Research Article

The Environment and Society Centre

June 2023

Why lifecycle solutions are needed to tackle marine plastic pollution

Patrick Schröder, Jack Barrie and Niamh Brannigan

CHATHAM HOUSE

Chatham House, the Royal Institute of International Affairs, is a world-leading policy institute based in London. Our mission is to help governments and societies build a sustainably secure, prosperous and just world.

The leakage of plastics into terrestrial and aquatic environments is a substantial challenge that shows no sign of abatement. In 2019, 22 million tonnes (Mt) of plastics leaked into the environment globally and, according to the OCED's Global Plastics Outlook, this amount is expected to double to 44Mt by 2060 if no action is taken by the international community.

Addressing the global plastic pollution crisis will require a combination of approaches applied in a systematic way as well as informed decisions on how to spend limited resources. Therefore, national and international coordination across the plastics value chain will play a key role.

The social cost of inaction

The level of required investment to address the global plastic crisis is significant. However, the upfront costs will be more than offset by the avoided costs to society and the environment caused by mismanaged plastic waste in the long-term.

In recent years, several estimates have been made about the economic and societal costs of mismanaged plastics waste. For example, Deloitte has estimated that the economic cost of plastic pollution of rivers was between $6 and 19 billion globally in 2018, accounting for its loss to economic value in tourism, fisheries, aquaculture and the costs of clean-up activities although other estimates are even higher.

Carbon Tracker, focusing on the climate impacts of plastics, estimates that the social cost of one tonne of plastic is at least €840. This includes CO2 emissions from plastic production and waste, the impact of air pollution on health, the collection of waste and the cleaning up of cities and nature.

On a global scale, this amounts to almost €300 billion per year. UNEP-FI and Mindero Foundation estimates that the social costs associated with plastic-related chemicals already exceeds $100 billion per annum, much of it driven by harm to human health, and near-term corporate liabilities may exceed $20 billion in the US alone.

Looking forward, the World Wide Fund for Nature estimates that the societal lifetime cost of the plastic produced in 2040 could reach as much as $7.1 trillion (+/-$2.2 trillion) which is equivalent to approximately 85 per cent of global spending on health in 2018 and greater than the GDP of Germany, Canada and Australia in 2019 combined.

Beyond the environmental risks, the growing financial risks of unmanaged plastics pollution linked to human health and society, and financial risks for corporate investments, are a clear indication that urgent and effective action is needed.

Focusing on leakage hot spots

Plastic waste leakage is a complex problem that requires a tailored approach to policy design, public spending and investment. The Organisation for Economic Co-operation and Development (OECD) has analyzed different groups of countries based on a variety of factors including policy stringency, existing plastic waste infrastructure, per capita plastic consumption and plastic leakage rates.

Based on this classification, large emerging economies have been identified as a significant hotspot for plastic leakage into the environment. These countries typically have moderate policy stringency and infrastructure for plastic waste management but high rates of waste generation and plastic consumption. As a result, the amount of mismanaged waste is substantial with per capita plastic leakage estimated to be around 3kg per year.

Figure 1: Categories of plastic consumption, waste and leakage based on the OECD.

Country category	Typical plastic consumption levels	Typical plastic leakage rates	Policy objectives
High waste policy stringency, extensive waste management infrastructure and good data availability.	Very high per capita plastic consumption and production, but mismanaged waste low.	Plastic leakage low, about **0.20 to 0.40 kg per capita per year.** 	Policies that achieve demand side reduction and re-use models.
Moderate waste policy stringency, moderate waste management infrastructure and some data availability.	Waste generation rates are high, plastic content waste is high and the amounts of mismanaged waste are relatively high.	High average **per capita leakage of 3kg per year.** 	Policies such as EPR schemes, taxation and economic incentives to cover the costs of plastic waste management and recycling.
Low waste policy stringency, limited waste management infrastructure and lack of data availability.	Low waste generation rates, plastic contents are low, but there is insufficient infrastructure to capture the waste.	Relatively high average **per capita leakage of 1.7 kg per year.** 	Policies to attract investment for basic collection services, waste management and recycling infrastructure.

The OECD classification aligns with new data on riverine plastics pollution. Recent studies and models have become increasingly accurate in their estimates of plastic volumes and identification of geographic hotspots. For example, they show that 1,656 rivers are responsible for 80 per cent of global emissions of plastic waste into the ocean. The majority of these rivers are located in Asia, with the top ten polluters being middle-income countries, and the top three countries with highest levels of riverine plastic pollution being the Philippines, India and Malaysia.

Similarly, the Plastics Management Index by the Back to Blue Initiative evaluated selected countries on their ability to address plastic pollution based on governance, systemic capacity and stakeholder engagement. Middle-income countries such as Nigeria, Jordan, Mexico, Kenya, Egypt and India had the lowest overall scores which is a strong indication that, to address plastic pollution in middle-income countries, strong policy coordination and international cooperation to build institutional capacity and address the governance deficit is needed.

While low-income countries tend to have low per capita plastic consumption, they also lack basic waste management and collection services, and have higher leakage into water resources and the marine environment. Given the high costs of clean-ups of plastic waste once it has entered the marine environment, it is important to prioritize land-based plastic waste collection and treatment solutions. Targeted and cost-effective lifecycle solutions to prevent plastic pollution are needed especially because most solutions to stop marine plastics pollution need to be implemented in low- and middle-income countries.

From clean-ups to preventing leakage

Yet, many of the current efforts by national and local governments, industry and civil society are still highly uncoordinated and often focus on downstream solutions, in other words, the cleaning up of plastic waste after it has already leaked into the environment. While these efforts to recover plastics from the beaches and aquatic environments are laudable, particularly in terms of awareness-raising, the current capacity and widespread implementation are limited given the vast extent of the plastic pollution problem. They fail to address the source of plastic leakage and have negligible impact on the overall amounts of plastic waste in the environment.

Cleaning up marine debris from coastal environments is also expensive and it is hard for local governments and communities to recover the costs. For example, it cost around $8,900 per tonne of plastic removed from the beaches of the Aldabra Atoll, and with an estimated 513 tonnes of plastics on the Atoll's beaches, this approach would cost over $4.5 million making it clearly unaffordable. While community beach clean-ups are a good means of raising public awareness about marine pollution, and one way of collecting data on types of plastic waste, they are not making a big

difference in terms of the overall amount of plastic waste in the marine environment. Available funds would be better spent on waste management and recycling infrastructure.

Getting plastics back out of the ocean – for example the Ocean Cleanup project or Sea Cleaners Manta initiative – is even more expensive and technology-intensive and solutions remain at the proof-of-concept level. Cost estimates of such marine clean-up activities, and assigning responsibility for bearing such costs, vary widely. The cost of recovering plastics through sea bins, for example, an innovation set up to assist in cleaning up marinas and harbours, is between $1,200 and $1,500 per tonne of plastics.

While the Ocean Cleanup project has successfully removed 1,000 tonnes of plastic waste from the ocean, and the interceptors prevent plastics from polluting beaches, the solutions remain costly. Furthermore, it will only work for surface level floating plastic debris, which is not the biggest proportion of the 'plastic iceberg', which sinks and drifts under the surface.

Analysis of plastics collected from the Great Pacific Garbage Patch shows that most of the floating material stems from fishing activities. Indeed, between 500,000 and 1 million tonnes of abandoned or lost fishing gear – so-called 'ghost gear' – are entering the ocean every year, posing significant threats to marine wildlife, habitats and even the livelihoods of coastal communities.

While recent assessments for plastic inputs into the ocean point to coastal developing economies and rivers as major contributors into oceanic plastic pollution, most floating plastics in the North-Pacific subtropical gyre can be traced back to five industrialized fishing nations. Nevertheless, dealing with this ghost gear requires different solutions than addressing land-based plastic waste sources.

Furthermore, there are more leaked plastics accumulated in freshwater systems than in the ocean. Rivers have been identified as a hotspot due to the slow rate at which plastics move through rivers, accumulate and keep on flowing towards the ocean decades after they enter an aquatic environment. In fact, rivers function as long-term reservoirs or sinks for plastic pollution, with detrimental consequences for plants and animals. In this case, there is a role for so-called 'end-of-pipe' solutions such as river nets, booms and trash racks, screening and grit removal systems in wastewater and stormwater treatment works which captures the plastics in rivers before it reaches the oceans.

Projects and solutions to intercept leaked plastics in rivers, before they get to oceans, are more effective and less costly than clean-ups. However, they are still expensive – deployment of booms and operating costs can range from $22,500 to $30,000 per tonne of plastic waste recovered – which is prohibitively expensive for most communities especially compared to other land-based approaches. More innovative solutions such as TrashBoom – which is a scalable open-source barrier that stops plastic waste in the rivers

of developing countries and prevents ocean plastic by utilizing locally available low-cost materials – are needed.

Back to basics

Basic waste collection and management services are – and will – remain a priority since 2 billion people currently lack waste collection services. It is one of the major global development challenges in the context of the Sustainable Development Goals (SDGs) and 2030 Agenda. Indeed, by 2040, an additional 1.7 billion people will need to be connected to waste collection and management services. Yet municipal government budgets in most developing countries are already overstretched and expensive solutions are not an option. According to UN Habitat, in many developing countries, the costs for municipal solid waste management can amount to 20–40 per cent of total municipal revenues.

To achieve ambitious policy targets and reduce plastic pollution, substantial investments in improved waste management infrastructure must be made between now and 2060. McKinsey estimates that building functional waste management systems in emerging economies and the supporting infrastructure would cost $560 billion to $680 billion over the next decade.

Low-income countries in Sub-Saharan Africa will face the largest financial burden in tackling plastic pollution as they especially lack the necessary infrastructure for plastics recycling including collection systems, sorting facilities and processing plants. The OECD in the Global Plastics Outlook estimates that GDP in Sub-Saharan Africa would be reduced by 2.8 per cent below the baseline in the OECD ambitious policy scenario. This highlights the need for international financial support and leveraging private investments in infrastructure to ensure governments can implement the actions needed, realise the existing low-cost abatement opportunities and avoid low-income households being impacted.

Ensuring cost-effective solutions requires working with the informal sector especially in countries and cities where most of plastic waste is at risk of leaking into the environment due to insufficient formal solid waste management services and infrastructure. The ILO estimates there are up to 15 million informal waste pickers globally and is the case that many countries depend on the informal sector for collecting the majority of plastic waste. For example, informal waste pickers in Morocco collect more than 85 per cent of all plastic waste collected. It makes sense, therefore, in the short-to-medium term to leverage and support the existing capability and expertise of the informal sector in many high polluting countries. This can be done through legitimizing the profession, upgrading their work with new technologies and infrastructure, improving safety and expanding activities that focus on door-to-door collection rather than scavenging from dumpsites.

Yet eliciting the true cost of plastic waste management across the entire value chain, including the informal sector, is needed to implement effective policy solutions like Extended Producer Responsibility (EPR), make investment decisions and enable decent livelihoods. In South Africa's province KwaZulu-Natal, for example, waste pickers are paid a mere 2 Rand – about $0.1 – per kg of plastics collected. There is an illogical disparity between what plastic waste collectors earn for the services and what international society is willing to spend on clean-ups.

Similarly, in Ghana's Greater Accra Region, the costs of collecting, sorting and recycling different plastic types for 1 tonne of different types of plastic materials such as LDPE, HDPE and PP is approximately between $240-$270. Accra's waste pickers only earn a fraction of the already low minimum wage and the largest share of revenues from plastic waste are captured by middlemen and aggregators. This type of detailed disaggregated data on the costs and profit margins of plastic is scarce and often not available in most countries but essential to design and implement effective policy.

In terms of plastic waste treatment, African countries are lacking industrial-scale recycling infrastructure. In the ENF global plastics recycling plant directory, Africa has only 67 listed facilities, compared to 1,236 in Europe. Increasing the number of these facilities in low- and middle-income countries is crucial to enabling the recycling of plastic waste, improving the quality of recyclables and reducing plastic pollution in a low-cost way.

Mechanical recycling remains the most cost-effective option for dealing with plastic waste and creating a circular plastics economy with a cost of between $3 and $230 per tonne depending on the material type, level of contamination and quality requirements. Other treatment options are chemical recycling technologies – such as pyrolysis and gasification – with a cost of between $83 and $102 per tonne. For non-recyclable plastics, waste-to-energy treatment has a cost of $40 to $150 per tonne.

Existing and emerging policy solutions

The most cost-effective solution over the long term, if designed and implemented correctly, is the introduction of a suite of upstream and downstream policy measures ranging from product design requirements, targeted bans and levies on the most harmful and hard to treat plastics through to EPR schemes. Such policies have also been shown, in certain cases, to return a net-profit rather than a cost to the public purse through delivering long-term economic, environmental and social benefits by reducing waste and promoting sustainable practices. Indeed, successful policies that work are already being applied in various parts of the world, especially the European Union (EU), but also in countries like Japan and Chile.

In the EU, a frontrunner in policy development on tackling plastic pollution, the Waste Framework Directive and Packaging and Packaging Waste Directive have set recycling targets and circular design requirements on plastic packaging products for over a decade. This policy has been instrumental in reducing plastic leakage into the environment. Furthermore, most member states have an EPR scheme for packaging, several of which have been in operation since the 1990s.

More recently, in the context of the new Circular Economy Action Plan from 2020, the EU's policies are increasing in ambition and the EU plastics policy is entering a new phase of a more transformative policy targeting the full lifecycle of plastics.

In Japan, Asia's largest packaging waste producer, where single-use plastic packaging waste accounts for over three quarters of Japan's total plastic waste, leakage into the environment and water resources is relatively low. Japan ranks second highest after Germany in the plastic management index (PMI) out of 25 countries in the world due to its comprehensive waste management system. In 2019, Japan introduced a Plastic Resource Circulation Strategy which sets new goals to turn all existing plastic packaging and goods to be either reusable or recyclable by 2025 and, by 2030, re-use or recycle 60 per cent of all plastic containers and packaging.

In Chile, the Ministry of Environment and Fundación Chile launched the Chile Plastics Pact in 2018. The initiative aims at rethinking the way the country produces, uses and disposes of plastics, ensuring that plastics are used in a more circular approach to avoid contaminating the environment. Four specific targets aim at elimination of problematic single use plastics, 100 per cent of plastic packaging to be designed to be recyclable, reusable or compostable, a third of household and non-domiciliary plastic packaging to be recycled, reused or composted and a requirement of 25 per cent recycled content for plastic containers.

Meanwhile, the two largest producers of plastics – China and the United States – are beginning to implement comprehensive policy frameworks to tackle the problem. China's government amended and released a series of laws and regulations between 2016-21 that have significantly transformed the country's approach to governing plastics. The type of plastics targeted, and the different aspects of the plastic value chain, are covered by an all-government approach including new guidelines setting unified standards for more sustainable packaging to ensure compliance by industry players to reduce the use of packaging materials and prevent pollution.

In the United States, there is now a national recycling strategy in place. The US Environmental Protection Agency (EPA) released its 2021 National Recycling Strategy which is designed to address major recycling challenges, including contamination, to create a cost-effective municipal solid waste recycling system with the goal of achieving a 50 per cent national recycling rate by 2030.

These successful examples and proven policy approaches to reduce plastic pollution can serve as a starting point for individual countries seeking to curb plastic waste pollution as well as providing a baseline for the global plastics treaty negotiations. These policies will need to be adopted and replicated around the world but tailored to the specific needs of individual countries. However, models developed by the Pew Charitable Trust show that current collective policy commitments will reduce marine plastic litter in 2040 by only less than 7 per cent compared to today's. Therefore, it is crucial for all countries to urgently increase their ambition and financial resources to invest in infrastructure, new technologies and capacity building, especially in low-income economies.

Plastics data transparency and traceability

Reliable data about plastic flows within society and into the environment is especially key to implementing lifecycle solutions. For effective, evidence-based policymaking to tackle plastic pollution, reliable and disaggregated data on cross-border trade flows across the lifecycle of plastics is required.

Currently, coordinated action and implementation of lifecycle solutions is hampered by the combination of a lack of data and poor data transfer along the value chain. For example, we are lacking disaggregated data about plastics production, its uses, recycling, re-use, disposal, litter/leakage hotspots and plastic waste trade by country, resin/application.

Most countries also lack indicators to monitor progress on reducing marine plastics litter, with only 22 countries having indicators, out of the 35 signatories of the G20 Osaka Blue Ocean Vision.

In many low- and middle-income countries, even basic data about national waste management systems, including collection rates, plastics imports and exports, access to adequate recycling facilities, non-recycling data by type, including disposal, incineration, and dumping, are lacking.

In many countries, informal sector plastic collection rates of plastics are very high, but difficult to quantify, as the volumes collected and processed are usually not captured in official statistics.

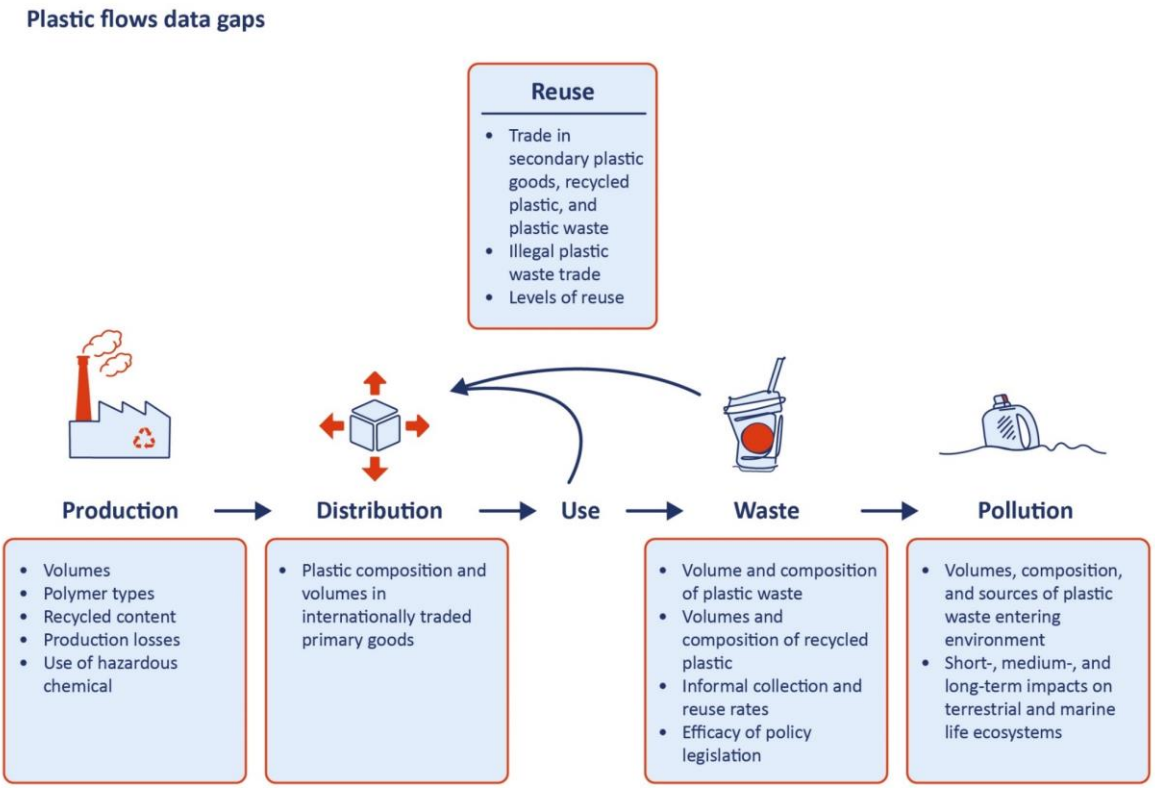
The economic data about prices of informally collected materials and their processing, wages and incomes of workers, are also scarce, all of which are important for inclusion and formalization.

When it comes to the international trade in plastics, the Forum on Trade, Environment and the SDGs (TESS) has raised the issue that there are a number of shortfalls in existing Harmonized System of Codes classifications that limit understanding of trade flows relevant to efforts to tackling plastic pollution.

There is no internationally recognized and comprehensive classification of plastics to facilitate a straightforward identification of which polymers are used by product category or industrial application.

Furthermore, most plastic products are not labelled in ways that clearly identify the additives included in them.

Figure 2: Plastics value chain traceability and transparency data gaps.



On a positive note, there are many new digital applications and technologies for improving the traceability and transparency of plastics from design to end-of-life. For example, remote sensing and satellite imagery can be used to identify areas of plastic pollution in bodies of water or on land as well as to track the movement of plastic waste in rivers and oceans. Internet of Things (IoT) sensors can be placed in waterways, beaches and other locations to monitor plastic waste and detect changes in waste levels over time.

Mobile apps, such as Debris Tracker, can be used to crowdsource data on plastic waste thereby allowing users to report plastic pollution they

encounter in their daily lives. This data can then be aggregated and analyzed to identify trends and patterns in plastic waste.

Blockchain is also increasingly being used to track the movement of plastic waste throughout the supply chain from production to disposal. Embedding blockchain technology into the advanced recycling value chain can provide a fully traceable and accurately labelled record of recycled materials. This can help to identify areas where plastic waste is being lost or improperly disposed of as well as to verify the authenticity of recycling claims. Examples include BanQu and Plastic Bank which help trace plastic throughout the whole life cycle including that which is captured by the informal sector.

Finally, artificial intelligence (AI) can be used to analyze large datasets on plastic waste, generated by the above-mentioned technologies, and identify patterns and trends in plastic leakage. This information can be used to inform policy decisions and identify areas where interventions are needed.

Table 1: Technological and procedural solutions for improved plastics traceability and transparency

Category	Examples
Data storage and retrieval approaches and systems	Digital Product Passports, traceability apps and services (such as BanQu and Plastic Bank) Blockchain, cloud computing, Internet of Things (IoT) and 5G
Sensors and markers	Computer vision, Optical scanning – underpinned by artificial intelligence and machine learning Watermarks, chemical tracers, radio frequency identification tags (RFID), QR Codes, barcodes
Additional data collection approaches	Citizen science apps (e.g. Debris Tracker), drone and satellite imaging, and geographic analyses

What is the role of the global plastics treaty?

In March 2022, United Nations member states agreed on a mandate to negotiate a legally-binding global plastics treaty, to end plastic pollution. The treaty aims to address plastics pollution across the full lifecycle from feedstock production to end-of-life. The treaty is an important international mechanism that will provide overall coordination and can improve the governance of plastics around the world.

The High Ambition Coalition, chaired by Norway and Rwanda, has the goal of ending plastic pollution by 2040. The coalition's membership now covers all regions of the world and almost one third of UN member states. Besides bringing together countries with similar visions regarding plastic pollution, this coalition will work on more science-based objectives to inform the intergovernmental negotiations.

However, not all parties are supportive of a legally-binding and high-ambition outcome to address the full lifecycle of plastics. A 'Paris Agreement-style' outcome would be somewhat of a failure, given the experience with the climate negotiations, as parties are lacking ambition, and national commitments to reducing plastic pollution are likely to be insufficient to address the challenge adequately. Ensuring that the treaty can be implemented, and identifying the most cost-effective solutions that can be supported by the treaty, will be crucial.

Furthermore, the lack of reliable data has been highlighted by many submissions to the plastics treaty negotiating process and all point to significant data gaps that must be addressed for the international instrument to be effectively implemented. The data will also affect the level of ambition of the treaty and determine the speed of deployment of solutions and which approaches and technologies are adopted.

Therefore, the reduction of overall volumes of plastic production is becoming increasingly important from both an environmental and a circular plastics economy perspective. The treaty can establish clear targets and timelines for reducing plastic production volumes which can help to focus coordinated efforts on achieving this goal. Furthermore, the treaty can provide overall policy guidance at the global level and connect to other multilateral agreements especially those relating to marine and water environments such as the International Convention for the Prevention of Pollution from Ships (MARPOL).

The treaty also has a role to play in levelling the playing field for more circular solutions and addressing existing economic incentives that drive plastics production. The current system is not set up for a circular plastics economy and incentives, infrastructure and pricing models are misaligned. Market-based instruments can help redress this but there must be a comprehensive approach.

Nonetheless, the treaty will not address all the problems of plastic pollution and the hard lifting will still need to be done by national governments. Moreover, what limits the potential impact of the plastics treaty are macro-level issues, like fossil fuel and petrochemical subsidies, that are beyond the scope of the negotiations. Other multilateral agreements like the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal will also continue to play a role.

The global plastics treaty will be an important international mechanism that can provide overall coordination and improve the governance of plastics and it has the potential to raise the ambitions of governments to achieve zero plastic pollution by 2040.

Nonetheless, as mentioned, there are significant challenges that the treaty faces, such as the lack of reliable data and the misalignment of economic incentives, infrastructure and pricing models. The treaty will not address all the problems of plastic pollution and it must therefore work alongside other multilateral agreements.

Toward lifecycle governance of plastics pollution

Beyond the treaty, addressing global plastic pollution and marine litter requires new governance that examines the entire lifecycle of plastics. A lifecycle approach to plastic identifies key hotspots in the production and consumption system by considering all potential impacts on the climate, ecosystems and the economy caused by plastic products, goods or services. This approach helps to address potential trade-offs between environmental impacts and can guide the selection of the best solutions for the environment with the best socio-economic implications.

The lifecycle approach has also been politically endorsed by the G20 Osaka Blue Ocean Vision which aims: 'To reduce the additional pollution by marine plastic litter to zero by 2050 through a comprehensive lifecycle approach'.

In fact, modelling by the International Resource Panel shows that only through a lifecycle approach and ambitious combination of interventions using known approaches and technology can marine plastic litter entering the ocean be significantly reduced compared to business as usual.

When it comes to preventing plastic waste leakage into water resources, the Integrated Water Resources Management (IWRM) framework can play a useful role. IWRM promotes the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and the environment.

IWRM has been successful in bringing different actors in the sector together to ensure an integrated and cross-sectoral approach to water management

by replacing traditional, fragmented, sectoral management styles that often result in poor services and unsustainable water resource use. This approach enables collaboration and the use of data to implement policy more effectively.

There is also a correlation of countries with low levels of IWRM implementation which also have low levels of municipal waste management. Given the complexity of plastic value chains and pollution of water resources, the IWRM approach is suitable to deal with higher degrees of complexity than, for example, integrated waste management strategies can cope with. While integrated waste management strategies primarily deal with managing waste streams that are less complex and more straightforward to manage, IWRM has proven success in managing a finite and essential resource that is interconnected with various social, economic and environmental factors.

Once key hotspots have been identified through a lifecycle approach and an IWRM framework, there are five key action areas that policy makers can focus on (Fig 3).

The first is reducing demand for unnecessary or harmful plastic products through the likes of levies, bans or removal of subsidies.

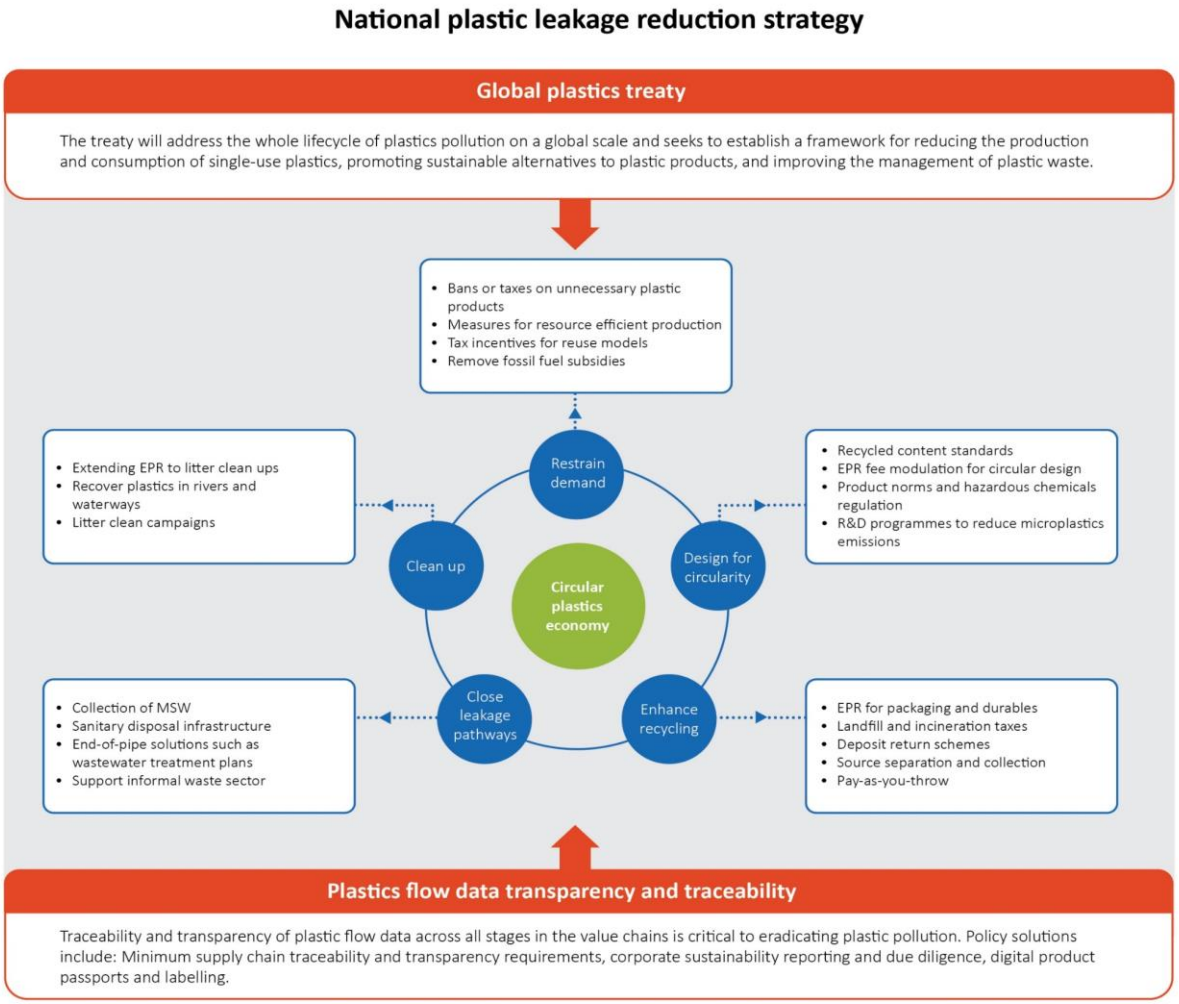
The second is to encourage design for circularity through approaches such as mandatory recycled content levels, modulated extended producer responsibility schemes and ecodesign standards.

Third is enhancing recycling rates, for example, through introducing deposit return schemes, landfill taxes and source separation and pay-as-you-throw collection models.

Fourth is to close the leakage pathways in the identified hotspots through improvement of collection systems including support to the informal sector.

The final area for focus is on the clean-up of leaked plastic via the roll out of river and sea booms, bubble barriers and interceptors combined with regular beach clean ups.

Figure 3: Lifecycle policy solutions, underpinned by value chain transparency and the global plastics treaty, based on OECD global plastics outlook and other sources.



The participation and collaboration between a wide range of stakeholders operating at different levels of society – from local to regional, national and international – is required.

National governments: Achieving zero plastic waste going into the environment and water resources by 2040 will require increasing political ambition and implementing new policies. Different countries, depending on their role in the plastics value chain and the different plastics hotspots, will have different policy priorities. What high-income countries have been good at is waste management and minimizing the leakage of plastic waste where action is needed is to reduce overall plastics consumption levels and plastic footprints, especially single-use plastics, while shifting to re-use models and re-designing products. Low-income countries often lack the necessary

infrastructure for recycling, such as collection systems, sorting facilities and processing plants. Increasing investments and testing novel approaches to public-private financing, such as blended finance to build new while upgrading existing facilities, is crucial to enabling the industrial scale recycling of plastic waste. Economic incentives, such as deposit schemes, plastic taxation and waste fees, can encourage people to reduce plastic waste and recycle by providing a financial reward for doing so.

Businesses: Mismanaged plastic waste and plastic-related pollution will become reputational, financial and compliance risks for businesses, given the development of the global plastics treaty and many new national policies. Furthermore, corporates will increasingly be asked by investors and regulators to disclose where their business has exposure pathways to plastic-related pollution across the full lifecycle. The current voluntary commitments by industry to address the plastics crisis are laudable but insufficient. Voluntary measures, or voluntary EPRs, where reported data on production volumes is not verified, have shown limited success. Upcoming policy reforms will shift the economics of plastics production, control which plastics are used and strengthen the management of plastic waste. As a result, producers need to prepare to pay more for the costs of plastic production and waste generation. At the same time, economic incentives will encourage shifts to more circular plastics business models.

Local and regional authorities: Municipal and regional governments have a critical role to play in working with the private sector, empowering informal waste workers and supporting small informal businesses to scale up. Furthermore, managing waste and supporting the development of recycling infrastructure, particularly in urban centres and municipal areas where national governments have limited capacity or focus, is key to closing plastic leakage points.

International organizations: International organizations, such as the United Nations, the World Health Organization and regional bodies, are providing leadership on plastic pollution on the international level, raising awareness of the issue and promoting best policy practices and solutions globally. Furthermore, the World Trade Organization and other multilateral trade bodies need to improve the international regulatory framework for plastics trade to increase traceability and transparency.

Science and academic community: Researchers in various fields can contribute to understanding the extent of plastic pollution, identifying solutions and evaluating the effectiveness of initiatives. Strengthening the science-policy interface and informing policymakers based on data collection, digital solutions, effective policies, investments and innovations will be driven by data.

Investment community: Investments in waste management and plastic recycling facilities are urgently needed in developing countries to provide plastic collection systems, waste management services and recycling infrastructures. Providing access to finance for small and medium enterprises (SMEs), both domestically and through international

development cooperation, can help to support the development of recycling facilities. Furthermore, investments in business models involving the informal sector have social co-benefits, for example, by giving waste pickers a fair income and safer working conditions. Investments in collection infrastructure must be coordinated with improved governance around collection, sorting and safe management of generated waste.

Civil society and the media: NGOs and other civil society organizations can play an important role in raising awareness about the impacts of plastic pollution, advocating for policy change and working on the ground with communities to set up collection and recycling systems. Journalists and media outlets can help raise public awareness about the issue of plastic pollution, hold governments and businesses accountable and highlight innovative solutions and success stories. NGOs have also played an important role as intermediaries for the informal recycling sector which plays a significant role in reducing and managing plastic waste. Inclusion and formalizing this sector through engagement and support can help to improve the safety and working conditions of informal waste pickers as well as increase the amount of plastic waste that is recycled.

Marine plastics pollution is a global crisis that requires urgent action from decision-makers across the public and private sectors. It is essential to adopt a lifecycle approach to plastic production and consumption, focus on cost-effective solutions and create an ambitious policy agenda that targets countries with leakage points and high potential for abatement.

It is also crucial to include waste pickers in the process of closing leakage and to improve data collection and analysis to better understand the problem and develop effective solutions.

The Integrated Water Resource Management approach offers the opportunity to systemically address plastic pollution of water resources. Acting now can prevent further damage to the world's rivers, oceans and marine life. Only by working together can the international community create a world where marine plastics pollution is a thing of the past.

This in-depth research article was first published on 1 June 2023 on the Chatham House circulareconomy.earth website.

About the authors

Patrick Schröder is a senior research fellow in Chatham House's Centre for Environment and Society. He researches the global transition to an inclusive circular economy, with a specific focus on collaborative opportunities between key countries, closing the investment gap and building an evidence base for circular economy trade.

Jack Barrie is a research fellow in Chatham House's Centre for Environment and Society and an expert on the topic of the circular economy. He holds a PhD from University of Strathclyde on circular economy innovation policy, a PhD from University of Strathclyde on circular economy innovation policy and previously held the role of Schmidt-MacArthur fellow with the Ellen MacArthur Foundation.

Niamh Brannigan is Head of Communications at the Global Water partnership. She specializes in environmental communications and media relations and has practiced strategic communications for the UN Environment Programme, World Resources Institute, as well as the Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science.

Acknowledgments

The authors are much obliged to Yumiko Yasuda, Senior Network & Transboundary Water Cooperation Specialist, GWP and Dimitris Faloutsos, Deputy Regional Coordinator at GWP-Mediterranean, who offered comments and suggestions.

Chatham House and the authors gratefully acknowledge the financial support of the The Global Water Partnership (GWP) for this project. The views expressed in this paper do not necessarily reflect the positions of GWP.

About GWP

The mission of the Global Water Partnership (GWP) is to advance governance and management of water resources for sustainable and equitable development. GWP is an intergovernmental organisation and a global network of 13 Regional Water Partnerships, 85 Country Water Partnerships and more than 3,500 Partner organisations in 172 countries. The GWP network is committed to building a water secure world.

Cover image: Art exhibition of marine plastic pollution is displayed at Phuket Aquarium on June 30, 2021 in Phuket, Thailand.

Independent thinking since 1920

The Royal Institute of International Affairs
Chatham House
10 St James's Square, London SW1Y 4LE
T +44 (0)20 7957 5700
contact@chathamhouse.org | chathamhouse.org

Charity Registration Number: 208223