

Plastic pollution and flood risk

An estimate of the number of people at risk of more severe and frequent flooding due to plastic pollution, and its relevance to the UN plastic treaty

Plastic pollution acts as a significant threat multiplier when it comes to flood risk. As climate change makes rainfall events more intense and frequent, plastic pollution is blocking drainage systems in poor urban areas (slums) posing a serious danger to communities living in flood-risk areas.

As far back as 1988 it was reported that plastic bags blocking waterways in Bangladesh contributed to devastating flooding, with two-thirds of the country submerged¹. Since then several research studies have increased our understanding of the extent of plastic-aggravated flooding, but to date, no research has attempted to quantify how many people globally are at risk of plastic-aggravated flooding events.



Photo credits: Background: Moeah Films/Tearfund. Inset: Instituto Solidare/Tearfund

218 million people are at high risk of plastic-aggravated flooding worldwide*.

This represents 3% of the global population, equivalent to the populations of the UK, France and Germany combined.

Of these, 41 million are infants, elderly people or people with disabilities who are at particularly high risk of severe health impacts.

*Using the same flooding definition as Rentschler et al (2022) 'Flood exposure and poverty in 188 countries': 1-in-100 year floods with inundation depths over 0.15m, which they find would pose a significant risk to lives and livelihoods (and the 1-in-100 year flood being that which has a 1% chance of occurring each year).



The findings

What is causing plastic-aggravated flooding and where is it happening?

Plastic-aggravated flooding is caused by plastic pollution blocking drainage systems, thus making flooding events more severe, as flood water is unable to drain away as it would under normal circumstances.

This is in large part caused by recent increases in plastic waste (which doubled globally between 2000 and 2019²) coupled with poor solid waste management.

Densely populated slums in South Asia, East Asia and Pacific and sub-Saharan Africa are likely to be experiencing the worst effects of plastic-aggravated flooding due to rapid, poorly planned development with limited flood mitigation infrastructure.

Who is affected and what are the health impacts?

People in urban poverty are most likely to be impacted by health-related issues due to flooding.

Children are twice as likely to ingest polluted flood water leading to enteric infections³.

Flooding events pose both immediate and long-term dangers to human health. Cholera and other gastrointestinal infections are the major health risks. Skin infections, vector-borne (e.g. mosquito) diseases and mental health issues have also been associated with flooding, but the relationship remains less well understood.

Will it get worse in the future?

Mismanaged plastic waste will continue to increase globally under a business-as-usual scenario, particularly on the continents of Africa and Asia⁴.

Over one billion people currently live in slums globally and this is expected to reach 3 billion by 2050⁵.

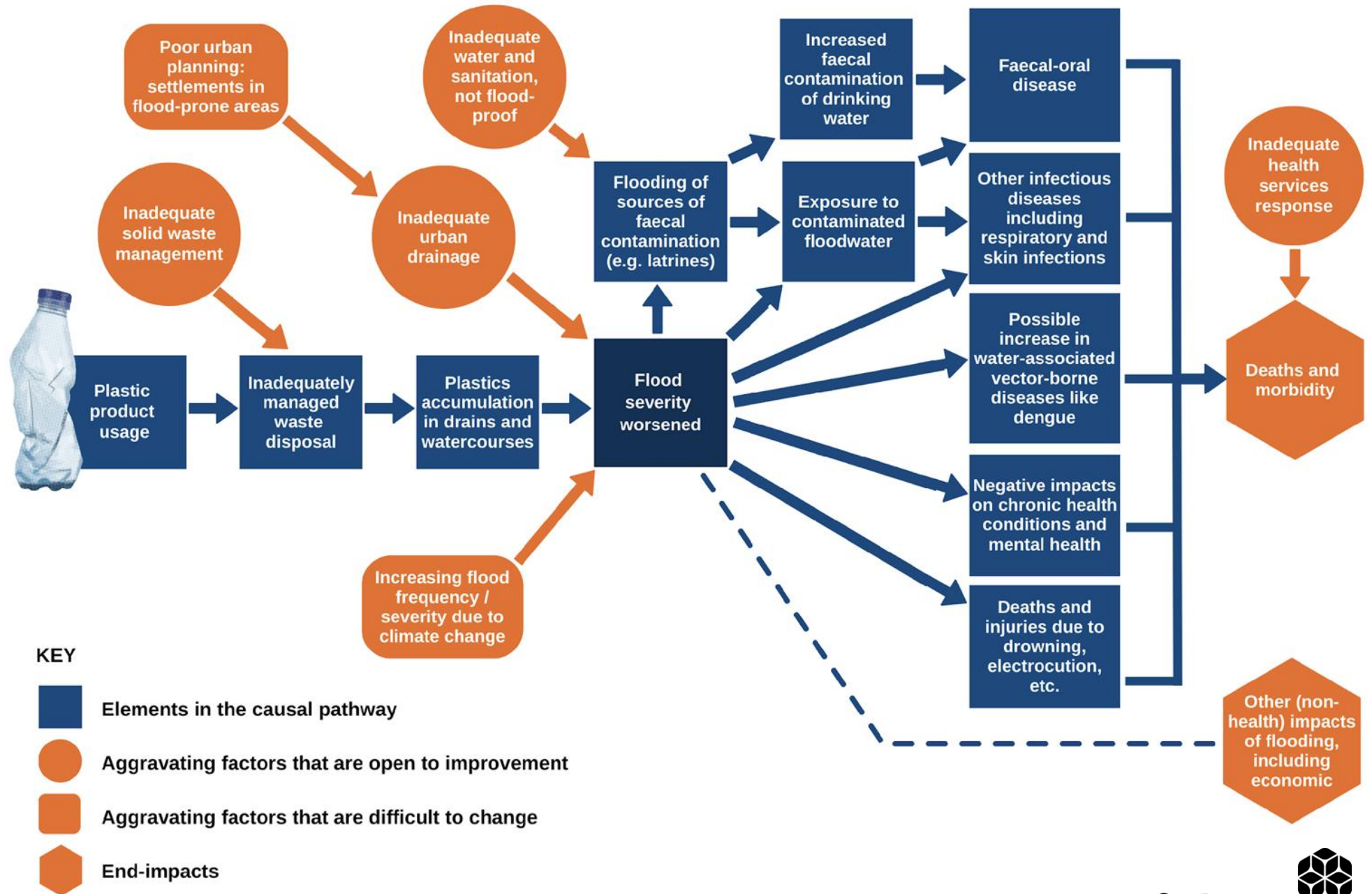
Due to climate change, precipitation events are becoming more intense with increased rainfall occurring over shorter time periods⁶.



Image: Kompas/Hendra A Setyawan (HAS)
<https://www.flickr.com/photos/worldmeteorologicalorganization/40040249760/in/faves-163849083@N02/>

Causal pathways linking plastic pollution, flooding and health

This is a summary representation of the main causal pathways linking plastic pollution, flooding and health.



Global population at risk of plastic-aggravated flooding

The percentage of populations at risk of plastic-aggravated flooding worldwide, as identified through our estimation model.

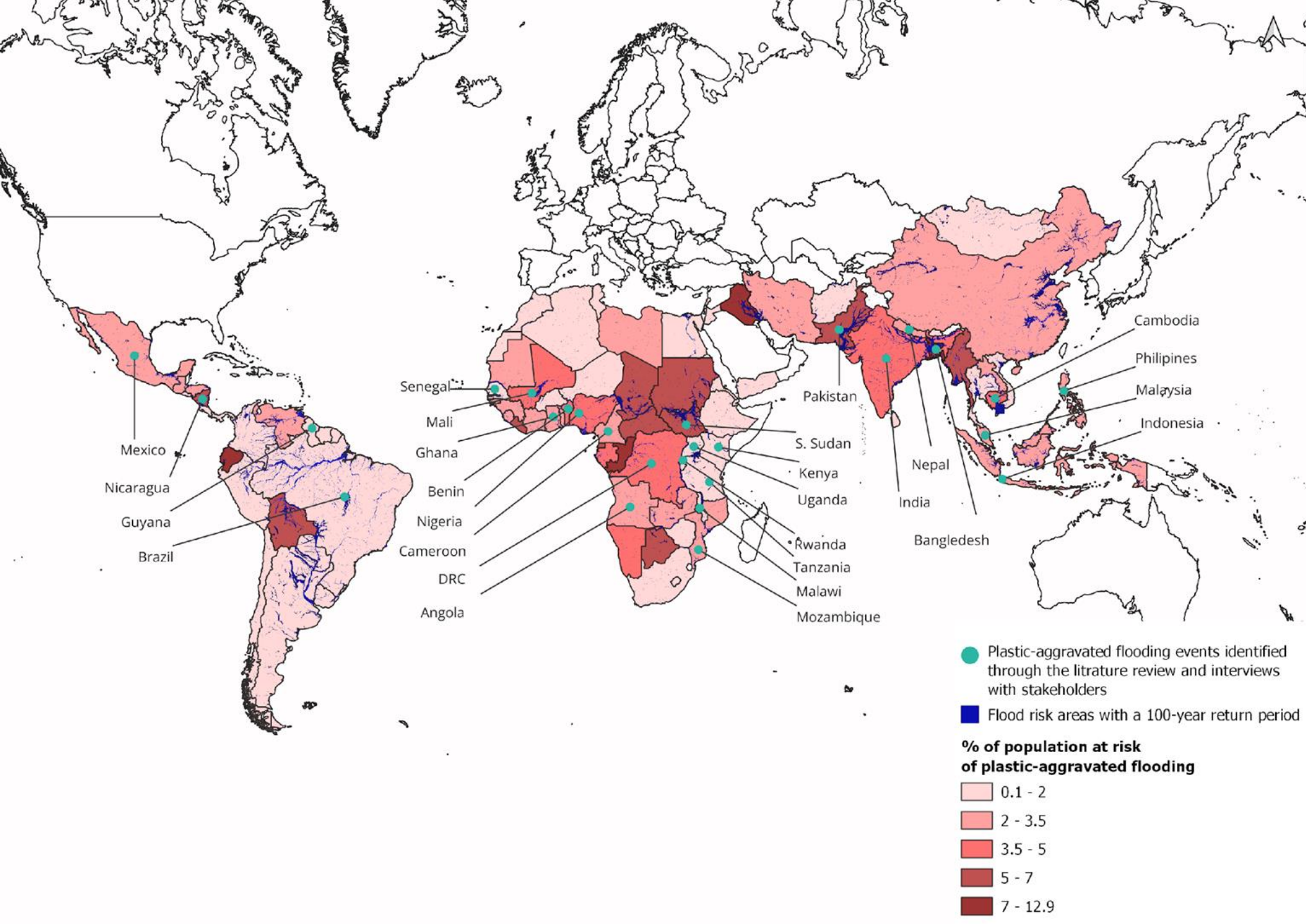




Image: Tom Price/Bin Twinning

The estimation methodology

As a starting point, a study by Rentschler *et al.* was used which estimated the population at significant of flood exposure in 188 countries globally. We then identify those within this group for whom plastic pollution is aggravating flood risk.

Our estimate considers only:

- low and middle-income countries; with
- high levels of mismanaged plastic waste per person; and within these countries:
- only urban areas;
- those living in slums in existing flood-risk areas.

We also exclude:

- coastal communities; and
- Small Island Developing States on the view that coastal flooding is unlikely to be aggravated by plastic (as opposed to fluvial and pluvial flooding).

This reflects the view – based on the literature review and key informant interviews – that plastic-aggravated flooding is primarily an urban issue, and that substantial impacts on well-being will largely be seen in slum communities of low- and middle-income countries with poor drainage, poor waste management, and poor water and sanitation services.

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Why it matters for the UN plastic treaty

With UN member states currently negotiating a global treaty on plastic pollution, the main objective of this research is to bring to light new evidence on plastic-aggravated flooding events and the negative consequences these events have on human health.

The extent of plastic-aggravated flooding is significant, and the associated health impacts are serious. Furthermore, they affect those that are already vulnerable in poor, urban communities.

Further research to fully understand these impacts is needed and is directly in line with the core obligations proposed for the global plastics treaty, which has a stated focus on understanding how plastic pollution is impacting human health.

We estimate that 218 million people globally are at risk of plastic-aggravated flooding, but the true figure is likely much higher, as the research could not fully capture all at risk.

It is important to note that the negative health impacts associated with plastic-aggravated flooding are largely avoidable.

A greater understanding of the composition, quantity and behaviour of plastic pollution in drainage systems in urban areas of low- and middle-income countries, and the important connection this has to human health, would shed light on key mitigating actions. Action to eliminate problematic plastics and improve waste management would clearly be beneficial, particularly to marginalised communities.

For further information please refer to the full research report or contact **Lucy Tanner** at lucy.tanner@tearfund.org or **Brendan Cooper** at brendan.cooper@resourcefutures.co.uk

Sources:

1. United Nations Environment Programme (2018) *Single-Use Plastics: A Roadmap for Sustainability (rev. 2)*
2. OECD (2022) *Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options*
3. Ballesteros (2010) *Linking Poverty and the Environment: Evidence from Slums in Philippine Cities*
4. Lebreton L., Andrady A. (2019) *Future scenarios of global plastic waste generation and disposal*
5. Khan et al (2019) *Slum settlement problem and solution: A case Report of Karachi*
6. World Weather Attributes (2022) *Climate change likely increased extreme monsoon rainfall, flooding highly vulnerable communities in Pakistan*

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