Closing the Intention-Action Gap: Behaviorally-Aligned Strategies for Effective Plastic Pollution Reduction

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Executive Summary: This brief provides an overview of existing or proposed policies that aim to mitigate plastic pollution in four countries across the Americas (Argentina, Brazil, Canada, and Jamaica), as well as how a behavioral framework can be used to analyze and develop effective plastic pollution mitigation policies. At times, policy efforts do not always produce the desired outcomes, resulting in an intention-action gap, which is a disconnect between policy intentions and the everyday behavior of stakeholders. This brief highlights behaviorally-aligned recommendations to reduce the impact of plastic waste and pollution. The ultimate goal of this policy brief is to provide policymakers an insight into behaviorally-aligned policy perspectives to address plastic pollution in their respective countries.

I. Background

Plastics have made human lives easy and provided benefits and convenience, particularly in the areas of food safety and storage, technology, and medicine, among others. However, as one of the greatest environmental challenges of the 21st century, plastic pollution is a global issue, causing extensive damage to ecosystems, food systems, and human health. Likewise, livelihoods have been disrupted due to negative impacts on tourism and fishing industries, resulting in significant economic costs (UNEP 2021a). According to the OECD (2022), the world is currently producing twice as much plastic waste as it did two decades ago, with only 9% being successfully recycled, while the vast majority is categorized as mismanaged and uncollected litter, landfilled, and/or incinerated. The majority of poorly managed plastic waste leaks into nature, making its way into rivers and eventually ending up in the ocean.

For this reason, many international and regional organizations, as well as governments around the world at national and local levels, have established laws and other public policies to reduce plastic pollution. There are over 550 current policies in over thirty languages at the subnational, national, and international level (Karasik et al. 2022). More than 120 countries have bans or taxes on single-use plastics, but these measures are insufficient to reduce overall pollution. Most regulations are restricted to items such as plastic bags, which account for a minor portion of plastic waste and are more effective at reducing littering than reducing plastic consumption (OECD 2022). Therefore, amidst numerous multi-level and multi-scale policies, laws, and regulations in place to combat plastic pollution,

the problem persists. Recently, the UN Environment Assembly unanimously endorsed an historic resolution entitled, "End Plastic Pollution: Towards an internationally legally binding instrument". Its charge to the Intergovernmental Negotiating Committee (INC) was to have this instrument completed by 2024 to prevent and reduce global plastic pollution through a comprehensive approach by addressing the full life cycle of plastic and facilitating its sustainable consumption.

As plastic pollution is a global issue, it is challenging to formulate policy solutions across different stakeholders in different countries, and even more challenging to implement those policies across national boundaries. Building consensus across multiple stakeholders within and across sovereign nations requires extensive science diplomacy approaches and behaviorally-informed strategies. There is growing recognition of the importance of integrating behavioral science in policymaking to maximize positive outcomes. Generally, "behavioral insights have disproportionately focused on developed countries, while there are many opportunities to apply behavioral insights in developing countries" (UNEP 2017). As policy directly impacts human beings and anticipates a related behavioral change as one of the outcomes, behavioral science inputs can augment missing gaps in the policy design, implementation, and evaluation processes.

Certain behavioral interventions focus on framing the policy issue in an individual (I)-frame, rather than the systemic (S)-frame, and while they may show success at times, they are difficult to sustain and scale-up. However, it is well established now that context alters the policy outcomes dramatically. Without aligning the ecosystem in which the individuals operate, the sole emphasis on individual behavior change may not succeed. In this context, an ecosystem consists of the socio-political-cultural-regulatory-economic landscape in which an individual or a stakeholder collective operates, effectively constituting the S-frame. Instead of focusing on the individual, ecosystem-level institutional support is critical to help overcome human psychological frailties such as confirmation bias, anchoring effect, motivated reasoning, sunk cost fallacy, loss aversion, and present-bias (Heidbreder et al. 2019). The S-frame and I-frame approaches (Chater & Loewenstein 2022) could support significant improvement in bringing about varied stakeholder inclusion and positive results while applying behavioral science for policy. Consequently, policy solutions that include systemic action aligned with human behavior can have significantly higher success in adapting solutions offered by science (Thaler & Sunstein 2009). In other words, a system-level behavioral intervention is critical for the success of individual and stakeholder-level behavior change.

i. Behavioral biases in the Americas' policy landscape relevant to plastic pollution

Following international trends to reduce plastic waste and raise awareness about plastic pollution, countries in the Americas are creating several mechanisms to ban or restrict the production and consumption of single-use plastics. For example, the Latin American and Caribbean (LAC) region produces ten percent of global plastic waste (UNEP 2018; 2021). Through multi-level laws, taxes, regulations, bans, and campaigns, countries are making efforts to reduce the circulation of plastic bags, straws, and other common single-use objects that have negative impacts on the environment, particularly in marine ecosystems.

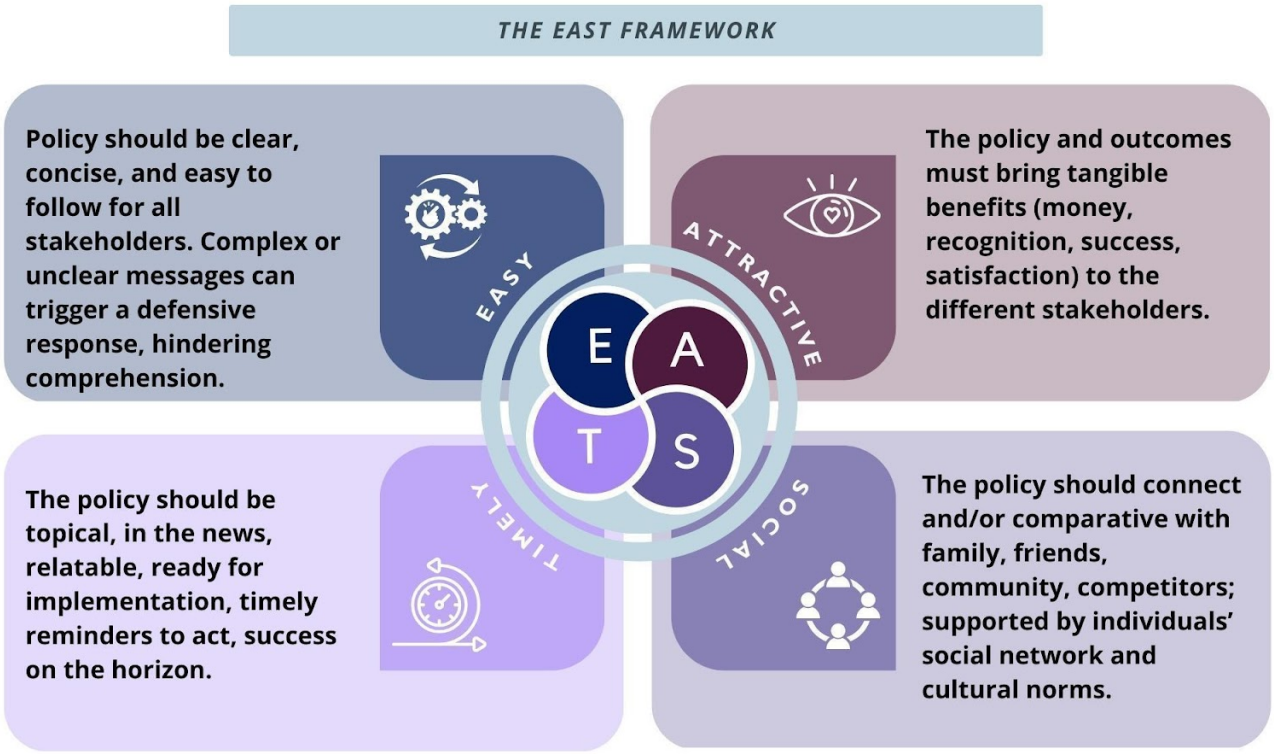

Figure 1: EAST framework with a set of guidelines adopted for analyzing policies and draft legislation aimed at reducing single-use plastic towards plastic pollution mitigation among the four countries in the Americas: Argentina, Brazil, Canada, and Jamaica.

In this policy brief, we consider the EAST framework (Figure 1) to analyze policies on plastic from four target countries in North and South America as well as the Caribbean (Argentina, Brazil, Canada and Jamaica). EAST (Easy, Attractive, Social, and Timely) is a behavioral framework that has been tested and used across different countries and contexts (The Behavioral Insights Team 2014). It identifies four crucial factors that influence the behavioral change of individual stakeholders. Incorporating these factors into policies, interventions, or campaigns is more likely to encourage individual stakeholders to adopt and maintain a new or desired behavior. Because the four selected countries span the Americas and are member states of the Inter-American Institute for Global Change Research (IAI), the analysis offers an opportunity to develop behaviorally-aligned science diplomacy solutions for regional issues. The four countries were selected for analysis based on the authors' participation in the IAI Science, Technology, and Policy (STeP) Fellowship Program. This is a professional development program for early-career researchers in the Americas, particularly in the LAC region, where Fellows are encouraged to form multinational groups to develop a science diplomacy project that will address complex and transboundary challenges facing the region.

Globally, many organizations and countries have successfully adopted behaviorally-aligned strategies and tools in their policy and decision-making processes (OECD 2017). In the context of the EAST framework, the stakeholders' processes and any challenges faced on the path to policy compliance must be understood. This understanding can come from various experimental methods, such as surveys, to map stakeholder perception as well as conducting randomized-controlled trials (RCTs). Here, the framework is applied through a review of the policies and regulations against plastic pollution in the four countries listed.

II. Results

i. Current policy status in Argentina

Argentina does not have a national law addressing plastic pollution. Single-use plastics like straws and

plastic bags are prohibited in some cities like Buenos Aires. In October 2021, the Ministry of Environment and Sustainable Development presented the Chamber of Deputies with a bill called, "Law of Packaging with Social Inclusion" (Argentina 2021). This bill focuses on the Extended Producer Responsibility (EPR) in the plastic product cycle, oriented to sustainable management of the products from their design, production, distribution, consumption, and disposal.

The Chamber of Deputies approved the bill with the support of the Natural Resources and Budget commissions. However, it could not be discussed in the Chamber of Senators, and it lost validity because of legislative turnover at the end of the year. Moreover, the discussions between political parties about the bill's details ended the policy bill cycle (Ambito 2022). Therefore, the bill should be presented again to the Chambers for discussion.

One of the main points of the law is the creation of an environmental tax (Ambito 2022) to be paid by companies that produce packaging for the market. If companies create products with recycled materials or design products with alternative materials and/or with fewer contaminants, they will pay less than others using only plastic material. The proceeds from the tax will be used to create "recycling systems with social inclusion," supporting the activities of recyclers, or so-called Cartoneros, in Argentina, and cooperatives that collect, reuse, and transform packaging before its final disposal. According to the Argentinian Movement of excluded workers (MTE n.d.), around 200,000 recyclers from different municipalities of Argentina collect recycled materials under poor conditions, with no labor rights. Thus, they expect this environmental tax could help them improve and dignify their daily work. On the other hand, some political parties and big companies disagree with this environmental tax, arguing that the tax will increase the price of the products, like medicines, and argue that the cost will be transferred to consumers.

EAST analysis for policy in Argentina

Easy: The responsibility of consumers and the production sectors is clear in the proposed law. This ambitious bill addresses the entire plastic chain and other materials from production to waste disposal to achieve sustainable management, which will last over time. The bill proposes an environmental tax to producers according to the material companies' and producers' use of the products. It is easy to read and understand, but poorly disseminated.

Attractive: The bill has a holistic perspective, seeking to achieve environmental, economic, and social goals. The environmental dimension of the bill focuses on decreasing the amount of plastic produced while encouraging the design of products with alternative or recycled materials. If companies use alternative materials with less polluting components, the amount of tax is also less. This will be determined by the packaging and waste management body (HDNC 2016). The bill is proposed as a rewarding process encouraging companies to align with best practices. However, the bill triggers many discussions about the tax, such as who should pay it, or if its cost will be transferred to the consumers. In this sense, stakeholders' early engagement is needed to build consensus to support the bill and move forward.

The economic dimension of the bill concerns the proceeds from the tax. According to the bill, they will be used to fund waste management systems to collect and reuse packaging before its final disposal. The social dimension of the bill recognizes the labor of recyclers as a formal position that protects the environment (Pagina 12, 2022); all dimensions could have successful impacts on society and environment.

Social: Public awareness about plastic pollution, waste management, consumption trends, and the intended positive outcomes of the law is required. As some discussions tend to focus on misleading information that is not in the bill (e.g., that the consumer will be charged with the tax or that it will lead to product cost increases), it is relevant to contemplate public awareness campaigns and dissemination strategies that address these concerns about the law's implementation.

Timely: This bill has had other precedents, like law No. 25,916, which establishes minimum monetary budgets for environmental protection for comprehensive household waste management. However, the bill discussed here, "Law of Packaging with Social Inclusion", goes further to align with national and international agendas to reduce plastic pollution and waste management. At the same time,

it addresses the private sector's responsibility in the plastic cycle and promotes the rights of recyclers and cooperatives as they are key actors in the recycling process. This element of the bill is key as it addresses the environmental issue while tackling poverty and inequality conditions.

ii. Current policy status in Brazil

Brazil does not have a national law addressing plastic pollution and/or banning single-use plastics. However, some cities and states have laws to restrict or ban certain types of single-use plastics. Some Brazilian states, such as Esprito Santo, initially prohibited plastic bags but later declined to ban them. On the other hand, the island state district of Fernando de Noronha is the first in the nation to prohibit the import, distribution, and use of single-use plastic or similar material packaging and containers. In October 2022, the Federal Supreme Court unanimously upheld the law mandated by the municipality of Marlia (São Paulo State) that calls for using biodegradable bags and sacks instead of plastic ones. This decision establishes a benchmark for local governments nationwide to adopt their own laws.

Currently, the Brazilian House of Representatives has several national draft legislations addressing single-use plastics (Faroni-Perez 2023 in press). The first draft legislation (PL 3.750/1997) was presented twenty-five years ago and included extended producer responsibility, a tax on producers excluding recycled materials, and awareness-raising measures to combat plastic pollution of rivers. Since then, several lawmakers have presented new draft laws that have accumulated in the National Congress. None of them have yet been approved. Although sixty-five draft legislation proposals have been amended to the draft PL 612/2007 that focused on biodegradable plastic bags, the EAST framework analysis herein is based on the draft legislation PL 10.504/2018, a more developed proposal to establish a National Program for Banning Single-Use Plastics by 2030.

EAST analysis for policy in Brazil

Easy: The National Single-Use Plastics Ban Program is easy to understand and simple to follow by different stakeholders, due to its clear text. It defines single-use plastic products as those not intended for multiple rotations in their lifecycle through recycling or reuse, but fails to incorporate banning of primary microplastics, which are intentionally produced in small sizes to be added to products. The draft legislation aligns principles and objectives with those stated in Law 12.305/2010 (National Solid Waste Policy), including the protection of public health and the environment; sustainable production and consumption; the adoption of clean technologies; and the promotion of the recycling industry.

Attractive: The National Single-Use Plastics Ban Program brings benefits as it allows the Union, States, Federal District, and Municipalities, within their competencies, to establish regulations. These regulations grant tax, financial, or credit incentives to industries, entities, and projects dedicated to recycling plastic waste and to companies and commercial establishments that implement selective waste collection systems. Another element of the draft legislation is the establishment of a National System of Information on Plastic Waste Management, which will be cooperatively administered by the federal, state, and municipal governments.

Social: The draft legislation connects different stakeholders, and its guiding principles include prevention and precaution, shared responsibility, and the value of recyclable plastic as an economic and social asset. The National Single-Use Plastics Ban Program goals include safeguarding the environment and public health, managing waste, implementing sustainable production and consumption regulations, and the integration of waste pickers into plastic products' life cycle. However, it does not consider the different economic realities across the country or the inclusion of specific social demands, such as those for people with physical or health needs.

Timely: The National Single-Use Plastics Ban Program covers hot topics in the media, is ready for implementation, and can achieve success as long as the draft legislation does not impose behavioral changes suddenly. It lists implementation measures to be taken until 2030, including gradual consumption reduction, the development of more sustainable products, labeling programs, producer responsibility, promotion of selective waste collection, and consumer education. However, it does

not mandate any changes in behavior. Across the country, the draft legislation prohibits the manufacturing, commercialization, and distribution of non-recyclable single use plastics (such as cotton swabs, cutlery, balloon sticks, and non-biodegradable bags).

iii. Current policy status in Canada

In Canada, the federal government decided to designate plastics as "toxic" under the Canadian Environmental Protection Act. This act effectively meant regulations that put a ban on the sale, import, and production of single-use plastic items with the aim to achieve zero plastic waste by 2030. While this is a step in the right direction, only a limited number of products fall under this ban and some prohibitions come into effect only after 2025. The six categories of products banned only make up about 3% of the total amount of plastic waste created in a year (Environment and Climate Change Canada, 2023). The ban will have an estimated cost of C$1.3 billion over the next decade (Canada Gazette 2021), and is likely to have adverse economic impacts on local employment outcomes. Additional negative impacts to ecology (in particular to wildlife and their habitats) are non-monetized consequences of the selected-item ban. Due to the lack of current alternatives, items like plastic cup covers are still permitted, but some compostable plastic products are banned, making the policy confusing for producers.

EAST analysis for policy in Canada

Easy: A complete ban on goods that both producers and consumers regularly produce and use is likely to cause short-term and medium-term distress. While most plastic single-use straws are banned, flexible or bendable straws are not. The policy allows the retail sale of flexible straws but restricts visibility for customers (i.e, they are not on public display and provided only if requested by the customer). Such restrictions do not apply to business-to-business transactions. The policy has specific but hard-to-follow definitions of reusable and recyclable plastic. For instance, checkout bags are prohibited (with no easy alternatives made available), but single-use bags for pet waste and garbage bags are not (even if they are only used once). Some alternatives are not allowed, because they are considered non-conventional plastic (e.g., compostable cutlery and takeout containers). Environment and Climate Change Canada (ECCC), the government agency responsible, maintains that both conventional and non-conventional plastics are prohibited, and that in order for a product to be exempt from the ban, it must be "reusable," which means it must not degrade after 100 dishwasher cycles.

Attractive: The policy is restrictive and unattractive for many stakeholders, including plastic producers. The narrative framing effect is also quite visible, where the government's decision to designate plastics as "toxic" was received quite negatively by the plastic producers and resulted in a lawsuit challenging it. Another lawsuit asks the Federal Court to quash the ban, prohibit the government from using the act to regulate single-use plastics, and prevent the ban from being implemented.

Social: The policy doesn't seem to encourage a social aspect and fails to offer alternatives. In addition, different stakeholders (plastic producers, large and small retail suppliers, and consumers) are not incentivized to collaborate or compete with regards to reduction or ban on plastic use. Further, the single-use plastic ban is likely to increase demand for paper as an alternative, putting pressure on forests and environment and requiring additional energy, water and land use.

Timely: The time for the policy to come into force (a 42-month phase-out period) is quite long and allows the government to meet international commitments while minimizing adverse impacts to the industry. Sufficient time is being allowed for multiple stakeholders to understand the policy and gradual phase-out of plastic products with grace periods for compliance.

iv. Current policy status in Jamaica

In 2019, Jamaica implemented legislations (the Natural Resources Conservation Authority Act and the Trade Act), through a three-phased process to ban the manufacture, importation, distribution, and use of specific categories of plastics, such as single-use plastic carrier/shopping bags (dimensions at and below 24"x24"), expanded polystyrene foam (styrofoam), and plastic drinking straws (including items attached to drink boxes and pouches). These products are primarily used in the retail and wholesale sectors, as well as in the food

and beverage industry. There were exemptions, including the ban not being applied to single-use plastic bags that maintain public health or food safety standards, such as those used to package food items (e.g., raw meats, flour, sugar, rice, and baked goods such as bread). Likewise, drinking straws manufactured for use by persons with disabilities were exempted. Considering that plastics account for 15% of residential waste (Rose and Webber 2019), the legislation achieved bi-partisan support and acknowledgment from local and international stakeholders and organizations. The law is anticipated to facilitate several positive outcomes, including a decrease in plastic litter on beaches, on roadways, in storm drains, and in rivers and oceans. The ban is likely to encourage the use of more sustainable alternatives, as well as to open up new economic opportunities for local businesses producing biodegradable or reusable products (UNEP 2021b). However, the challenges of effective enforcement, compliance through public education, adequate alternative options for consumers, and an infrastructural environment that facilitates efficient containerization of plastic waste remain a major concern (Jamaica Observer 2021). Legislation without the support of an enabling environment cripples its effectiveness in producing any lasting impact.

EAST analysis for policy in Jamaica

Easy: The Jamaican legislation is easy to understand and follow. Its draft design was facilitated by a government-appointed working group which conducted several consultations with various stakeholders prior to being enacted. However, there remains a lack of enforcement, possibly due to insufficient human, financial, and institutional resources, such as a robust municipal waste management system.

Attractive: The Jamaican legislation is not attractive. Though the general public and other stakeholders recognized the importance of reducing plastic use and waste, the ban has been implemented in an environment and culture where the convenience, affordability and ease of using plastics, especially shopping/carrier bags, was normalized. Beyond the promotion of a healthy environment, there aren't any tangible rewards offered to the public to encourage high compliance. Instead, it depends on citizens cultivating their own sense of environmental stewardship. The legislation is also not necessarily attractive to the pockets of consumers and the private sector. Some alternative paper based and/or reusable products in the food industry have been characterized by several issues, including complaints of high cost and heat transfer and leakage due to the poor quality of the material used. In an effort to maintain profits, businesses and restaurants have found creative ways to legally circumvent the use of paper-based containers and avoid prosecution by increasing the importation and use of plastic based food containers (initially not addressed in the ban). This workaround has resulted in unintended consequences of replacing one type of plastic waste with another.

Currently, alternative products are used throughout the formal retail market including major supermarkets. However, there remain some retail and wholesale businesses that issue plastic bags with the purchase of goods. According to a 2020 Regulatory Impact Assessment on the effectiveness of Jamaica's single-use plastic ban, these plastic shopping bags may have been illegally imported, and/or are being locally manufactured (NEPA 2022). Recently, it was revealed that the legislation will be amended to include plastic-based lunch containers, large single-use carrier bags, and microplastics (Spence 2022a).

Social: The Jamaican legislation is social. In an effort to increase buy-in and social acceptance, an educational campaign and a strategic communication plan accompanied the legislation, in which information on the ban was advertised on traditional and social media. Notably, under Jamaica's Vision 2030 Development Plan and 2018-2021 Medium Term Socio-Economic Policy Framework, a "Beating Plastic Pollution Campaign'' was designed to raise public awareness on the devastating impacts of plastics on the environment, and to encourage environmental stewardship and influence behavioral change by encouraging a transition from disposable to reusable items. The campaign adopted the "6Rs" approach: Reduce, Reuse, Refuse, Rethink, Repair and Recycle (GoJ 2018). Recent reports from the government have acknowledged that the severity of plastic waste pollution cannot be solved through a voluntary system approach and have indicated that a Deposit Refund Scheme (DRS) will be supported by

legislation by the end of the 2022 financial year (Spence 2022b).

Timely: The Jamaican legislation is timely. Jamaica's approach to reducing plastic pollution has been very ad hoc in nature, with intermittent recycling projects and beach clean-ups in local communities by state agencies and environmental NGOs. Therefore, the implementation of legislation on single use plastic was timely and welcomed by the general public. The three-phase process of the legislation attempted to ease consumers, producers, and businesses into being fully compliant with the policy by 2021.

III. Discussion

The four countries presented here are differentiated by their political, economic, social, and cultural context, as well as their geographic location, language, size, and economic development, among other factors. Regardless of whether they have implemented various measures such as environmental regulations or policies, these countries share the commonality of battling persistent plastic waste, its leakage to nature, and its impact on economic sectors, health, and livelihoods. For example, Brazil contributes 325,000 tonnes of plastic annually that end up in the ocean from land-based sources like open dump sites (Oceana 2020). Similar challenges have also been noted in Jamaica, Argentina, and Canada. This pervasiveness of plastic pollution can be due to unfavorable management conditions such as poor plastic waste infrastructures, lack of enforcement, and limited investment in low cost and easily accessible alternative materials. In addition, existing policies do not directly target microplastics or plastic particles.

The plastics industry and market pressures may also restrict discussions, the passage of laws, or even the implementation of public policies. Over decades, Brazil has proposed several draft laws concerning plastic bags and single-use plastics, yet none has been properly debated towards approval. Similarly, in Canada, plastic producers challenged the nationwide plastic policy by filing two lawsuits with the aim of preventing the single-use plastic ban from being implemented. In Argentina, the draft policy triggered resistance as many companies and interest groups have invested in lobbying efforts and started to misinform the public about who will be responsible to pay an environmental tax and if cost is transferred to the consumers. The above are the examples of opposition to S-frame interventions that will impact the downstream individual-level compliance and behavior. Relatedly, there has been limited effectiveness of EPR policies, which is due to the insufficient allocation of responsibility to plastic producers to drive them systematically towards ecologically-protective design strategies (Walls 2006; Compagnoni 2022).

Policymakers may need to consider new strategies to foster public and private collaborations and innovative ways of sustainable production and consumption. Brazil recently published two decrees on social inclusion and valorization of waste pickers in reverse logistics. This term refers to the management and control of the flow of goods and materials from consumption at retail stores, back to their manufacturing point. Reverse logistics can reduce environmental impact while increasing the value of returned products. The decrees have similarity to the "Law of Packaging with Social Inclusion" in Argentina. Both cases can serve as models and lessons learned for the LAC region. However, before plastic policies can be implemented effectively, they should consider how to extend producers' responsibility over the whole chain from production to disposal, and how to engage the private sector to tackle this issue, by assuming their accountability in sustainable management and environmental protection. Additionally, since the "Law of Packaging with Social Inclusion" focuses on providing recyclers with better labor conditions, it is still necessary to raise awareness on the role recycling cooperatives play in transforming plastic waste into resources.

Behavioral policy and sustainable solutions

The policy measures discussed have not comprehensively addressed the "intention-action gap", which refers to the gap or disconnect between policy intentions and the everyday behavior or actions of stakeholders (people and organizations) (UNEP 2017). Addressing this gap is critical for policymakers to understand that even though public awareness campaigns and supporting infrastructure may facilitate the necessary knowledge and intention in stakeholders, the stakeholders may still fail to act as expected (UNEP 2017). Hence, effective interventions and policy design depend on how

information is understood by stakeholders and the context in which their behavior is influenced, both of which contribute to the decision-making process and subsequent action on the ground. When considering the fight against plastic pollution, this gap has a significant impact on the effectiveness of policies. Despite extensive policy depth and dynamics covering multiple well-intentioned stakeholders, the actual implementation of these policies often falls short.

To close the gap between intentions and behavior and address the intention-action gap on plastic policies, some elements are crucial, such as setting clear and achievable goals; breaking down broader goals into smaller and more progressive results as more feasible steps; and establishing accountability to support measures. Using the EAST framework for a behavioral audit can help examine stakeholders' perceptions, behavioral biases and whether there is ecosystem-level support for behavioral change—for example, whether there are available alternatives to plastic production, distribution, and use, as well as incentives and ease of understanding—of multiple stakeholders.

Policy communication must be simple to understand and to act upon (Easy), with elements that allow for rapid onboarding and early adoption of policy instruments (Timely). Organizations and people are often attracted to short-term gains rather than equivalent or slightly higher benefits in the longer-term. This bias could be included in the policy instruments to nudge action at the organizational level. Since humans are social beings, both at the individual and organizational levels, social-norm messaging or nudges can accelerate the onboarding and implementation process (Attractive, Social). For instance, a nudge could be facilitating easier ways for people to recycle and dispose of plastic waste properly through accessible recycling drop-off points and collection services. In Jamaica, an assessment conducted to determine the features required for a successful Deposit Refund System (DRS) and to encourage public participation revealed that approximately 90% of the population would prefer collection points to be within a five-minute convenient drive or walk of their regular daily commute to incentivize them to return their plastic bottles (CAPRI 2019).

Additional examples that could be included in policies to nudge stakeholder action towards reducing plastic pollution are providing incentives such as tax breaks or subsidies for companies to reduce their plastic waste or to design new materials and products from recycled plastics. These elements to nudge stakeholder action are encompassed in the Brazilian draft legislation (PL 10.504/2018), Articles 11, 12, and 13, which proposes that the government may establish tax, financial, and credit incentives. Moreover, the previously discussed Argentinian bill proposes to reward companies with fewer taxes if they use alternative plastic materials that are less toxic than traditional plastic.

It is also crucial to innovate educational and public campaigns that can raise awareness and effectively shift behavior. To achieve this shift, it is necessary to couple these campaigns with accessible, timely, and relevant information. Additionally, motivational techniques that impact choice, and opportunities for cost-effective, accessible alternative/sustainable materials that are convenient to society can target the behavior of stakeholders and the public while taking into account cultural nuances.

III. Conclusion

A behaviorally-informed and strategically-planned policy benefits the entire policy process cycle, from formulation to the implementation and evaluation stages. When used, behavioral solutions have been shown to be cost-effective in terms of public funds, as they can be inserted into an ongoing policymaking or implementation process, and they may reduce the long term costs associated with a policy failure during implementation and on-the-ground change (Thaler and Sunstein 2009).

An effective policy on plastic pollution must bring changes in perception and behavior. For these changes to occur, a policy must be easy to understand, attractive to various stakeholders, social in its application, and timely in its implementation. The Canadian ban on single-use plastic is already in place (since December 2022) and behaviorally-aligned policy updates could enhance the applicability and compliance across stakeholders. Likewise, Jamaica's law on single-use plastic (legislated in 2019) could be supported through the ecosystem-wide application of behaviorally-aligned principles. As Brazil and

Argentina have yet to approve their national laws, policymakers have an opportunity to enhance the current proposals and align them with intentions and desired behaviors, leading to more successful implementation in the future.

Need for unified approach for effective policy across boundaries

As noted, some countries in the Americas do not seem to have a nationwide policy to reduce single-use plastic. In addition, the timeframe to formulate, implement, and evaluate policy takes several years, and, at times, decades. In the absence of national- level policies, it is hard to come together as nation states on a negotiation table to build consensus and formulate a multilateral binding and implementable policy that addresses the issue while taking into account the concerns and preferences of all stakeholders in respective countries.

In a multilateral context, whether relating to the four countries examined here or the UN Global Plastic Agreement, "End Plastic Pollution: Towards an internationally legally binding instrument", the first steps in solving the plastic pollution problem will be to align diverse stakeholders' interests, focus on shared perception, and build common ground for sustainable and joint action to remove and reduce plastic pollution. As the issue is trans-national in nature and requires multilateral cooperation and consensus, countries must work together to develop transboundary solutions and best practices, technology, and shared resources to effectively manage plastic waste. Given that science diplomacy can bring all of these elements together, it should be considered by governments to foster consensus and facilitate solution-oriented collaboration among countries facing the same problems, such as plastic pollution.

Likewise, the intention-action gap can be filled by an ecosystem-level behavioral shift that facilitates desired behavioral change, first at the institutional level, then at the individual level. Public policy must be crafted to nurture behavior that will promote environmental sustainability and reduce plastic pollution. This behavioral alignment will create easier enforcement of and compliance with the policies. Hence, behaviorally-informed public policies are not dependent on a single strategy implemented in a political, economic, social, cultural, or infrastructural silo, but rather require a suite of multi-scale strategies and coupled approaches.

This policy brief serves as an overview and commentary on behavioral limitations in existing policies and draft legislations targeting plastic pollution. Strengthening the internal capacity within government to consistently integrate behavioral insights into public policy is critical to advancing sustainable societal change and action against plastic pollution, at both the ecosystem and individual level.

References

Ambito. 2022. "Diputados: el proyecto de Ley de Envases será retomado por la comisión de Recursos Naturales" https://www.ambito.com/politica/diputados/el-proyecto-ley-envases-sera-retomado-la-comision-recursos-naturales-n5582138 11 November 2022.

Argentina.gob.ar. 2021. "Se presenta en Diputados el proyecto de ley de gestión de envases elaborado por el Ministerio de Ambiente de la Nación". https://www.argentina.gob.ar/noticias/se-presenta-en-diputados-el-proyecto-de-ley-de-gestion-de-envases-elaborado-por-el. 27 October 2021.

Canada Gazette. 2021. Single-Use Plastics Prohibition Regulations. Part I, Volume 155, Number 52. December 25, 2021. https://www.gazette.gc.ca/rp-pr/p1/2021/2021-12-25/html/reg2-eng.html

CAPRI (Caribbean Policy Research Institute). 2019. Economic Assessment of a Deposit Refund System (DRS) for Jamaica. UWI Mona: Kingston, Jamaica. Available from: https://www.capricaribbean.org/sites/default/files/public/documents/report/an_economic_assessment_of_a_drs_for_pet_bottles.pdf

Chater, Nick and George Loewenstein. 2022. "The i-frame and the s-frame: How focusing on individual-level solutions has led behavioral public policy astray." Behavioral and Brain Sciences. DOI: https://doi.org/10.1017&am

Compagnoni, Marco. 2022. "Is Extended Producer Responsibility living up to expectations? A systematic literature review focusing on electronic waste." Journal of Cleaner Production: 133101.

Environment and Climate Change Canada. 2023. Proposed Single-use Plastics Prohibition Regulations – Summary of public comments. January 2023. https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/reduce-plastic-waste/single-use-plastics-comments-response.html

Faroni-Perez, Larisse. 2020. Fatos e dados sobre a Política Nacional de Resíduos Sólidos. Fundação Heinrich Böll Brasil. Retrieved April 20, 2023, from https://br.boell.org/pt-br/2020/11/30/fatos-e-dados-sobre-politica-nacional-de-residuos-solidos-infografico

Faroni-Perez, Larisse. 2023. "Overcoming plastic pollution: Challenges faced by Brazilian policies and perspectives for stakeholder engagement and global governance opportunities''. The Journal of Science Policy & Governance. Vol. 22, Issue 2, https://doi.org/10.38126/JSPG220204

GoJ (Government of Jamaica). 2018. Vision 2030 Jamaica National Development Plan: Year in Review 2018. https://www.vision2030.gov.jm/wp-content/uploads/sites/2/2020/04/Vision-2030-Jamaica-Year-in-Review-2018-Final.pdf

Grillo, Jose F., Alejandra Guerrero Rebolledo, Marcos A. Sabino, and Ruth Ramos. 2022. "Microplastics in Latin America and the Caribbean: On the adoption of reporting standards and quality assurance and quality control protocols." Environmental Advances (2022): 100236 https://doi.org/10.1016/j.envadv.2022.100236.

HCDN. 6910-D-2016. Bill: Ley de Presupuestos mínimos de Proteccion Ambiental para la Gestión integral de envases y sus residuos a través de Trabajadores Recicladores. Available: https://www.hcdn.gob.ar/proyectos/textoCompleto.jsp?exp=6910-D-2016&tipo=LEY#:~:text=Son%20sujetos%20obligados%20para%20esta,los%20responsables%20de%20la%20primera

Heidbreder, Lea Marie et al. 2019. "Tackling the plastic problem: A review on perceptions, behaviors, and interventions." The Science of the total environment vol. 668: 1077-1093. https://doi:10.1016/j.scitotenv.2019.02.437

Jamaica Observer. 2021. "Jamaica gets D-plus for enforcement of plastic ban ahead of World Environment Day". https://www.jamaicaobserver.com/news/jamaica-gets-d-plus-for-enforcement-of-plastic-ban-ahead-of-world-environment-day/

Karasik R., Virdin J., Pickle, A., J. Wilson. (Editors. 2022. Plastics Policy Inventory https://nicholasinstitute.duke.edu/plastics-policy-inventory

MTE. N.D "Ley de envases con inclusión social". https://mteargentina.org.ar/ley-de-envases-con-inclusion-social/#:~:text=La%20Ley%20de%20Envases%20se,mercado%20nacional%20y%20los%20envases

NEPA (National Environmental Planning Authority). 2022. Plastic Pollution: Jamaica's Initial Response. https://www.nepa.gov.jm/sites/default/files/2022-08/Plastic-Pollution-Jamaica-Initial-Response.pdf

Oceana 2020. Um oceano livre de plástico : desafios para reduzir a poluição marinha no Brasil / Lara Iwanicki,. Ademilson Zamboni. 1. ed. Brasília, DF : Oceana. https://brasil.oceana.org/wp-content/uploads/sites/23/Um-Oceano-Livre-de-Plastico.pdf

OECD. 2022. "Plastic pollution is growing relentlessly as waste management and recycling fall short, says OECD." https://www.oecd.org/newsroom/plastic-pollution-is-growing-relentlessly-as-waste-management-and-recycling-fall-short.htm

OECD. 2017. Behavioural Insights and Public Policy: Lessons from Around the World, OECD Publishing, Paris, https://doi.org/10.1787/9789264270480-en.

Pagina 12. 2022. "Ley de envases con inclusión: El turno de los cartoneros" https://www.pagina12.com.ar/377691-ley-de-envases-con-inclusion-el-turno-de-los-cartoneros

Rose, Deanna, and Webber, Mona. 2019. "Characterization of microplastics in the surface waters of Kingston Harbour." Sci Total Environ. 664:753-760. https://10.1016/j.scitotenv.2019.01.319.

Spence, Chanel. 2022a. Plastic Ban Changes Coming to Counter Practices Outside Regulations. Jamaica Information Service. https://jis.gov.jm/plastic-ban-changes-coming-to-counter-practices-outside-regulations/

Spence, Chanel. 2022b. Government to Legislate Deposit Refund Scheme for Plastic Bottles. Jamaica Information Service. 30 August. https://jis.gov.jm/government-to-legislate-deposit-refund-scheme-for-plastic-bottles/

The Behavioural Insights Team. 2014. East: Four simple ways to apply behavioural insights. Retrieved Feb, 18, 2023, from https://www.bi.team/publications/east-four-simple-ways-to-apply-behavioural-insights/

Thaler, Richard H., and Sunstein, Cass R. 2009. Nudge: Improving decisions about health, wealth, and happiness. Yale University Press, New Haven, CT.

UNEP (United Nations Environment Programme). 2017. Consuming differently, consuming sustainably: Behavioural insights for policymaking. http://www.ideas42.org/wp-content/uploads/2017/11/UNEP_consuming_sustainably_Behavioral_Insights.pdf

UNEP (United Nations Environmental Programme). 2018. Waste Management Outlook for Latin America and the Caribbean. Retrieved from https://wedocs.unep.org/bitstream/handle/20.500.11822/26448/Residuos_LAC_EN.pdf?sequence=2&isAllowed=y

UNEP (United Nations Environment Programme). 2021a. From Pollution to Solution: A global assessment of marine litter and plastic pollution. Nairobi.

UNEP (United Nations Environment Programme). 2021b. Jamaica: plastic ban creates new opportunities. https://www.unep.org/news-and-stories/story/jamaica-plastics-ban-creates-new-opportunities

UNEP (United Nations Environment Programme). 2021c. Policies, Regulations and Strategies in Latin America and the Caribbean to Prevent Marine Litter and Plastic Waste: Information Report to the XXII LAC Forum of Ministers of Environment UNEP – Latin America and the Caribbean Office. https://wedocs.unep.org/20.500.11822/34931.

Walls, Margaret. 2006. "Extended producer responsibility and product design: economic theory and selected case studies."

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