slowin-down-in-europe/

19 UNEP (2018) *Single-use plastics: a roadmap for sustainability*, https://wedocs.unep.org/handle/20.500.11822/25496

20 See Tearfund (2019) *No time to waste: tackling the plastic pollution crisis before it's too late*. For further details, see: www.tearfund.org/notimetowaste

21 Break Free From Plastic Coalition (2019) *The Brand Audit Report 2019*, https://www.breakfreefromplastic.org/globalbrandauditreport2019/. These four companies came top in terms of the number of products found globally.

22 All four companies are all termed 'fast-moving consumer goods' (FMCG) companies. However, we refer to them as multinational companies (MNCs) in this report.

23 Break Free From Plastic Coalition (2019) *The Brand Audit Report 2019*, https://www.breakfreefromplastic.org/globalbrandauditreport2019/ In September 2019, Break Free From Plastic engaged 72,541 volunteers in 51 countries to conduct 484 brand audits. These volunteers collected 476,423 pieces of plastic waste, 43 per cent of which was marked with a clear consumer brand.

24 In BFFP's rating, Mondelez came 4th, beating Unilever as its waste packaging was found in slightly more countries. But in terms of the amount of pieces of waste found, Unilever scored higher (Mondelez: 1,083 pieces of plastic in 23 countries; Unilever: 3,328 pieces of plastic in 21 countries).

25 www.tearfund.org/rubbishcompanies

26 The Coca-Cola Company (2019) 2018 Business & Sustainability Report, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf, p 11

27 'The plastic tide: choking on Coke', a documentary by German public service broadcaster Deutsche Welle. Available at: https://articles.mercola.com/sites/articles/archive/2019/11/16/coca-cola-plastic-pollution-documentary.aspx

28 Exactly what is meant by this is unclear.

29 See Tearfund (2019) *No time to waste: tackling the plastic pollution crisis before it's too late*, www.tearfund.org/notimetowaste, p 47

30 Defra (2011) *Guidance on applying the waste hierarchy*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69403/pb13530-waste-hierarchy-guidance.pdf

31 Laermann M (2019) 'Chemical recycling of waste: waste no more?', Euractiv opinion column, https://www.euractiv.com/section/energy-environment/opinion/chemical-recycling-of-plastic-waste-no-more/

32 World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company (2016) *The new plastics economy – Rethinking the future of plastics*, http://www.ellenmacarthurfoundation.org/publications

33 Boyd S and Schröeder P (2017) *Smoke Screen*, Tearfund, https://learn.tearfund.org/~/media/files/tilz/circular_economy/2017-tearfund-smoke-screen-en.pdf?la=en

34 Ibid

35 Nestle (2018) 'Danone, Nestlé Waters and Origin Materials welcome PepsiCo to the NaturALL Bottle Alliance',

https://www.Nestlé.com/media/news/naturall-bottle-alliance-welcomes-pepsico [accessed 30 January 2020]

36 Coca-Cola, 'Sustainable packaging', https://www.coca-colacompany.com/plantbottle-technology [accessed 30 January 2020]

37 The Coca-Cola Company (2019) *2018 Business & Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf, p 22

38 Gibbens S (2018) 'What you need to know about plant-based plastics', *National Geographic*, https://www.nationalgeographic.com/environment/2018/11/are-bioplastics-made-from-plants-better-for-environment-ocean-plastic/

39 Coca-Cola (2017) 'Innovative packaging: an introduction to PlantBottle™',

https://www.coca-cola.co.uk/stories/sustainability-section/packaging---recycling/innovative-packaging-an-introduction-to-plantbottle [accessed 30 January 2020]

40 Greenpeace (2019) *Throwing away the future: how companies still have it wrong on plastic pollution 'solutions'*, https://storage.googleapis.com/planet4-international-stateless/2019/09/8a1d1791-falsesolutions2019.pdf

41 See Resources Futures and Nextek (2018) *Eliminating avoidable plastic waste by 2042: a use-based approach to decision and policy making*. Published at the Resourcing the Future Conference, June 2018, https://www.circularonline.co.uk/ This report helpfully categorises plastic according to the length of time a given plastic item is used for its intended purpose.

42 Ideally companies should work with governments to establish mandatory EPR schemes, but in the short term, voluntary EPR schemes – coordinated with government – can allow rapid progress.

43 We don't discuss the context for this recommendation in detail in this report, but more information can be found in Tearfund (2019) *No time to waste: tackling the plastic pollution crisis before it's too late*, www.tearfund.org/notimetowaste

44 Coca-Cola, 'How many drinks does The Coca-Cola Company sell worldwide each day?', https://www.coca-cola.co.uk/faq/how-many-cans-of-coca-cola-are-sold-worldwide-in-a-day [accessed 30 January 2020]

45 Nestlé (2019) *Annual review 2018*, https://www.Nestlé.com/investors/annual-report, p 7

46 PepsiCo (2019) *2018 PepsiCo Annual Report*, https://www.pepsico.com/docs/album/annual-reports/2018-annual-report.pdf?sfvrsn=35d1d2bc_2, p4

47 Unilever, 'About Unilever', https://www.unilever.com/about/who-we-are/about-Unilever/

48 Elmore B (2017) 'Plastic bottles are a recycling disaster, Coca-Cola should have known better', *The Guardian*, 2 May 2017, https://www.theguardian.com/commentisfree/2017/may/02/plastic-bottles-coca-cola-recycling-coke [accessed 30 January 2020]

49 Vanguard (2012) 'Coca-Cola phases out returnable glass bottles across plants', https://www.vanguardngr.com/2012/11/coca-cola-phases-out-returnable-glass-bottles-across-plants/ [accessed 30 January 2020]

# ENDNOTES

50 The Ellen MacArthur Foundation (2019) *New Plastics Economy global commitment June 2019 report*, https://www.newplasticseconomy.org/assets/doc/GC-Report-June19.pdf ; and The Ellen MacArthur Foundation (2019) *New Plastics Economy global commitment 2019 progress report*, https://www.ellenmacarthurfoundation.org/assets/downloads/Global-Commitment-2019-Progress-Report.pdf

51 In some cases these were not available in the company accounts and have been accessed from subsidiary accounts, financial media or other compilers of corporate information. These figures should therefore be regarded as unofficial estimates.

52 We only have PepsiCo figures for its beverage sales in Nigeria.

53 'Unit case' means a unit of measurement equal to 24 eight-ounce servings of finished beverage. '"Unit case volume" means the number of unit cases (or unit case equivalents) of company beverages directly or indirectly sold by the company and its bottling partners to customers,' as explained in the notes of this Coca-Cola press release: https://www.coca-colacompany.com/press-releases/the-coca-cola-company-reports-operating-results-q2-2018 [accessed 30 January 2020]

54 Unit case volume figures from The Coca-Cola Company (2019) *2018 Business & Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf; sales figures from its *2018 Financial Report*, https://www.coca-colacompany.com/investors/investors-info-reports-and-financial-information

55 Webb D and Schneider J (2018) *Everyday Plastic: what we throw away and where it goes*, https://www.everydayplastic.org

We carried out further desk-based research to see whether an alternative formula for this conversion had been developed, and also consulted WRAP (The Waste and Resources Action Programme) in the UK, but were unable to find any other equations to convert the weight of mixed, uncrushed plastic into volume.

56 Based on a bottle weight of 25g. The current weight of a 500ml bottle in most of Western Europe is 20g but Coca-Cola Hellenic, who also operate in low- and middle-income markets, indicate a bottle weight of 25g. Conservatively, we use this higher figure. (Sources: 'Redesign, collaborate and collect: Inside Coca-Cola European Partner's plastics strategy', https://www.edie.net/news/5/Redesign--collaborate-and-collect--Inside-Coca-Cola-European-Partner-s-plastics-strategy/ [accessed 6 February 2020] and 'Coca-Cola Hungary further decreases its ecological footprint – its plastic bottles lose 4 percent of weight again' https://hu.coca-colahellenic.com/en/media/news/coca-cola-hungary-decreases-pet-bottle-weight-by-another-4-percent/ [accessed 6 February 2020])

57 The total number of football pitches (83) does not match precisely with the individual figures given for each company, because we only count complete football pitches in the company specific figures, whereas the total includes these fractions.

58 UNEP (2019) *Emissions Gap Report 2019*, https://wedocs.unep.org/bitstream/handle/20.500.11822/30797/EGR2019.pdf?sequence=1&isAllowed=y

59 Unilever Sustainable Living Report Hub, https://www.unilever.com/sustainable-living/our-sustainable-living-report-hub/ [accessed 30 January 2020]

60 The Coca-Cola Company (2019) *2018 Business & Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf, p 43

61 The Coca-Cola Company (2019) *2018 Business & Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf

62 Royer S-J et al (2018) 'Production of methane and ethylene from plastic in the environment', *PLoS ONE* 13 (8), https://doi.org/10.1371/journal.pone.0200574

63 It is also because they use a higher proportion of a type of plastic called PET, as discussed below.

64 Unilever, *Our greenhouse gas footprint*, https://www.unilever.com/sustainable-living/reducing-environmental-impact/greenhouse-gases/Our-greenhouse-gas-footprint/ [accessed 30 January 2020]

65 PepsiCo Inc, *Climate Change 2019, CDP Disclosure*

66 The Coca-Cola Company, *Climate Change 2018, CDP Disclosure*

67 When evaluated over a 20-year time horizon. See Appendix 1 for more discussion of black carbon's global warming potential.

68 UNEP/ISWA (2015) *Global Waste Management Outlook*. http://web.unep.org/ourplanet/september-2015/unep-publications/global-waste-management-outlook

69 Guendehou S et al (2006) *2006 IPCC guidelines for national greenhouse gas inventories*, Chapter 5: 'Incineration and open burning of waste', https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_5_Ch5_IOB.pdf

Towprayoon S (2019) *2019 refinement to the 2006 IPCC guidelines for national greenhouse gas inventories*, Chapter 5: 'Incineration and open burning of waste', https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/

70 Based on our correspondence with Coca-Cola and meetings with staff.

71 The Coca-Cola Company (2019) *2018 Business & Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf These statistics appear to be for all countries but they are somewhat ambiguous. On p 60 the percentages seem to refer to developed countries; on p 61 the (same) percentages refer to the global picture. In addition, Coca-Cola had hoped to be collecting 75 per cent of its plastic in high-income countries by 2020, but this target does not appear to be clearly reported against with comparable figures.

72 The Coca-Cola Company (2019) *2018 Business & Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf This is the figure for non-returnable plastic bottles, given on page 15 of its report. It is unclear whether this relates to all markets or just high-income markets [accessed 5 December 2019]

73 Tearfund (2019) *No time to waste: tackling the plastic pollution crisis before it's too late*, www.tearfund.org/notimetowaste

74 Kaza S et al (2018) *What a waste 2.0: a global snapshot of solid waste management to 2050*, Urban Development, p 17. Washington, DC: World Bank, http://hdl.handle.net/10986/30317

75 For more details, please see Tearfund (2019) *No time to waste: tackling the plastic pollution crisis before it's too late*, www.tearfund.org/notimetowaste

76 Kishamawe C et al (2019) 'Trends, patterns and causes of respiratory disease mortality among inpatients in Tanzania, 2006-2015', *Trop Med Int Health 2019* Jan; 24(1): 91-100, https://www.ncbi.nlm.nih.gov/pubmed/30303586

77 Institute for Health Metrics and Evaluation, 'Tanzania', http://www.healthdata.org/tanzania

78 Unicef (2019) 'Diarrhoeal disease', https://data.unicef.org/topic/child-health/diarrhoeal-disease/ – see the excel doc entitled 'Diarrhoea as a cause of death in children under 5'

79 Kilonzi M et al. (2019) 'Comparison of malaria treatment outcome of generic and innovator's anti-malarial drugs containing artemether–lumefantrine combination in the management of uncomplicated malaria amongst Tanzanian children',. *Malaria Journal* 18, 133 (2019), https://doi.org/10.1186/s12936-019-2769-z

80 LinkedIn page for Coca-Cola Kwanza Ltd,

https://www.linkedin.com/company/coca-cola-kwanza-ltd [accessed 30 January 2020]

81 LinkedIn page for Nyanza Bottling Company, https://www.linkedin.com/company/nyanza-bottling-company-ltd [accessed 30 January 2020]

82 https://www.ippgroup.co.tz/companies/view/bonite-bottlers-limited-bbl [accessed 30 January 2020]

83 There is some ambiguity as to the ownership structure of Kilimanjaro. It isn't displayed as a brand on Coca-Cola's website, but Kilimanjaro bottles claim that Kilimanjaro is trademarked to Coca-Cola, and adverts for it in Tanzania also display the Coca-Cola logo. We asked Bonite Bottlers for clarification and did not receive a response.

84 SBC Tanzania Limited website, http://www.sbctanzania.com/overview.html [accessed 30 January 2020]

85 Kaza S et al (2018) *What a waste 2.0: a global snapshot of solid waste management to 2050*, Urban Development. Washington, DC: World Bank, http://hdl.handle.net/10986/30317 This report defines municipal solid waste as including 'residential, commercial, and institutional waste'.

86 Yehdego M (2017) *From sanitary landfill to a dump site: Pugu Kinyamwezi community curse in Dar es Salaam, Tanzania*, DO 10.13140/RG.2.2.27828.04483, https://www.researchgate.net/publication/316561973

87 Ibid

88 Breeze R (2012) *Municipal solid waste management in Dar es Salaam: draft baseline analysis, prepared for the World Bank*, http://siteresources.worldbank.org/INTUSWM/Resources/463617-1202332338898/MSWM_Dar-es-Salaam.pdf

89 Yhdego M (2017) *From sanitary landfill to a dump site: Pugu Kinyamwezi community curse in Dar es Salaam, Tanzania*, DO 10.13140/RG.2.2.27828.04483, https://www.researchgate.net/publication/316561973 and Yhdego M (2019) *Environment impact assessment: Pugu Kinyamwezi Sanitary Landfill Dar es Salaam*, https://www.researchgate.net/publication/336667064_ENVIRONMENTAL_IMPACT_ASSESSMENT_Pugu_Kinyamwezi_Sanitary_Landfill_Dar_es_Salaam

90 SMEC (2013) *Consultancy services for improvement of Solid Waste Management in Dar es Salaam. Local authorities in support of preparation of the proposed DMDP. Initial draft report.* Prime Minister regional administration and local government, cited in Yhdego M (2017) *From sanitary landfill to a dump site: Pugu Kinyamwezi community curse in Dar es Salaam, Tanzania*, DO 10.13140/RG.2.2.27828.04483, https://www.researchgate.net/publication/316561973

91 UNEP (2018) *Single-use plastics: a roadmap for sustainability*, https://wedocs.unep.org/handle/20.500.11822/25496, p 12

# ENDNOTES

92 Tanzania National Bureau of Statistics, '2017-18 Household Budget Survey: Key Indicators Report' available at https://www.nbs.go.tz/index.php/en/census-surveys/poverty-indicators-statistics/household-budget-survey-hbs/413-the-2017-18-household-budget-survey-key-indicators-report [accessed 6 February 2020] it suggests average monthly consumption per household of 417,000 TZS.

93 The title of Coca-Cola's initiative on packaging. Available at: https://www.coca-colacompany.com/news/progress-toward-a-world-without-waste [accessed 31 January 2020]

94 Taken from PepsiCo's vision statement: 'Be the global leader in convenient foods and beverages by winning with purpose.' Available at: https://www.pepsico.com/about/mission-and-vision [accessed 31 January 2020]

95 Taken from PepsiCo's website: https://www.pepsico.com/sustainability/beyond-the-bottle [accessed 31 January 2020]

96 UNEP (2018) *Legal limits on single-use plastics and micro-plastics: a global review of national laws and regulations*, https://wedocs.unep.org/bitstream/handle/20.500.11822/27113/plastics_limits.pdf?sequence=1&isAllowed=y [accessed 31 January 2020]

97 Ibid

98 Brooks A (2019) 'Kenya: President Kenyatta promises plastic ban by 2020', *East Africa Monitor*, 30 October 2019, https://eastafricamonitor.com/kenya-president-kenyatta-promises-plastic-ban-by-2020/ [accessed 31 January 2020]

99 Mugisha I R (2019) 'Rwanda bans all single-use plastics', *The East African*, 21 October 2019, https://www.theeastafrican.co.ke/news/ea/Rwanda-bans-all-single-use-plastics/4552908-5318814-akk8csz/index.html [accessed 31 January 2020]

100 Westcott B and He L (2020) 'China announces plan to phase out most single-use plastics by 2025', *CTV News*, 20 January 2020, https://www.ctvnews.ca/sci-tech/china-announces-plan-to-phase-out-most-single-use-plastics-by-2025-1.4774728?cache=yesclipId104062%3FclipId%3D68597%3FclipId%3D104070 [accessed 31 January 2020]

101 Stanway D(2019) 'China's Hainan to ban single-use plastics by 2025: state media'. *Reuters*, 22 February 2019, https://uk.reuters.com/article/us-china-environment-plastic/chinas-hainan-to-ban-single-use-plastics-by-2025-state-media-idUKKCN1QB013 [accessed 31 January 2020]

102 Gu J (2019) 'Modi has vowed to ban single-use plastics to fight India's trash crisis', *CNN*, 15 August 2019, https://edition.cnn.com/2019/08/15/asia/india-single-use-plastic-ban-scli-intl/index.html [accessed 31 January 2020]

103 Dasgupta N (2019) 'India shelves plan on countrywide ban on single-use plastic products', *Reuters*, 22 February 2019, https://uk.reuters.com/article/us-india-pollution-plastic/india-shelves-plan-on-countrywide-ban-on-single-use-plastic-products-idUKKBN1WG43W [accessed 31 January 2020]

104 Kalra A (2019)' Spooked by PM Modi's plastics ban, India Inc seeks clarity, exemptions', *Reuters*, 18 September 2019, https://www.reuters.com/article/us-india-pollution-plastic/spooked-by-modis-plastics-ban-india-inc-seeks-clarity-exemptions-idUSKBN1W21I6 [accessed 31 January 2020]

105 Phartiyal S and Rajendra J (2019) 'India state softens plastic ban after industry lobbying', *Reuters*, 3 July 2018, https://uk.reuters.com/article/us-india-plastic-ban/indian-state-softens-plastic-ban-after-industry-lobbying-idUKKBN1JT1H4 [accessed 31 January 2020] and Dalugdug A (2018) 'Report: Amazon, H&M among companies lobbying to ease plastic ban in Indian state', S&P Global Market Intelligence, 29 June 2018,https://www.spglobal.com/marketintelligence/en/news-insights/trending/ltlwxcpdksrjtpvc_pgilw2 [accessed 31 January 2020]

106 Sharma NC (2019), 'Government plans to put companies using plastic on the radar', *LiveMint*, 2 October 2019, https://www.livemint.com/news/india/government-plans-to-put-companies-using-plastic-on-the-radar-11570012506099.htmlhttps://www.livemint.com/ [accessed 31 January 2020]

107 Rating this 8 or above on a 10-point scale (where 1 = not at all a concern and 10 = very serious concern)

108 Break Free From Plastic Coalition (2019) *The Brand Audit Report 2019*, https://www.breakfreefromplastic.org/globalbrandauditreport2019/ [accessed 31 January 2020]

109 Kantar and Europanel (2019) *Who cares, who does? Consumer response to plastic waste*, https://www.kantarworldpanel.com/global/News/Who-Cares,-Who-Does-Consumer-response-to-plastic-waste#downloadThankyou

110 Kantar and Europanel (2019) *Who cares, who does? Consumer response to plastic waste*, September 2019, https://www.kantarworldpanel.com/global/News/Who-Cares,-Who-Does-Consumer-response-to-plastic-waste#downloadThankyou [accessed 31 January 2020]

111 Ibid

112 Kemira press release: 'International consumer survey: concern over plastic use is reflected in consumer attitudes on food packaging',.16 October 2019, https://www.kemira.com/company/media/newsroom/releases/international-consumer-survey-concern-over-plastic-use-is-reflected-in-consumer-attitudes-on-food-packaging/ [accessed 31 January 2020]

113 GAIA, '7 out of 10 Filipinos favor a national single-use plastics ban, survey reveals', 21 January 2020, https://www.no-burn.org/7-out-of-10-filipinos-favor-a-national-single-use-plastics-ban-survey-reveals/ [accessed 31 January 2020]

114 Greenpeace (2019) *Throwing away the future: how companies still have it wrong on plastic pollution solutions*, https://storage.googleapis.com/planet4-international-stateless/2019/09/8a1d1791-falsesolutions2019.pdf [accessed 3 February 2020]

115 Ellen MacArthur Foundation and UNEP (2019) *The New Plastics Economy global commitment 2019 progress report*, https://www.ellenmacarthurfoundation.org/assets/downloads/Global-Commitment-2019-Progress-Report-Summary.pdf [accessed 3 February 2020]

116 Nestlé press release:'Nestlé inaugurates packaging research institute, first-of-its-kind in the food industry',12 September 2019, https://www.Nestlé.com/media/pressreleases/allpressreleases/Nestlé-inaugurates-packaging-research-institute [accessed 3 February 2020]

117 Unilever, 'Rethinking plastic packaging – towards a circular economy', https://www.unilever.com/sustainable-living/reducing-environmental-impact/waste-and-packaging/rethinking-plastic-packaging/

118 Clancy H (2019) 'The startup disrupting Unilever', GreenBiz, 26 September 2019, https://www.greenbiz.com/article/startup-disrupting-unilever [accessed 3 February 2019]

119 Culliney K (2018) 'Coca-Cola Brazil wants 40% of its bottles to be returnable by 2020', *Food Navigator*, 28 November 2018, https://www.foodnavigator-latam.com/Article/2018/11/282/Coca-Cola-Brazil-wants-40-of-its-bottles-to-be-returnable-by-2020# [ accessed 3 February 2020]

120 Henderson E (2017), 'How Dabbawalas became the world's best food delivery system', *The Independent*, 4 August 2017, https://www.independent.co.uk/life-style/food-and-drink/dabbawalas-food-delivery-system-mumbai-india-lunchbox-work-lunch-tiffin-dabbas-a7859701.html [ accessed 3 February 2010]

121 Caldicott and Caldicott (2014) 'Time for tiffin: the history of India's lunch in a box', *The Guardian*, 17 August 2014, https://www.theguardian.com/lifeandstyle/2014/aug/17/tiffin-the-history-of-indias-lunch-in-a-box-mumbai [accessed 3 February 2020]

122 Ellen MacArthur Foundation and New Plastics Economy (2019) *Reuse: rethinking packaging*, https://www.ellenmacarthurfoundation.org/assets/downloads/Reuse.pdf [accessed 3 February 2020]

123 Bengali S (2019), 'The tiny plastic packages that are fueling Asia's waste crisis', *LA Times*, 10 November 2019, https://www.latimes.com/world-nation/story/2019-11-10/the-tiny-plastic-packages-that-are-fueling-asias-waste-crisis [accessed 2 February 2020]

124 Coca-Cola, *2014/2015 Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2014-2015-sustainability-report.pdf [accessed 30/01/2020]]

125 Nestlé, 'Climate change leadership', https://www.nestle.com/csv/impact/climate-change/climate-change [accessed 30 January 2020]

126 PepsiCo, 'Climate change', https://www.pepsico.com/sustainability/climate-change [accessed 30 January 2020

127 Unilever, 'Global climate action', https://www.unilever.com/sustainable-living/reducing-environmental-impact/greenhouse-gases/global-climate-action/ [accessed 30 January 2020]

128 PepsiCo, 'Health and wellness approach and engagement', https://www.pepsico.com/docs/album/esg-topics-policies/health-and-wellness-approach-and-engagement.pdf?sfvrsn=e5c67405_8

129 Coca-Cola Hellenic Bottling Company, 'Health and wellness policy', https://coca-colahellenic.com/en/about-us/policies/health-wellness-policy/ [accessed 30 January 2020]

130 Nestlé, *Climate Change 2018, Disclosure to CDP*

131 Unilever Sustainable Living Report Hub, https://www.unilever.com/sustainable-living/our-sustainable-living-report-hub/ [accessed 30 January 2020]

132 Our initial recommendation on country-by-country reporting called for disclosure of units only. However, volume is also important as a key determinant of the impacts on people's health and the environment, hence we have amended our call to also include volume.

133 Ideally companies should work with governments to establish mandatory EPR schemes, but in the short-term voluntary EPR schemes – coordinated with government – can allow rapid progress.

# ENDNOTES

134 We don't discuss the context for this recommendation in detail in this report, but more information can be found in Tearfund (2019) *No time to waste: tackling the plastic pollution crisis before it's too late*, www.tearfund.org/notimetowaste

135 Our initial recommendation on country-by-country reporting called for disclosure of units only. However, volume is also important as a key determinant of the impacts on people's health and the environment, hence we have amended our call to include volume.

136 The exception being people with particular disabilities that require the use of straws

137 Bio-based, 'biodegradable' or compostable plastics are not a solution to the plastic pollution crisis as they present similar risks to the environment as conventional plastics and can propagate linear material flows that undermine the transition to a circular economy.

138 Tearfund (2019) *No time to waste: tackling the plastic pollution crisis before it's too late*, www.tearfund.org/notimetowaste

139 The Coca-Cola Company (2019) *2018 Business and Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf

PepsiCo (2019) *2018 PepsiCo Annual Report*, https://www.pepsico.com/docs/album/annual-reports/2018-annual-report.pdf?sfvrsn=35d1d2bc_2

Nestlé (2019) *Annual Review 2018*, https://www.Nestlé.com/investors/annual-report

Unilever (2019) *Unilever Annual Report and Accounts 2018*, https://www.unilever.com/Images/unilever-annual-report-and-accounts-2018_tcm244-534881_en.pdf

140 'Unit case' means a unit of measurement equal to 24 eight-ounce servings of finished beverage. '"Unit case volume" means the number of unit cases (or unit case equivalents) of company beverages directly or indirectly sold by the company and its bottling partners to customers,' as explained in the notes of this Coca-Cola press release: https://www.coca-colacompany.com/press-releases/the-coca-cola-company-reports-operating-results-q2-2018 [accessed 30 January 2020]

141 The Coca-Cola Company (2019) *2018 Business and Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf, p 61

142 Global plastic packaging volumes for Coca-Cola, Nestlé and Unilever are published in The Ellen MacArthur Foundation (2019) *New Plastics Economy global commitment June 2019 report*, https://www.newplasticseconomy.org/assets/doc/GC-Report-June19.pdf

PepsiCo's global plastic packaging volume is published in The Ellen MacArthur Foundation (2019) *New Plastics Economy global commitment 2019 progress report*, https://www.ellenmacarthurfoundation.org/assets/downloads/Global-Commitment-2019-Progress-Report.pdf

143 The Coca-Cola Company (2019) *2018 Business & Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf, p 61

144 Coca-Cola India website – https://www.coca-colaindia.com/sustainability-report/sustainability-recycling – gives the figure as 30% of all packaging of beverages [accessed 28 January 2020]

145 Ibid

146 The Ellen MacArthur Foundation (2019) *The New Plastics Economy global commitment 2019 progress report*, https://www.newplasticseconomy.org/assets/doc/Global-Commitment-2019-Progress-Report-Summary.pdf, p 32: 'In Brazil, The Coca-Cola Company invested USD 25 million to design reusable PET bottles and USD 400 million in expanding reuse infrastructure, to fulfill its aspiration to scale up reusable packaging to 50% by 2030 in Brazil, up from the current 20%.'

147 We know the global average use of refillables, plus the rates in India and Brazil. If we assume close to zero use of refillables in high-income countries, then some simple algebra allows us to infer an implied rate of 20 per cent for other regions: $\sum Viri/VG = 0.133$ where V is unit case volume, r is refill rate, the subscript i refers to each region or country and the subscript G refers to global.

148 Unit case volume figures from Coca-Cola's *2018 Business and Sustainability Report*; sales figures from the *2018 Financial Report*, https://www.coca-colacompany.com/investors/investors-info-reports-and-financial-information

149 Although Unilever is piloting refill schemes in several countries

150 Kaza S et al (2018) *What a waste 2.0: a global snapshot of solid waste management to 2050.* Urban Development; Washington, DC: World Bank, http://hdl.handle.net/10986/30317. See Appendix B, p 233ff

151 World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company (2016), *The New Plastics Economy – Rethinking the future of plastics*, http://www.ellenmacarthurfoundation.org/publications

152 Kaza S et al (2018) *What a waste 2.0: a global snapshot of solid waste management to 2050*, Urban Development, Washington, DC: World Bank. http://hdl.handle.net/10986/30317, p 35. According to this report, high-income countries generate approximately a third of the world's waste, and a larger share of its plastic waste.

153 World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company (2016), *The New Plastics Economy – Rethinking the future of plastics*, http://www.ellenmacarthurfoundation.org/publications, p 26

154 For example, De Souza Marotta Alfaia et al (2017), 'Municipal solid waste in Brazil: a review', *Waste Management and Research* Vol 35. https://www.ncbi.nlm.nih.gov/pubmed/29090660;

Ocean Conservancy and McKinsey Center for Business and Environment (2015) *Stemming the tide: land-based strategies for a plastic-free ocean*, https://oceanconservancy.org/wp-content/uploads/2017/04/full-report-stemming-the.pdf; Putri A R, Fujimori T & Takaoka M, 'Plastic waste management in Jakarta, Indonesia: evaluation of material flow and recycling scheme', *J Mater Cycles Waste Manag 20*, 2140–2149 (2018). Some studies on specific dumpsites suggest that in those locations, more flexible plastics are collected, but this is almost certainly because rigid plastics such as PET have already been removed by other operators higher up the chain, before waste reaches the dumpsite.

155 World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company (2016), *The New Plastics Economy – Rethinking the future of plastics*, http://www.ellenmacarthurfoundation.org/publications, p 26

156 GA Circular (2019) *Full Circle: accelerating the circular economy for post-consumer PET bottles in Southeast Asia*, sponsored by Coca-Cola, https://www.gacircular.com/full-circle/ The five countries are the Philippines, Vietnam, Thailand, Myanmar and Malaysia.

157 Ibid, p 73

158 Sasaki et al (2014) 'Household income, living and working conditions of dumpsite waste pickers in Bantar Gebang: toward integrated waste management in Indonesia', *Resources Conservation and Recycling* Vol 89

159 Putri A R, Fujimori T and Takaoka M, 'Plastic waste management in Jakarta, Indonesia: evaluation of material flow and recycling scheme', *J Mater Cycles Waste Manag* 20, 2140–2149 (2018); Ocean Conservancy and McKinsey Center for Business and Environment (2015) *Stemming the tide: land-based strategies for a plastic-free ocean*, https://oceanconservancy.org/wp-content/uploads/2017/04/full-report-stemming-the.pdf;

160 United Nations Department of Economic and Social Affairs, Population Dynamics, World Urbanization Prospects 2018, Country Profiles, https://population.un.org/wup/Country-Profiles/

161 Wang A et al (2017) 'Rural solid waste management in China: status, problems and challenges', Sustainability 2017, 9(4), 506. https://www.mdpi.com/2071-1050/9/4/506

162 Ibid

163 CSIR-National Chemical Laboratory Innovations (2017) *PET recycling in India: mapping the recycling landscape*, http://www.in-beverage.org/lca-pet/NCL%20Report_Indian%20PET%20Recycling%20Landscape__Final_Ver%2003_December%202017.pdf

164 Mahapatra D (2013) 'Plastic waste time bomb ticking for India, SC says.' *Times of India*, https://timesofindia.indiatimes.com/home/environment/pollution/Plastic-waste-time-bomb-ticking-for-India-SC-says/articleshow/19370833.cms [accessed 30 January 2020]

165 GA Circular (2019) *Full Circle: Accelerating the Circular Economy for Post-Consumer PET Bottles in Southeast Asia Indonesia*, sponsored by Coca-Cola, https://www.gacircular.com/full-circle/

166 de Souza Marotta Alfaia R et al (2017) 'Municipal solid waste in Brazil: A review', *Waste Management & Research* 2017, Vol. 35(12) 1195 –1209. https://journals.sagepub.com/doi/pdf/10.1177/0734242X17735375 . The 51% statistic is credited to ABIPET (2016) Censo da reciclagem de PET no Brasil.

167 See, for example http://cempre.org.br/upload/CEMPRE-Review2019.pdf

168 PETSTAR (2019) *Sustainability Report 2019*, https://www.petstar.mx/media/1862/informe-de-sustentabilidad-ingles-2018-version-final.pdf The shareholders are the various Coca-Cola bottling plants in Mexico, as well as Coca-Cola Mexico.

169 There are relatively few purchasers for recyclable PET, and collection is still at a low level: for example, see: https://www.bloomberg.com/news/articles/2019-11-13/nigeria-enlists-big-beverage-companies-to-fight-plastic-waste

170 Webb D and Schneider J (2018) *Everyday Plastic: what we throw away and where it goes*, https://www.everydayplastic.org

171 UNEP/ISWA (2015) *Global Waste Management Outlook*, http://web.unep.org/ourplanet/september-2015/unep-publications/global-waste-management-outlook

172 Guendehou S et al (2006), *2006 IPCC guidelines for national greenhouse gas inventories*, Chapter 5: 'Incineration and open burning of waste', https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_5_Ch5_IOB.pdf

Towprayoon S (2019) *2019 refinement to the 2006 IPCC guidelines for national greenhouse gas inventories*, Chapter 5: 'Incineration and open burning of waste', https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/

# ENDNOTES


173 Wiedinmyer C et al (2014) 'Global emissions of trace gases, particulate matter, and hazardous air pollutants from open burning of domestic waste', *Environmental Science and Technology*, 48 (16), pp 9523–9530, https://www.ncbi.nlm.nih.gov/pubmed/25019173

174 Reyna Bensusan N (2019) 'Experimental measurements of black carbon emission factors to estimate the global impact of uncontrolled burning of waste', *Atmospheric Environment*, Vol. 213, 629 – 639. https://doi.org/10.1016/j.atmosenv.2019.06.047

175 One specific form of particulate matter is possibly worth mentioning briefly here: organic carbon, which is a co-emitted particle that can have a cooling effect on the climate. Emissions of organic carbon are most strongly associated with the burning of wood and other biomass, rather than with the burning of fossil fuels, and relatively small amounts of it would be emitted by burning plastic. Furthermore, its cooling effect, for an emission of similar mass, is a factor of ten smaller than the warming effect of black carbon (Fuglestvedt et al [2010], 'Transport impacts on atmosphere and climate': Metrics. *Atmospheric Environment*, 44, 4648-4677)

176 Kistier and Muffett (2019), *Plastic and climate*, Centre for International Environmental Law, https://www.ciel.org/wp-content/uploads/2019/05/Plastic-and-Climate-FINAL-2019.pdf

177 As presented in the annex to Kistier and Muffett (2019), *Plastic and climate*, Centre for International Environmental Law, https://www.ciel.org/wp-content/uploads/2019/05/Plastic-and-Climate-FINAL-2019.pdf

178 Ibid

179 New cars emitted 125 grams of $CO_2$ per km (201 grams per mile), but the average car in use was reported to have emissions 20% higher than this. Source: Society of Motor Manufacturers and Traders, https://www.smmt.co.uk/reports/co2-report/

180 RAC Foundation, https://www.racfoundation.org/motoring-faqs/mobility#a1

181 Jezek et al (2015), 'Black carbon, particle number concentration and nitrogen oxide emission factors of random in-use vehicles measured with the on-road chasing method', *Atmospheric Chemistry and Physics* 15(11)

182 The characteristics of the car fleet in Slovenia were qualitatively similar to that of the total EU car fleet in this year.

183 Jezek et al (2015), 'Black carbon, particle number concentration and nitrogen oxide emission factors of random in-use vehicles measured with the on-road chasing method', *Atmospheric Chemistry and Physics* 15(11) page 15373.

184 This is extremely conservative, as new EU regulations since 2011 have also further tightened emissions factors.

185 https://www.gov.uk/government/statistical-data-sets/energy-and-environment-data-tables-env#fuel-consumption-env01

186 The Coca-Cola Company, *Climate Change 2018, CDP Disclosure*, pp 39 and 47

187 Client Earth, *Reducing particulate matter emissions from diesel vehicles and equipment*, available at https://www.healthyair.org.uk/documents/2013/10/black-carbon-retrofit-guidance.pdf/

188 The Coca-Cola Company (2019) *2018 Business & Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf

189 Coca-Cola Hellenic Bottling Company (2018) *In good company: 2018 Integrated Annual Report*, https://coca-colahellenic.com/Campaigns/AnnualReport2018/assets/pdf/Coca-Cola%20HBC%202018_IAR_15Mar2019.pdf

190 Nestlé (2019) *Annual Review 2018*, https://www.Nestlé.com/investors/annual-report

191 Nestlé Nigeria Plc (2019) Unaudited Financial Statements for the period ended 31 March 2019, https://www.nestle-cwa.com/sites/g/files/pydnoa346/files/asset-library/documents/unaudited_financial_statement_march_2019.pdf

192 PepsiCo (2019) *2018 PepsiCo Annual Report*, https://www.pepsico.com/docs/album/annual-reports/2018-annual-report.pdf?sfvrsn=35d1d2bc_2

193 Malviya S and Bhushan R (2017) 'Coca-Cola beats rival PepsiCo with double-digit revenue growth in FY17', *The Economic Times*, https://economictimes.indiatimes.com/markets/stocks/earnings/coca-cola-beats-rival-pepsico-with-double-digit-revenue-growth-in-fy17/articleshow/61811811.cms?from=mdr

194 Desiderio L (2019) 'Pepsi sees improved sales volume this year', *The Philippine Star*, https://www.philstar.com/business/2019/06/28/1930037/pepsi-sees-improved-sales-volume-year

195 Seven-Up Bottling Company (2017) 'Financial statement to the Nigerian Stock Exchange and shareholders on the interim unaudited financial statement for the quarter and nine months ended 31st December 2017', http://www.nse.com.ng/Financial_NewsDocs/20773_7-UP_BOTTLING_COMP._PLC._FINANCIAL_STATEMENTS_JANUARY_2018.pdf

196 https://graphics.reuters.com/USA-CHINA-MARKETS-EU/0100900600D/index.html

197 Hindustan Unilever Limited (2017) *Making sustainable living commonplace: Hindustan Unilever Limited Annual Report 2018-19*, https://www.hul.co.in/Images/hul-annual-report-2018-19_tcm1255-537453_1_en.pdf

198 'In 2017, the company generated a revenue of approximately 12.15 billion Brazilian Reals', https://www.statista.com/statistics/800467/unilever-net-revenue-brazil/

199 http://www.hoovers.com/company-information/cs/company-profile.unilever_de_m%C3%83%C6%92%C3%82%C2%A9xico_s_de_rl_de_cv.de9d26f89314d427.html?aka_re=2 [accessed 6 January 2020]

200 https://www.pressreader.com/philippines/the-philippine-star/20180820/282741997646567 [accessed 6 January 2020]

201 Unilever Nigeria Plc (2018) *Annual Report 2018 Unilever Nigeria Plc*, https://www.unilever-ewa.com/Images/unilever-audited-financial-statements-ye-31-december--2018_tcm1283-535769_1_en.pdf

202 GA Circular (2019) *Full Circle: Accelerating the Circular Economy for Post-Consumer PET Bottles in Southeast Asia Indonesia*, sponsored by Coca-Cola, https://www.gacircular.com/full-circle/

203 The Coca-Cola Company (2019) *2018 Business & Sustainability Report*, https://www.coca-cola.co.uk/content/dam/journey/gb/en/hidden/PDFs/2019/Coca-Cola-Business-and-Sustainability-Report.pdf, p61 In the list of 'packaging mix', the report refers to 'plastic (primarily PET) bottles'.

204 We assume that PepsiCo's beverage business (which comprises 46% of its sales) uses 90% PET, and 10% other plastics. We assume that its food business (which comprises 54% of its sales) uses half PET and half other plastics (since both PET and PP are commonly used to make metalised films).

'THE DUMP IS ON FIRE EVERY TWO DAYS. SOMETIMES, THE SMOKE IS SO DARK AND HUGE THAT YOU CAN'T SEE THE PERSON IN FRONT OF YOU OR THE HOUSE NEXT TO YOU. I GET BREATHING PROBLEMS AND COUGHING, AND EYE PROBLEMS TOO. THE KIDS COUGH A LOT.'

ROYDA JOSEPH, TANZANIA

tearfund

renew our world

Tearfund is part of the global movement Renew Our World

learn.tearfund.org

100 Church Road, Teddington TW11 8QE, United Kingdom
T +44 (0) 20 3906 3906 E publications@tearfund.org

Registered office as above. Registered in England 00994339. A company limited by guarantee.
Registered Charity No. 265464 (England & Wales) Registered Charity No. SC037624 (Scotland)

00252-(0320)