

CLEARING A PATH THROUGH THE WASTE

TRANSPARENCY IN THE PLASTICS SUPPLY CHAIN



SYSTEMIQ

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1. EXECUTIVE SUMMARY

Every month, over a million tons of plastic enters rivers and oceans worldwide, and billions of dollars are spent by governments in attempting to manage plastic waste. At the same time, much of the industry of plastic producers, users and investors operates under a shroud of mystery. The purpose of this paper is to call for greater transparency across the plastics supply chain and to inspire the appropriate action from public and private sector stakeholders, and from civil society groups.

Versatile, strong, light, and cheap – the functional benefits of plastics are not in dispute. They explain how plastics have become ubiquitous in everyday life and essential to the global economy: from packaging and preserving food and goods; to sterile and anti-bacterial healthcare equipment; to light-weight materials that reduce transportation costs and fuel emissions.

However, the same attributes that led to plastics' exponential rise – being durable and disposable – have turned out to be a curse. Plastic pollution is now rife in many parts of the world and found in (nearly) every ecosystem. Plastic accumulates in the oceans and on our sea beds; it can be detected in almost all food chains and organisms; toxic additives disrupt human hormonal balances; and microplastics may even cross the blood-brain barrier. These negative impacts have turned the “miracle” of plastics into an acute crisis.

Unless we fundamentally change the entire system of whether and how we produce, use, and dispose of plastics, these impacts are set to worsen dramatically over the coming decades. Plastic production is forecast to double, plastic leaking into nature to triple, and plastic leakage into the ocean to quadruple by 2040.ⁱ One major obstacle hampering efforts to avert such a catastrophe is the lack of transparency across all parts of the plastics supply chain. There is a paucity of quality data and intelligence about the flow of materials; about financial flows; about the social, environmental, and economic impacts of plastic pollution; and about the accountabilities, policies, and commitments required of all stakeholders.

This lack of transparency undermines any shared understanding of what solutions and success look like, and whether we are making sufficient (or, indeed, any) progress. In the absence of transparency, activities risk being disjointed and duplicative, rather than integrated and synergistic. The current state of affairs inevitably means resources are being misallocated and even well-intentioned efforts are falling short of their expectations and potential. Meanwhile, natural ecosystems are increasingly degrading and the window of opportunity to avert the mounting crisis is narrowing rapidly.

Without transparency...

- **Companies and investors** have only a limited understanding of how they contribute to plastic pollution, and of their exposure to commercial, legal, and reputational risks. Equally, pioneering companies that are acting to reduce plastic pollution are neither recognised nor rewarded consistently, and are sometimes even criticised, for prioritising transparency.
- **Governments and regulators** can be found grasping in the dark as they set plastic pollution targets, try to allocate limited public resources efficiently, and draft and enforce policies that must protect health, ecosystems, and economies.
- **Consumers and civil society groups** struggle to hold companies to account for the plastics being produced and sold, and which end up polluting the environment. They do not know if governments are winning or losing the battle, nor which interventions are working (and which are not).

The intention of this paper is threefold: first, to characterise the gaps between the *status quo* and how a truly transparent plastics supply chain would look. Second, to offer an organizing framework that describes what roles different stakeholders will need to play in order for these gaps to be closed. We believe greater transparency will be achieved through three mutually reinforcing, but increasingly challenging, pathways:

- **Outside-in reporting by academia and ‘shadow reporting’ by civil society campaigners** that raise the level of awareness and understanding thanks to novel research or using publicly available data and information in new ways (e.g., tracking plastic leakage to the ocean).
- **Voluntary disclosure by the plastics industry, encouraged by investors (with technical support from industry organisations and NGOs),** where a toolbox of standards, methodologies and disclosure frameworks can bring consistent and comparable data into the public domain.
- **Regulated disclosure by governments and policymakers** to set, clarify, and enforce legal requirements to report on plastics use, impacts and mitigation strategies.

Finally, this paper identifies seven transparency themes, or workstreams, that together constitute a comprehensive roadmap for progress on all critical fronts. These are summarised in **Exhibit 1** below.

While supply chain transparency is not a solution in and of itself, it enables all other solutions: with it comes increasing clarity and certainty on how best to clear a pathway out of the plastic waste mire; and how to accelerate the circular plastic economy transition. Transparency helps businesses and investors to de-risk decisions, future-proof strategies and drive new business models.

Experience from the global efforts to fight climate change proves that greater supply chain transparency can be achieved. By providing this overview of what needs to be done, by whom, and how, the aspiration of this paper is to catalyse action, spur ambition and focus multi-stakeholder efforts to deliver this roadmap. And to emulate in the plastics context – over a few years’ timeframe – what has been achieved in the climate/ carbon context over the last several decades.



Photo credit: Vladimir Tretyakov / Shutterstock.com

EXHIBIT 1

THEME	PROBLEM ADDRESSED	ACTIONS REQUIRED	EXAMPLE IMPACT PATHWAYS
OUTSIDE-IN COLLECTION & REPORTING	A PLASTICS FATE & LEAKAGE TRACKING	Post-consumer wasteflow-mapping continues to rely on top-down modelling, outdated and incompatible datasets, resulting in low granularity and comparability	Coordinated effort to build waste mgmt. / fate database (definitions & methodologies; data platform; primary data collection) Exploration and scaling of tech solutions to capture primary data
	B PUBLIC SECTOR EXTERNALITY COSTS	The costs of pollution and benefit of decisive interventions are largely unquantified to date (esp. at municipal & country-level), resulting in sub-par resource allocation/policy	Analysis of waste mgmt. externalities and cost/benefit of interventions Analysis of impact of waste trade Indexing of public sector waste mgmt. expenditures
	C CAPITAL MARKETS SCREENING	Investor and companies’ exposure to plastic risks, incl. regulation and litigation, remain largely unquantified to date	Financial analysis of corp. exposure to pollution risks; e.g. regulation, taxation, liability risks and ESG rating
	D POLICY MONITORING & EVALUATION	Low transparency on existing & emerging policies and evaluation of policy effectiveness	Policy monitoring & effectiveness evaluation Development of EPR best practices & ‘new horizons’
VOLUNTARY DISCLOSURE	E TRACK, TRACE & REPORT	Low adoption of methodologies & mechanisms to track material flows from source to sink Inconsistent target-setting, low comparability/ accountability of targets and efforts	Supporting corporate foot-printing efforts Driving adoption of material flow mapping and verification from RP to brand Drive T&T solutions from brand to fate
REGULATORY DISCLOSURE	F REGULATED DISCLOSURE ADVOCACY	Limited regulated disclosure of plastics production, trade, risks and exposure	Advocate for a ‘plastic registry’ Support mandated integrated plastics reporting Lobby to regulate material business/plastic risk assessments and disclosure

2. THE RISING PLASTICS TIDE, ITS ROOT CAUSES, AND HOW TO AVERT CRISIS



The signs of a rising plastics tide are abundant throughout nature and are set to worsen dramatically if business-as-usual persists [see **Exhibit 2** below]. Five root causes underlie the surge in plastic waste:

1. LINEAR PRODUCTION, CONSUMPTION, AND DISPOSAL PATTERNS

Almost all plastics (95%+) are produced from virgin feedstock – that is, from relatively cheap fossil fuels – that benefit from significant scale economies in their manufacture.

In contrast, the costs of collecting and sorting plastic waste are relatively fixed, while recycling systems are smaller and decentralized – resulting in a structural cost premium and low recycling rates.ⁱ

The abundance of cheap virgin feedstock also undermines the business case for substituting plastics – especially low-cost but hard-to-recycle plastic films – with suitable alternative materials, compounding the current make-use-waste pattern.

Packaging reuse models are heralded as a promising and necessary component of the transition to a circular plastic economy, but relatively few models have so far proven to be commercially viable at scale.ⁱⁱ

Recycling rates continue to be pitifully low both in developed and emerging economies. In regions where waste management infrastructure is under-developed, widespread terrestrial dumping, open burning, and discarding of plastic directly into water occurs. In regions with mature waste management systems, linear disposal models dominate, with managed landfills, incineration, and waste-to-energy plants the primary solutions for end-of-life management of plastic waste.ⁱⁱⁱ

2. MASSIVE DIVERSITY IN MATERIALS PROPERTIES

The term ‘plastics’ encompasses an enormous diversity of polymers, additives, pigments, and packaging structures, each with their own material characteristics. This diversity in materials and properties complicates efforts to design and implement recycling strategies as many polymers cannot be recycled together.^{iv}

While most plastics are in theory “recyclable” – and labelled as such – this is hardly the case in practice, with global plastics recycling rates averaging ~15% and many plastic products rarely, if ever, recycled.^v

3. A GLOBAL AND COMPLEX VALUE CHAIN

The production, trade and consumption of plastics is a global commodity market with hundreds of resin producers, thousands of resin converters and hundreds of thousands of brands and other users of plastic. It is not only the primary polymer resins that are traded, but also additives, packaging materials, packaged goods, and plastic waste – neither of which are systematically tracked or reported.

This complex web of trade has its parallel in a fragmented policy and regulatory landscape, complicating efforts to effectively manage the plastics system.^{vi}

4. ASYMMETRY OF BENEFITS, COSTS, AND NEGATIVE IMPACTS

As with the climate crisis and other environmental catastrophes, the very global nature of the plastic trade results in many of the most harmful environmental, social, and economic impacts being felt far from where plastics are originally produced. ^{vi} Financial profits from plastic production are skewed towards low plastic leakage, economically more developed countries.

Conversely, the highest costs of waste management, on a relative per capita income basis, and the impacts of plastic pollution and leakage from widespread mismanagement, are socialized and concentrated in less economically developed countries. This disconnect undermines the ability of local actors to shape their own environments and highlights the need for a coordinated global response.^{vii}

5. POPULATION GROWTH AND RISING CONSUMPTION PER CAPITA

The contributory factors outlined above will be further amplified by population growth and rising per capita plastic consumption. The world’s population is expected to grow by 23% or 1.7 billion people between 2016 and 2040, and the majority of this growth is expected in middle and low income countries, where already over 84% of the population have insufficient access to effective waste management systems.

Population growth will be accompanied by increased plastics consumption per capita, expected to grow by 58% by 2040 unless immediate action is taken.^{viii} This per capita growth is driven by rapid economic development and urbanization, and also by continued expansion of virgin plastic manufacturing capacity – and production of single-use plastics – versus reuse models or substitute materials.^{ix}

Fortunately, means of addressing most of these root causes already exist and the business-as-usual scenario is not inevitable. A low-leakage, highly circular plastics economy is *technically* possible and economically feasible.* If such a transition can be achieved it would not only avert environmental disaster, but also bring about significant social benefits.^{xi}

To achieve this change, the entire plastics system needs to be re-tooled from linear to circular: upstream solutions (focused on reduction, reuse and redesign) need to be deployed at an unprecedented scale; and, in conjunction, seismic intervention is needed to happen downstream (in improved collection and recycling).^{xii}

However, to stand a chance of meeting ambitious circularity and leakage goals, far greater coordination and scale of action is necessary. Both will require better-informed and more enlightened decision-making from all stakeholders.

EXHIBIT 2

PHENOMENA OF THE RISING PLASTICS TIDE



MAJOR TRANSPARENCY GAPS TODAY IN THE PLASTICS SUPPLY CHAIN



Recent efforts from stakeholders across academia, industry and civil society groups have meaningfully advanced the collective understanding of the plastic pollution problem. That said, numerous critical data and evidence gaps persist throughout the plastics supply chain.

These gaps underlie and, in some cases, perpetuate the root causes of the plastics challenge described above. Consumers, regulators, investors – and industry itself – have imperfect clarity and a high degree of uncertainty over what is happening where and why, concerning:

MATERIAL FLOWS

A dearth of transparent information concerning material flows exists across the entirety of the plastics life-cycle: from production to consumption, and in the (mis)management and fate of plastic waste.^{xiii} Throughout, there is an absence of shared methodologies, tools or technologies to track materials and validate industry behaviours.^{xiv}

Addressing some of the transparency challenges requires real investment, technical expertise, capability-building and consistent comparable methodologies to gather and synthesize primary data, especially in those locations suffering the most from plastic pollution.

FINANCIAL FLOWS

Significant data gaps also persist in the financial flows linked to plastics. These include: the ownership and financing of (linear) plastic production and usage; the degree to which corporates pursue circular business models; the exposure of investors and business to plastics risks (e.g., liability, taxation); and the cost of plastics' externalities, e.g., waste management, the cost of environmental clean-up, and increased healthcare costs linked to exposure to toxic chemicals.^{xv}

POLICIES, ACTIVITIES, AND EFFECTIVENESS

The diversity in policies and commitments – and in how they are defined, implemented and reported on – limits the ability to compare actors, both public and private, and to hold them accountable to ambitious, verifiable mitigation and transition strategies.

IMPACTS

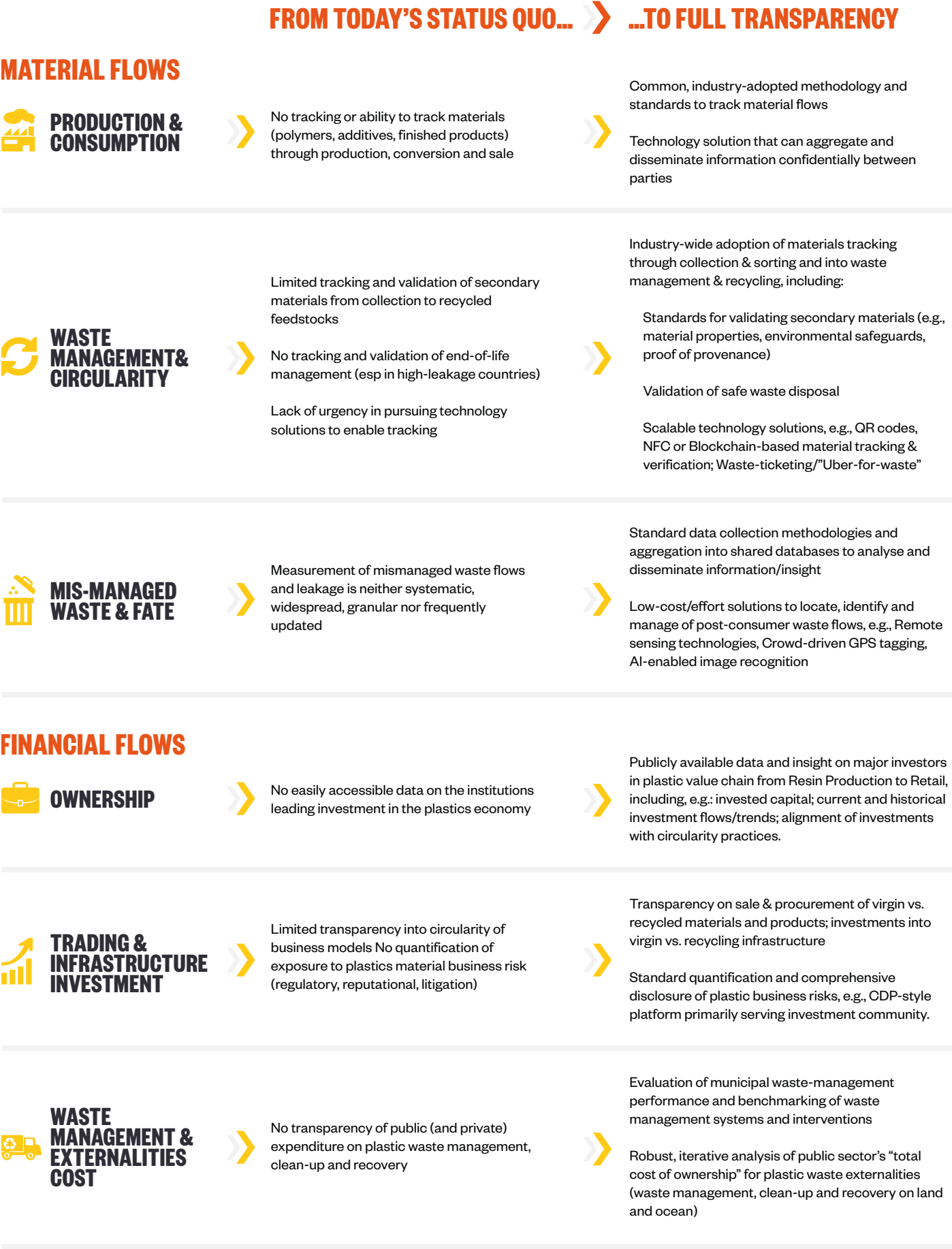
Despite a consensus that plastic pollution causes significant negative impacts along multiple pathways, the exact mechanisms and magnitudes of impact remain unknown for specific polymers, additives, or packaging formats.

Exhibit 3 below provides a summary of the specific gaps that exist today across these four dimensions of supply chain transparency and, for each, describes a “north star” end-state against which progress can be compared.

Without making progress to close these gaps, the transition to a highly-circular and low-leakage plastics economy will inevitably be stalled. Greater transparency is the key to unlocking more enlightened and effective decision-making across all groups of influential stakeholders:

- **Industry:** to make decisions around procurement and packaging strategies; investment and R&D decisions; and the ability to hold themselves accountable for the transition to circular business models.
- **Investors:** to make informed investment decisions that support companies pursuing ambitious circular plastics strategies; to enable the inclusion of plastic risks in ESG frameworks; and to mitigate their own exposure to plastic liability risks.^{xv}
- **Governments:** in designing the regulatory frameworks required to support the economics of effective waste prevention; and in setting policies to encourage sustainable business models, e.g., levelling the playing field for business models based on reuse.^{xvi}
- **Consumers:** to increase understanding of the negative impacts of plastics on health and the environment; and why they should demand a genuine alternative to single-use plastics.

Fortunately, the unknowns are now at least identified, and the critical knowledge gaps can be prioritised.



4. THREE PATHWAYS TOWARDS GREATER TRANSPARENCY



Progress to date in creating greater transparency has involved three distinct, but mutually re-enforcing, pathways: (a) outside-in and shadow reporting; (b) voluntary disclosure; and (c) regulated disclosure.

In turn, and in combination, they unlock the pathways to influencing the stakeholders described above and to create impactful changes in behaviour. **Exhibit 4** below offers an organizing framework for how to achieve the desired end-state and the role different stakeholders need to play.

A. OUTSIDE-IN AND SHADOW REPORTING

Outside-in reporting is the collection, analysis and publication of data, knowledge, and insight, independent of participation by industry. It is typically driven by academia and IGOs and, in some cases, supported by commercial analytics providers.

Outside-in reporting is often complemented by ‘shadow reporting’ by activist NGOs, as a form of ‘unconsented disclosure’ or radical transparency. Outside-in disclosure has the longest-standing track record of furthering transparency in the plastics sector and has contributed significantly to advancing the sustainability agenda.^{xvii}

Outside-in transparency fulfils two important functions. First, it raises awareness and understanding among the public, policy makers, investors and business leaders concerning the broken plastics system – e.g., by estimating material flows, identifying local impacts, analysing, and extrapolating implications. Second, by starting to attribute responsibility and accountability, outside-in reporting creates strong incentives for greater voluntary disclosure by industry participants as calls for increased accountability and transparency gather momentum.

B. VOLUNTARY DISCLOSURE

Voluntary disclosure is the publication of information by industry that is not mandated by any legal or governance framework. Typically, such disclosures come about through a combination of public pressure (channelled through activist NGOs) and with the guidance of third-party support for standardising methodologies (e.g., NGOs, IGOs and in some instances for-profit entities).

Voluntary disclosure enables comparisons between actors on their practices, commitments, and policies. The development of shared disclosure methodologies, standards and platforms are particularly relevant as they differentiate the leaders from laggards and can encourage a “race to the top”.

Once the supporting infrastructure of standard taxonomies, methodologies and reporting platforms are established, industry will find it harder to resist demands by consumers, governments, and investors to disclose comprehensive and verifiable data (e.g., on plastic footprints).

Finally, as earlier efforts to create transparency in the climate sector have shown, voluntary disclosure can be an important precursor to regulated disclosure – institutionalized either through legislative or corporate governance frameworks.^{xviii}

C. REGULATED DISCLOSURE

These are the disclosures of data and information required to satisfy regulatory mandate. Such disclosure requirements may arise through stock exchange listing requirements, corporate law (e.g., Directors Duties) or other specific legislation (e.g., environmental law).

To date, however, there are few examples of plastic disclosure being mandated by law. Although they have been successfully instituted around matters such as carbon and corporate governance, disclosures around plastics remain limited in scope, frequency and consistency.^{xix}

The route towards establishing legal disclosure requirements for plastics will vary heavily by jurisdiction. It may involve or adapt existing legislative routes or require entirely new regulation. For the latter to come about, civil society and shareholder pressure will be critical in order to raise awareness and push the issues up the political agenda. At the same time, legal expertise and regulatory advocacy will be essential for guiding and engaging in the actual drafting of legislation.

EXHIBIT 4

THEORY OF CHANGE
FOR SUPPLY CHAIN TRANSPARENCY



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5. A COMPREHENSIVE ROADMAP FOR PLASTIC SUPPLY CHAIN TRANSPARENCY



The previous sections outlined the dimensions of supply chain transparency, what critical data and intelligence gaps need plugging in the plastics supply chain, and the three pathways that provide the means for unlocking greater transparency.

The following section combines these lenses and identifies seven concrete themes, or workstreams, that, taken together, set a comprehensive agenda for achieving greater transparency in the plastics supply chain. For each theme, it is shown:

1. how the status quo perpetuates the current linear take-make-waste model;
2. what greater transparency looks like in each case and the actions required to deliver it; and
3. why doing so will unlock pathways for influential stakeholders to bring about positive change.

Each section closes with a case study of in-flight projects that are already tackling specific challenges. The aspiration is that these themes provide both a practical overview and a high-resolution roadmap of what needs to be done to enable a circular, low-leakage plastics economy.



A.

PLASTICS FATE AND LEAKAGE TRACKING



Business can play a transformative role in accelerating progress on plastic waste reduction if strategic corporate action leads to meaningful, measurable impact. To tap into this potential, we need transparency into plastic footprints and their fate, so that we can understand the flow and leakage of material throughout the global value chain and see where systemic challenges can be opportunities to bring data-driven solutions to scale.

Erin Simon, Head of Plastic Waste and Business, World Wildlife Fund (WWF)

Current approaches to map post-consumer waste flows rely predominantly on top-down models, diverse, partial, and often outdated data sets. As a result, estimates of where, how and how much plastics are leaking to nature are characterized by significant uncertainties: in terms of total volumes leaking along the supply chain, geographical differences, waste composition, as well as estimates of existing stocks and projections of future flows of plastics in nature.

While these models create awareness and provide starting points for further research, the lack of granularity and the degree of uncertainty also limit their ability to inform targeted waste management interventions and policy design. Current efforts to model and map post-consumer waste and fate are hindered by:

- The fragmented and often-informal nature of the sector. As a result, post-consumer waste flow estimations are constrained by high-level assumptions of waste generation, composition, collection, and disposal. This is especially true outside urban areas and in developing countries, where plastic leakage is the highest.
- The absence of a single institution, or collective, that coordinates stakeholders and data-collection efforts. The result being partial, fragmented datasets, typically based on divergent methodologies.

The absence of a central platform to aggregate, analyse, visualize, and disseminate data and findings limits the impact of existing efforts.

- Waste flow modelling relies either on abstract, archetypical characterizations of waste flows, or requires labour-intensive on-the-ground data collection in diverse and often remote locations.

More granular and frequently updated data on post-consumer waste flows will inform efforts on multiple fronts: estimates of the social, environmental and economic impacts of plastic pollution; attribution of responsibility and accountability for the problem; the 'right-sizing' of waste management systems; and the design of effective waste management interventions and policy. Progress requires:

- A coordinated, global effort to increase data availability and quality.
- A shared measurement platform that extends the reach of data and informs decision-makers and stakeholder about the 'state of the system', as well as the outcomes of current policies, and the development of new interventions.
- Tools and technologies for low cost/effort data collection and analysis that massively scale data quality, availability and ability to measure waste flows near to real-time. These will likely involve innovative combinations of hardware (e.g. satellite, LIDAR, remote sensing), software (e.g. artificial intelligence and machine-learning enabled data analysis and visualisation) and human networks (e.g. citizen science, crowd-sourced data and open innovation).

CASE STUDY

To drive evidence-based efforts, the International Solid Waste Association, in cooperation with the University of Leeds, developed and piloted Plastic Pollution Calculator to identify and measure the sources of marine litter origins, and to develop local-tailor made solutions and policy interventions to eliminate plastic pollutions.

The initiative surveyed households, conducted waste characterisation studies, and examined landfills. In combination with geospatial mapping of population centres, rivers and watersheds, the tool can identify the mechanisms of plastic leakage, key hotspots, and potential solutions at an unrivalled granularity. The tool has been successfully piloted in Bali but can be applied to any region or country.^{xx}



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B. PUBLIC SECTOR EXTERNALITY COSTS



Municipalities are on the front line of fighting mismanaged waste and plastic pollution. Understanding the total cost of plastic waste is a critical precursor to tackle the mounting plastic crisis. Currently these insights are rarely available to governments and local municipalities. Economic analysis of the externalities of plastic waste has the potential to transform the way we manage plastics and alleviate the public burden.

Robin Millington, CEO, Planet Tracker

The public sector carries a significant burden caused by the externalities of plastic pollution. These externalities include the direct costs of waste management and clean-ups, indirect costs such as increased health expenditure, and lost income, e.g., from tourism or fisheries.

Despite waste management often being one of the largest items in municipal budgets, most efforts to quantify the economic impacts of plastic pollution (on the public purse) remain limited in scope and sophistication, and rely on top-down modelling with limited empirical on-the-ground data. As a result, public waste management systems remain underfunded in many regions, resources are not allocated to high-impact interventions, and the economic impacts of waste trade remain underexplored.^{xxi}

Costing these public sector externalities, and sizing up the benefits of potential waste management interventions, is hampered by:

- Limited analysis of material flows at municipal levels, or recent on-the-ground data, especially for post-consumer plastics in high-leakage countries.
- Lack of precision on the true cost and effectiveness of local waste management operations, including household education and awareness campaigns, collection, sorting, recycling, and disposal of unrecyclable materials.

- Limited analysis to reveal how substitution of plastics with other materials, or new delivery models such as reuse and refill, can positively impact waste management economics and public sector costs.
- Little clarity on the relative social, environmental, and economic impacts of different polymers and packaging structures, and their associated end-of-life management – for example, PET bottles are more widely recycled versus flexible and multi-layer sachets that are typically dumped or burned.

Conducting detailed country or region-level analysis of the impacts of mismanaged plastic waste – and in conjunction the cost/benefit of waste management infrastructure – would enable municipalities to allocate resources more efficiently, allow regulators to design more impactful policy responses (e.g., Extended Producer Responsibility), and empower NGOs to drive more effective consumer campaigns. Furthermore, development of standard measures and analyses could also enable benchmarking of municipalities' waste management outcomes, creating further learning opportunities and, potentially, even unlocking outcomes-based finance.

CASE STUDY

Currently, few attempts to cost the externalities of plastic waste have been undertaken and the results vary by several orders of magnitude:

In 2018, Deloitte estimated that plastic pollution could have resulted in an economic loss of \$19bn for 87 coastal cities through government-financed clean-ups, as well as lost revenue from marine tourism and fisheries. However, costs associated to public health, marine ecosystems or real estate are not quantified in the model.^{xxii}

In contrast, a recent study in the Marine Pollution Bulletin attempts a more holistic quantification of the ecological, social, and economic impacts of plastic pollution. The study calculates the impact of reduced ecosystem services and quantifies the implication for human health and well-being, in particular linked to fisheries, heritage, charismatic species and recreation. It is estimated that a 1-5% reduction in marine ecosystem services from plastic pollution results in an annual loss of \$500-2,500 billion in value. Based on an estimated stock of 75-150 million tons of plastic in the marine environment, each ton of plastic in the ocean equates to US\$3,300-33,000 annual cost of reduced marine natural capital.^{xxiii}



C. CAPITAL MARKETS SCREENING AND FINANCIAL TRANSPARENCY

● ●

Creating transparency concerning financing, ownership and business risk has the potential to accelerate a fundamental realignment of financial flows towards a more sustainable supply chain for plastics.

Toby Gardner, Senior Research Fellow, Stockholm Environment Institute

Overall plastic production is expected to increase by 40% over the next decade, with approximately US\$300-400 billion in planned capital investments to expand capacity. Basic transparency is required of who owns the companies involved and how they are financed.

Further, mounting public pressure and the likelihood of an increasingly regulated operating environment represent significant risks for investors, for insurers, as well as for the producers and users of plastic. Risks include reputational, liability and business transition risks. These risks may result in higher costs of capital, margin erosion, stranded assets, and even payments of damages for historical liabilities.

To date, corporate exposure to plastics risks remain largely unquantified. Their absence from investor screening and decision-making is due to:

- Relatively recent realisation of the unintended consequences of plastics, i.e. major environmental and health risks.

- Paucity of relevant, standardized, and comparable metrics. In the rare cases that plastic consumption or leakage is reported, it is almost exclusively self-reported data without verification or assurance.
- Limited overview of the current and emerging policy and legislation landscape, especially in the form of increased taxation.
- Limited ability to translate a business's plastic exposure into financial implications.
- No integration of plastics in existing ESG frameworks and limited understanding of the relative magnitude of the risks.

Increased transparency on financial flows and risks has the potential to accelerate the inclusion of plastic waste metrics into sustainable investment and insurance frameworks. In so doing, capital allocation and financial flows can more easily be redirected towards a circular plastics economy

CASE STUDY

Carbon Tracker introduced the concept of Stranded Assets as a reference to assets that are no longer able to generate an economic return because of changes associated with the transition to a low-carbon economy. The concept has direct parallels for the plastics industry as it makes the transition to a circular economy. The “stranding” of assets can encompass a range of factors, including:

- Economic stranding due to a change in relative costs and prices.
- Physical stranding due to distances, flood, or drought.
- Regulatory stranding due to a change in policy of legislation.

The stranded asset concept is complemented by a stranded liability risk, namely the legal obligation to ‘retire’ assets at the end of their productive lives to protect human health and the environment.^{xxiv}

D. POLICY MONITORING AND EVALUATION

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Policy plays a pivotal role in solving the plastics crisis – designing, implementing, and enforcing good policy is mission-critical. At the same time, the plastics policy arena is shifting so rapidly, it is hard to keep track of what has worked and what hasn't. Creating such transparency by monitoring effectiveness could aid policy development and the transition to a low-leakage world.

Simon Reddy, The Pew Charitable Trusts

Plastic and waste management is characterized by a diverse and fragmented policy landscape, with new policy being developed in many countries, ranging from bans on certain products, to taxes, to the introduction or the reform of Extended Producer Responsibility systems. Despite this dynamic policy landscape, with far-reaching implications for many actors, there is no institution or focal point that systematically aggregates, analyses or evaluates policies. Further, policy effectiveness is not being consistently monitored at the national or sub-national level.

As a result, there is a lack of transparency concerning the current and future policy landscape, the implications for business and investments, and the impacts on plastics leakage to nature and circularity. These transparency and knowledge gaps persist along the following dimensions:

- Status and content of existing and emerging legislation, including an identification of potential gaps and areas for improvement, and an evaluation of effectiveness and impact.
- Analysis of policy implications for the plastics industry: across producers, converters, brands, retailers, and waste management companies.
- Insufficient research and thought leadership to catalyse innovative Extended Producer Responsibility systems or reuse/refill models.

A single institutional focal-point, or resource platform, that provides both aggregated and country-specific information and analysis concerning the plastic waste policy landscape would enable superior the evaluation of policy-effectiveness, design of better policy, and quantification of policy-risks for businesses and investors alike.

CASE STUDY

A comprehensive plastic-policy database has been synthesized by Duke University in collaboration with The Pew Charitable Trusts, to understand the policy response of governments to the global plastic pollution problem. This policy database also serves as a basis for more rigorous monitoring of progress, and to inform future public policies.^{xxv}

The scope of the study covers policies introduced between 2000 and 2019 and its primary focus is on those policies explicitly aiming to reduce plastic leakage. General waste management policies are also addressed, being considered fundamental to the problem.

The inventory includes more than 270 plastic-specific policy documents and more than 370 general waste management documents that are thought to have an impact on plastic pollution. The study also analyses trends in policy at the national, regional, and international level and reviews the available evidence of policy effectiveness.

E. TRACK, TRACE AND REPORT



Business is ideally positioned to help fixing the broken plastic system and accelerate progress to a circular economy by eliminating the plastics we don't need, innovating to ensure the plastics we do need are all reusable, recyclable or compostable, and circulating all plastics to keep them in the economy and out of the environment, landfills and incinerators. Understanding their own plastic footprints, and tracking material flows through the value chain, is critical to inform corporate strategies for action and impact.

Sander Defruyt, Lead of the New Plastics Economy, Ellen MacArthur Foundation

Significant progress has been made over the last years in reporting policies and commitments by industry. Most notably by the New Plastics Economy *Global Commitment*, led by the Ellen MacArthur Foundation in collaboration with the UN Environment programme, which now has over 450 signatories. All businesses in the Global Commitment have committed to the same set of targets, to reporting progress annually, and publicly using the same metrics and definitions.

However, gaps and challenges persist along other dimensions:

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- Shared and adopted definitions and standardized methodologies to determine corporate footprints and leakage are nascent, e.g., Quantis and EA's *Plastic Leak Project*^{xxvi}, WWF's ReSource: *Plastic Footprint Tracker*^{xxvii}.
- Cost and effort-effective solutions to track and trace materials through the plastics life-cycle are mostly nascent and in pilot stages, e.g., chemical finger-printing.

Creating greater transparency on material flows from source to consumer, both internally and externally, can enable corporates to design better interventions and abatement strategies, and enable the financial industry to quantify risks better and include measures of plastic waste in investment frameworks, e.g., a plastic footprint.

Comprehensive voluntary disclosure of plastic footprints also enables the transition from voluntary to regulated disclosure, by highlighting for regulators and legislators what needs to be measured. Voluntary commitments often lack "teeth", i.e., an accountability framework that provides independent verification and assurance that self-reported information is accurate, or that targets, and commitments are being implemented.

Finally, product-level transparency – e.g., verifying the provenance of plastic material – could present a significant opportunity to develop consumer-facing educational campaigns and encourage sustainable purchasing decisions.

CASE STUDY

Emerging commercial solutions to track and trace materials through the value chains are exploring distributed ledger technology ("blockchain"). These include start-up such as Circularise (Netherlands) or Circular (UK), but also solutions by established providers such as IBM and SAP. These solutions create digital twins that represent a physical unit of material and include all the data and verified documentation about the physical product as it moves through the supply chain. As the material moves through the value chain additional information can be added to the digital twin.

With this approach claims can be made pertaining to the product, for example, about the level of recycled content or proof of feedstock provenance. While these solutions are still in early stages and they must prove their viability in practice and the marketplace, there is significant momentum, with an increasing number of pilots and corporate partnerships being announced.

F. REGULATED DISCLOSURE ADVOCACY



We advocate to use the power of the law to mandate the disclosure of plastic usage, leakage and to protect peoples' health from toxic chemicals. Through regulation, we want to reduce the production of unnecessary plastics, increase the safe recycling of plastics, and hold all players accountable to contribute to a transition to a circular plastic economy.

James Thornton, Founder and CEO, Client Earth

The total amount of plastics 'in the system', as well as the footprints of individual companies, are typically unknown to regulators or investors. This includes polymer compositions, formats and the degree of recycled content used in packaging and packaged goods.

Corporate disclosure of plastic usage and risks to external audiences and shareholders has been limited to date partially due to the lack of standards, procedures and methodologies outlined in the previous sections, but also due to the lack of interest and demand from corporate stakeholders or regulators.

Comprehensive reporting of plastic material flows, through regulated disclosure, would benefit legislators in the design and implement effective plastics policy, and investors in screening the exposure of corporations to plastic risks.

Mandatory disclosure of plastic usage and reporting as a material business risk would also put a new onus on corporate directors, influence corporate strategy, and set business on a path towards circular plastic usage

CASE STUDY

An example of the legislative route to greater disclosure: The 'Central Agency Packaging Registry' is a core element of the reformed German packaging law and acts both as an official supervisory body and as a clearing house for all packaging-related data. All companies whose packaging waste is typically disposed by households must register their types and volumes of packaging brought onto the market in a central, publicly accessible database to ensure transparency and compliance.

An example of corporate governance route: shareholder advocacy groups such as *AsYouSow* have made initial attempts to increase disclosure of plastic risks by filing plastics-related resolutions at shareholder meetings. *AsYouSow* built an international coalition of investors to engage publicly traded companies on plastic waste and pollution. Twenty-five institutional investors from four countries with a combined \$1 trillion of assets under management have signed a declaration citing plastic pollution as a significant corporate risk and vowed to drive companies to address these challenges through new corporate commitments, programs, and policies.^{xxviii}

6. CONCLUSION



Current commitments by governments and industry to tackle the rising plastics tide fall short in ambition: they are too narrow in scope and scale, and mostly focus on low plastic leakage countries. Current commitments are projected to reduce ocean plastics leakage by only 7%. Under a business-as-usual scenario recycled content is projected to *decrease* to 12% of total plastic volumes, and new delivery models such as reuse or refill remain negligibly small.^{xxix}

In contrast, upstream and downstream technical solutions and novel business models have the potential to dramatically increase the amount of plastics in circularity and reduce leakage to the oceans compared to business-as-usual projections. But to stand a chance to transition to a zero-leakage and high-circularity world, far greater ambition, efficiency, and scale of action is necessary.

This will require better-informed and more enlightened decision-making by all stakeholders. By institutionalising greater transparency in the plastics supply chain, this lofty aim can be achieved. While transparency is not accountability or responsibility *per se*, it is an important precursor and systems-change enabler, without which progress beyond the *status quo* will continue to be painstakingly slow.

This paper outlines what needs to be done, by whom, and how. We call for courageous policies by governments, true leadership by the industry, pressure from investors, and for the support of civil society and academia to help bring it about. We call for bold strategies, collaboration, and joint efforts to address these transparency challenges and clear the pathways to a circular, zero-leakage plastics economy.

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CLEARING A PATH THROUGH THE WASTE ESSENTIAL TRANSPARENCY IN THE PLASTICS SUPPLY CHAIN

