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# A policy blueprint for scaling plastic alternatives in Global South contexts

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**Abstract**

Plastic pollution has emerged as a defining socio-environmental challenge of the twenty-first century, with its most severe impacts felt in the Global South. While alternatives to conventional plastics are increasingly promoted, policy responses in low- and middle-income countries remain fragmented, under-enforced, and poorly aligned with local realities. This paper introduces a novel policy blueprint matrix, an evidence-based framework that can help accelerate the adoption and production of plastic alternatives and non-plastic substitutes in a Global South context. For the purposes of this paper, the term Global South is used as a heuristic rather than a fixed geographic category. It refers primarily to low–and lower-middle-income contexts that often face overlapping structural constraints such as high informality, fragmented institutional coordination, constrained enforcement capacity, limited testing and standards infrastructure, and fiscal or industrial barriers to scaling plastic alternatives and non-plastic substitutes. Developed through a case study and co-creation process in Ghana, the blueprint integrates six interdependent pillars: stakeholder networks, economic incentives, regulatory standards, public awareness and behavioural change, research and development, and monitoring and compliance. While rooted in a Ghanaian experience, the matrix has been designed as a transferable tool across the Global South. The paper's originality and significance lie in its presentation of a policy blueprint matrix which can serve as a practical roadmap for advancing the adoption of plastic alternative and non-plastic substitutes in Global South contexts. It advances scholarship and practice by translating applied policy research into a structured framework that can guide governments, industry and civil society. The paper makes two primary contributions. First, it provides the policy blueprint as a coherent governance framework for enhancing the production and uptake of plastic alternatives. Secondly, it seeks to contribute to the scholarly discourse while also offering a practical framework that may help inform efforts to reduce plastic dependence in the Global South.

**Keywords** Plastic pollution, Global south, Plastic alternatives, Non-plastic substitutes

## 1 Introduction

Plastic has become a defining material of modern economies. Its durability, versatility, and low cost have entrenched it in nearly every sector–packaging, agriculture, health, transport, and consumer goods. In 2023, global plastic production reached

approximately 430 million tonnes, with nearly 280 million tonnes designed for short-lived use, thus quickly entering the waste stream [56]. Despite international commitments, recycling rates remain dismally low; only 9% of plastics are recycled globally, while 50% end up in landfills and the remainder leak into terrestrial and marine ecosystems [41].

The crisis is not evenly distributed. Countries in the Global South-spanning sub-Saharan Africa, South Asia, and parts of Latin America-face the brunt of plastic pollution's environmental, health, and socio-economic burdens [24]. Rapid urbanisation, weak waste management infrastructure, limited financial resources, and high dependence on single-use plastics for affordable consumption create conditions of acute vulnerability [1, 20]. For instance, Nigeria consumes 60 million sachet water packets daily, most discarded immediately [55], while India generates an estimated 9.3 million tonnes of plastic waste annually, 40% of which is mismanaged [20]. The consequences are severe; clogged drains exacerbate flooding in Accra and Lagos; plastic-laden fisheries undermine livelihoods in Ghana and Indonesia; and open burning of waste exposes millions to toxic air pollutants [45].

At the same time, Global South countries often serve as sinks for exported plastic waste from wealthier economies. Despite restrictions under the Basel Convention, reports show continued transboundary flows of contaminated plastic waste into Africa and Asia, further burdening fragile systems [42, 43]. Thus, plastic pollution in the Global South is not only an environmental issue but also a matter of climate justice, global trade inequities, and structural development challenges.

In this paper, the term "Global South" is used as a heuristic rather than as a strictly geographic or homogeneous category. More specifically, the policy blueprint matrix advanced herein is intended to speak most directly to low- and lower-middle-income settings in which plastic waste governance is shaped by combinations of high informality, fragmented institutional mandates, limited enforcement and monitoring capacity, underdeveloped standards and testing infrastructure, and fiscal or industrial constraints affecting the scale-up of locally viable substitutes [42].

The policy blueprint matrix is therefore not presented as uniformly applicable across all countries commonly grouped under the term "Global South". Rather, its transferability is expected to be strongest in contexts where these structural conditions are present in comparable ways.

Amid growing concern in these contexts about plastic waste management, attention has turned to sustainable substitutes; alternatives to plastics derived from renewable feedstocks, and non-plastic substitutes such as paper, glass, aluminium, bamboo, and seaweed-based composites [65]. These materials carry significant potential for reducing plastic dependence, enhancing circularity, and stimulating green industrialisation [50]. In Rwanda, for example, a national ban on single-use plastics has stimulated local industries producing paper bags and reusable packaging [5]. In India, government-backed start-ups are experimenting with compostable plastics and mycelium-based materials [32].

Yet, alternatives are not a panacea, with several Life Cycle Assessment (LCA) studies showing complex trade-offs. Paper bags, for example, while recyclable and biodegradable, often carry higher water and energy footprints than plastics if end-of-life systems are weak [57]. Cotton bags may require hundreds of uses to offset their production

impacts compared to single-use plastics [10]. Aluminium packaging, despite its recyclability, is energy-intensive to produce [2]. Substitution therefore requires nuanced, context-specific strategies that consider material properties, infrastructure availability, and socio-economic realities [42, 50, 56]. Without enabling policies, alternatives may remain niche, costly, and inaccessible for low-income populations, exacerbating inequality rather than reducing environmental harm [2, 55, 56].

Global South governments have experimented with a variety of interventions such as bans on single use plastics (Kenya, Rwanda), plastic taxes (South Africa, Ghana), excise duties, voluntary industry initiatives, and public awareness campaigns [1, 5, 42, 46]. While some show promising outcomes, most remain piecemeal, poorly enforced, or undermined by informal imports of banned single-use plastics [5, 6]. Even where alternatives are encouraged, supportive fiscal incentives, quality standards, and monitoring systems are often absent. The result is a policy landscape characterised by inconsistency, limited scalability, and vulnerability to reversal [22, 49, 55, 56].

Academic and policy literature increasingly recognises these shortcomings. It has been long argued that bans and taxes alone cannot deliver systemic change without complementary measures to accelerate innovation and behavioural shifts [13]. UNCTAD notes that trade-related measures on substitutes remain fragmented, dominated by defensive technical regulations rather than proactive support for green industries in developing countries [54].

Critically, there is no integrated policy blueprint that brings together regulatory, economic, governance, and behavioural dimensions into a single framework tailored to Global South contexts [13, 22, 49, 54] While high-income countries have experimented with circular economy strategies and extended producer responsibility (EPR), these models require adaptation to the realities of informality, resource constraints, and socio-cultural diversity that shape waste systems in the Global South[1] [27, 31, 39] .

This paper addresses the gap by presenting a policy blueprint matrix for enhancing the local production and adoption of plastic alternatives - developed through applied policy research undertaken in Ghana [34][2].

The policy blueprint matrix is informed primarily by a single structured participatory policy co-creation workshop held in Accra, Ghana, in October 2024 with 57 cross-sector stakeholders. The matrix should therefore be interpreted as a contextually grounded and evolving tool whose broader applicability and implementation performance require further comparative and longitudinal testing through future research.

Furthermore, the matrix is framed both as a roadmap for enhancing the adoption of plastic alternatives and non-plastic substitutes, and as a waste prevention-oriented framework. In this sense, it seeks to support upstream reduction of plastic waste through coordinated regulatory, fiscal, behavioural and monitoring interventions. The contribution of this paper is therefore analytical and applied. Analytically, it proposes a plastics substitutes-focused policy architecture that makes integration visible by linking

[1] For the purposes of this paper, the term 'Global South' is used as a heuristic for low and middle-income contexts with shared structural socio-economic constraints, and not as a claim of uniformity.

[2] Since its launch in Accra, the blueprint has been formally received by Ghana's Environmental Protection Agency and is being taken forward through an implementation-oriented process, signalling government acceptance and intent to implement the proposed roadmap (SMEP Programme, available at : https://smepprogramme.org/smep-funded-fresh-produce-impact-hub-successfully-launched-its-policy-blueprint-moving-ghana-beyond-plastics/, Accessed 4th March 2026).

regulatory, economic, governance, behavioural, innovation, and monitoring dimensions within one coherent matrix.

Methodologically, the paper shows how a structured co-creation process can be translated into a stabilised set of policy pillars through transparent synthesis and validation. In applied terms, it offers a Ghana-grounded policy prototype that is transferable in principle, while recognising that transferability still requires further participatory replication and comparative evaluation.

On this basis, the matrix is positioned as a complement to - rather than a replacement for - existing circular economy roadmaps and extended producer responsibility (EPR) models, providing an implementation-oriented blueprint for Global South contexts where policy fragmentation and capacity constraints commonly undermine plastics policy.

Unlike those more established individual approaches, the matrix is designed as an integrated implementation framework that brings together governance, regulatory design, economic incentives, behavioural change, innovation support, and monitoring within one structured policy tool.

The originality of this blueprint lies in its design and applied provenance. It is the outcome of engaged policy research undertaken within a real-world setting as opposed to being the product of a purely academic exercise. It bridges global trade debates with local needs, providing a framework that governments, donors, and private actors can adapt and operationalise in diverse contexts.

The remainder of the paper is structured as follows: Sect. 2 sets out the theoretical framework, drawing on circular economy, policy mix theory, multi-level governance, and behavioural science to provide the conceptual foundation for the roadmap. Section 3 describes the research and development approach for the policy blueprint matrix, with emphasis on the co-creation methodology (including the iterative validation of the six policy pillars which make up the matrix) employed in its development to help ensure stakeholder ownership and applied relevance. Section 4 presents the policy blueprint matrix in detail, elaborating each of its six pillars, associated instruments, case illustrations, and monitoring indicators. Section 5 discusses the comparative and applied relevance of the blueprint, highlighting lessons from Rwanda, Ghana, Chile, and India, and exploring the trade-offs and alignment with multilateral processes. These Global South examples were selected for their regional diversity and varying governance traditions, as well as for the characteristic they all share of having the common goal of reducing dependency on conventional single-use plastics through efforts and policies which scale the local production and adoption of plastic alternatives.

Section 6 highlights the limitations of the paper and implications for future research. Finally, Sect. 7 concludes with policy implications, underlining the role of the blueprint as both a national-level roadmap and a contribution to global plastic treaty negotiations.

## 2 Theoretical and conceptual foundations

Designing an effective policy roadmap for advancing plastic alternatives and non-plastic substitutes in the Global South requires grounding in robust theoretical and conceptual frameworks. The challenge of plastic pollution is not only technical or environmental but also deeply institutional, economic, cultural, and behavioural. It is shaped by questions of governance, trade structures, social practices, and political economy. Any

roadmap that seeks to chart a transition must therefore embed these dimensions into its foundations.

The policy blueprint matrix for plastic alternatives presented in this paper is underpinned by four interconnected frameworks: circular economy theory, policy mix theory, multi-level governance and subsidiarity, and behavioural change approaches. Each framework helps to explain why piecemeal interventions such as bans or taxes have so often fallen short and why systemic, multi-scalar, and culturally embedded approaches are needed. These frameworks are used in sections 4–6 to interpret and justify the six pillars after the matrix is presented and its development process has been explained.

Circular economy (CE) provides the most widely adopted paradigm for rethinking resource use [11]. It challenges the prevailing linear model of 'take–make–dispose' by emphasising strategies such as reducing, reusing, recycling, repairing, and remanufacturing, often summarised in the "10Rs" hierarchy [27]. CE is not simply about waste management but about system redesign - keeping resources in circulation for as long as possible and minimising virgin extraction [11].

Plastics represent a profound test of CE thinking. Their material properties - durability, versatility, and low cost make them attractive but also resistant to reintegration into biological cycles. Alternatives such as bioplastics and non-plastic substitutes hold promise, but LCA evidence complicates the picture. For example, Van Ewijk et al. show that paper bags, often promoted as substitutes, can have higher energy and water footprints than plastics if not reused or recycled effectively [57]. Similarly, the Danish EPA has demonstrated that cotton bags require hundreds of uses to offset their initial environmental burden compared to single-use plastics [10].

In the Global South, circularity is already practiced through informal reuse, repair, and recycling systems. Studies emphasise that this is often 'circularity by poverty', where necessity drives material conservation but without formal institutional recognition. Waste pickers and informal traders extend product lifespans, but their efforts are undervalued in policy frameworks [31].

Circular economy therefore contributes a systems perspective for plastics governance by linking substitution choices to material flows, infrastructure capacity, and end-of-life pathways [31]. In this sense, circular economy is best understood as a framework for system redesign that reduces dependence on virgin plastic materials, emphasizes waste prevention upstream, and strengthens reuse and recovery pathways [11, 27]. In Global South contexts, these considerations are intrinsically linked to the availability of locally sourced materials, established recovery and reuse systems, and the contributions of informal waste workers to circular economy pathways [39, 63]. In design terms, these insights most directly inform the Research and Development, Regulatory Standards, and Economic Incentives pillars of the policy blueprint (set out in Sect. 4) by framing substitution as a question of system redesign, local material suitability, and upstream waste prevention rather than material replacement in isolation.

Moving away from CE, plastic waste management has too often relied on singular, high-profile measures such as bans on single-use plastic bags or levies on bottles. Policy mix theory cautions against such siloed interventions, arguing that the transition to more sustainable practices requires coherent and complementary policy mixes that integrate regulatory, economic, informational, and voluntary instruments [49].

Studies by Flanagan et al. and Kivimaa and Kern show that successful policy mixes not only apply "carrots and sticks" but also address policy coherence, consistency, and credibility across time [14, 26, 29]. Poorly designed mixes can create contradictions - for example, subsidising virgin polymer production while imposing taxes on plastic bags - or weaken legitimacy if enforcement is inconsistent. Conversely, strong mixes combine prohibitions with enabling instruments, such as subsidies for alternatives, standards for biodegradability, and awareness campaigns.

Evidence from Rwanda demonstrates the effectiveness of a supportive policy mix. The ban on single-use plastic bags in Rwanda succeeded not simply because of legislation, but because it was reinforced by customs checks, public awareness campaigns, and economic incentive support for compliant manufacturers [6, 18]. By contrast, in India, uneven enforcement of bans without affordable substitutes undermined policy outcomes, thus showing the pitfalls of incoherent mixes [12].

The policy blueprint matrix for plastic alternatives incorporates these insights through the Economic Incentives and Regulatory Standards pillars. Legal-economic instruments such as VAT exemptions, concessional loans, and procurement quotas have the potential to ensure that the local production and adoption plastic alternatives and non-plastic substitutes are commercially viable, while regulatory standards prevent greenwashing and establish credible market rules. Policy mix theory also informs the blueprints' Monitoring & Compliance pillar, highlighting the need for adaptive learning which may help ensure that policies are be adjusted as technologies, behaviours, and markets evolve.

With plastic governance spanning multiple scales (municipalities, national governments, regional and global institutional blocs) multi-level governance (MLG) theory captures this complexity by showing how authority is distributed across vertical levels and horizontal networks of state and non-state actors [4, 15].

The principle of subsidiarity within MLG - that action should be taken at the lowest effective level - further clarifies that responsibilities for plastic waste management best lie at the point where they are closest to the everyday lived experiences of ordinary citizens [40]. Applied to the transition to plastic alternatives and non-plastic substitutes, this means local communities and municipalities must be empowered to innovate, while national governments provide regulatory support, and international actors harmonise trade rules to help ensure the fair and unhindered distribution of the benefits of innovative alternatives to plastics.

Evidence from the South African experience illustrates this very well. In South Africa, the national Extended Producer Responsibility (EPR) system requires collaboration with local municipalities for implementation [37]. Similarly, in Indonesia, municipalities are using a local initiative called 'waste banks' to mobilise citizens at the village level to increase recycling rates thus ensuring progression of national recycling targets [61].

In alignment with MLG theory the policy blueprint matrix addresses the fragmentation that has undermined many plastic policies in the Global South through its 'Stakeholder Networks' and 'Monitoring & Compliance' pillars. By establishing inclusive governance platforms, these pillars ensure accountability across scales.

Finally, sustainability transitions hinge on the ability to shift deeply ingrained consumer and producer behaviours. Behavioural science shows that knowledge alone rarely changes practices; instead, behaviour is shaped by habits, social norms, and contextual constraints [46, 51].

Recent systematic reviews show that interventions that combine regulation with behaviourally informed nudges–such as deposit-return schemes, opt-out defaults for single-use plastics, or retailer loyalty rewards for reusables – are most effective [8, 53]. In the Global South, behavioural barriers include perceptions of plastics as modern, convenient, and hygienic. Successful interventions therefore must draw on local traditions (banana leaves, woven baskets), use trusted community messengers, and integrate affordability measures [23].

The blueprint's Public Awareness and Behavioural Change pillar reflects this evidence by moving beyond one-off campaigns to systemic interventions that reshape cultural norms. Kenya's public mobilisation against plastic bags, Ghana's GRIPE retailer take-back schemes, and India's Swachh Bharat Abhiyan illustrate both the potential and the limitations of behavioural measures when not supported by structural incentives [44].

Taken together, these four frameworks justify the design of the policy blueprint matrix for plastic alternatives presented in this paper. The application of circular economy theory may help ensure that substitution strategies are systemic and resource-conscious. Policy mix theory ensures that economic, regulatory, and informational instruments are complementary and adaptive. The inclusion of multi-level governance and subsidiarity principles anchor the blueprint in multi-scalar legitimacy and coordination–and the incorporation of behavioural science elements ensures that transitions are socially embedded and culturally viable.

Nevertheless, the six pillars of the policy blueprint matrix were not deduced mechanically from the theoretical literature alone. Rather, they emerged inductively through structured synthesis of workshop outputs and were subsequently interpreted, refined, and stabilised in light of the four theoretical frameworks discussed above. In this sense, the relationship between theory and framework design is neither purely deductive nor purely descriptive. The workshop process identified recurring governance, fiscal, regulatory, behavioural, innovation, and monitoring concerns, while the theoretical literatures helped explain why these concerns mattered, how they related to one another, and why they warranted formalisation into interdependent pillars.

Existing circular economy roadmaps, policy mix frameworks, and EPR governance models each offer valuable guidance for plastics policy, but they do not, on their own, provide an integrated implementation-facing blueprint for accelerating the production and uptake of plastic alternatives and non-plastic substitutes under typical low- and middle-income constraints [17, 20, 22, 26].

Whiles circular economy roadmaps often articulate the direction of systemic change (e.g., waste prevention, reuse, circular flows), they often remain high-level and underspecify how regulatory, fiscal, behavioural, innovation, and monitoring instruments should be bundled and sequenced in contexts characterised by active informal sectors, limited testing infrastructure, and constrained enforcement capacity [17, 20, 27, 28].

In the same vein, policy mix frameworks provide analytical principles for legislative coherence, consistency, and credibility over time. However, they are commonly presented as design heuristics rather than as a structured tool that maps specific instruments, barriers, and monitoring indicators to a targeted transition objective such as the scaling of plastic alternatives and non-plastic substitutes which helps plastic waste upstream [14, 22, 26, 49].

EPR models, similarly, are best understood as one governance approach - typically focused on downstream responsibility and financing,rather than a comprehensive transition architecture that simultaneously addresses the standards, economic incentives and behavioural change required to prevent plastic waste upstream through enhancing the adoption of plastic alternatives and non-plastic substitutes [37, 41, 42, 56, 59].

The policy blueprint matrix for plastic alternatives offers a distinctive contribution by integrating these approaches together in a single, implementation-facing practical tool tailored to the governance, market, and institutional conditions commonly found in Global South contexts. It does so by translating this combined body of evidence into an integrated matrix that connects six policy pillars to specific instruments, likely implementation constraints, illustrative cases, and measurable indicators.

To ensure clarity about the analytical contribution of the policy blueprint matrix it is useful to position it explicitly against three dominant approaches that inform contemporary plastics governance debates: circular economy roadmaps, policy mix frameworks, and extended producer responsibility (EPR) models.

In that regard, the matrix seeks to integrate insights from each into a single implementation-facing framework oriented specifically toward the scaling of plastic alternatives and non-plastic substitutes under conditions commonly found in Global South contexts. Its distinctiveness lies in amalgamating six interdependent pillars with explicit attention to implementation constraints, illustrative policy instruments, likely barriers, and potential monitoring indicators, while also being grounded in a co-creation process undertaken within a real policy setting in Ghana (Table 1).

## 3 Policy blueprint methodology

The policy blueprint for plastic alternatives advanced in this paper was developed through an applied co-creation research process conducted in Ghana as part of a broader international initiative on plastic waste reduction, sustainable manufacturing and environmental governance in the Global South. The study adopted a co-creation methodology, combining transdisciplinary evidence-gathering, iterative stakeholder engagement, and design-led policy prototyping. This approach ensured that the blueprint is both theoretically grounded and practically implementable, addressing the persistent gap between ambitious policy initiatives and the realities of enforcement, affordability, and cultural acceptance in the Global South.

Two overarching principles guided the policy blueprint development process. The first was trans-disciplinarity, which recognises that plastic pollution is a "grand challenge" that cannot be solved by disciplinary silos [9, 33]. Academic research on plastic alternatives offers important insights on material substitution, life cycle assessment, and governance design, but these must be integrated with practitioner experience, industry data, informal sector knowledge, and civil society perspectives. Without this synthesis, policy recommendations risk being either technically sophisticated but socially blind, or socially inclusive but technically unviable [13].

The second guiding principle was co-creation and co-production. Under this principle, policymaking was not conceived as a government-led exercise in which stakeholders were only consulted at the end. Instead, stakeholders were involved from the outset in jointly identifying policy gaps and potential policy solutions. This reflects a broader shift in governance literature that emphasises "co-production of knowledge" as both a source

**Table 1** Comparative positioning of the global south policy blueprint matrix against dominant plastics governance frameworks

| Framework/Model | Primary orientation | Main strength | Main limitation for this study's purpose | How the policy blueprint matrix differs |
|---|---|---|---|---|
| Circular economy roadmaps | System redesign, circular flows, waste prevention, reuse and resource efficiency [12, 27]. | Provides a high-level vision for reducing material throughput and improving circularity [27, 31]. | Often remains programmatic and under-specifies how regulatory, fiscal, behavioural, innovation, and monitoring instruments should be bundled and sequenced in low-capacity settings [10, 18, 27]. | Converts circular economy goals into an implementation-facing architecture by linking six policy pillars to specific instruments, constraints, cases, and indicators relevant to Global South conditions |
| Policy mix frameworks | Instrument coherence, consistency, credibility, and interaction over time [15, 22, 26]. | Strong analytical basis for understanding how policy instruments complement or contradict one another [15, 29, 49]. | Usually functions as a design heuristic rather than a practical matrix tied to a specific transition problem such as scaling plastic alternatives and non-plastic substitutes [22, 26, 49]. | Translates policy mix logic into an applied governance tool by mapping instrument clusters to concrete institutional, market, behavioural, and monitoring dimensions |
| Extended producer responsibility (EPR) models | Downstream responsibility, cost internalisation, producer financing, waste management [37, 41]. | Useful for assigning responsibility and financing post-consumer waste management systems [37, 41, 42]. | Typically focuses on downstream packaging and waste governance and does not on its own provide a full upstream transition architecture for substitutes [37, 41, 42, 56]. | Extends beyond downstream responsibility by incorporating standards, incentives, behavioural change, research and development, stakeholder coordination, and compliance monitoring to support upstream substitution and waste prevention |

of legitimacy and a means of generating more innovative and resilient policy designs [58]. In the case of plastics, where informal actors such as waste pickers and small-scale producers are responsible for a significant proportion of material recovery and substitution, their participation is critical to crafting workable interventions [63].

### 3.1 Stages of the policy development process

The process began with a comprehensive scoping exercise which mapped Ghana's plastics policy landscape, identifying flows, macro impacts and waste management habits [21]. The scoping examined not only existing laws and regulations but also their enforcement capacity, gaps in standards and testing infrastructure, and the extent of informal sector involvement in collection and recycling [39]. Trade-related measures were also reviewed, drawing on UNCTAD's mapping of WTO notifications on non-plastic substitutes, which has shown increasing use of technical regulations and subsidies globally [54].

As part of the study's wider scoping phase, we reviewed life cycle assessment (LCA) evidence from the academic and grey literature to identify potential environmental trade-offs associated with commonly proposed material substitutions. Recent research demonstrates, for instance, that while paper and cotton are often promoted as alternatives, their climate and water footprints can be greater than plastics if systems for reuse and recycling are weak [10, 57]. These insights helped frame subsequent policy deliberations by providing a structured way to assess the suitability of substitution choices for

the local context, and to assess the potential conditions under which substitutes might generate unintended consequences. Although LCA evidence was used to help frame policy deliberations, LCA data did not directly inform the derivation of the six policy pillars reported in the policy blueprint.

In parallel with the scoping of Ghana's policy landscape, a structured comparative policy analysis was undertaken to identify common policy types relevant to plastic alternatives in Global South contexts. The analysis focused on reported policy implementation events related to bans on single-use plastics, the promotion of plastic alternatives through economic and other regulatory instruments, drawing on secondary evidence from selected illustrative country experiences discussed later in the manuscript (including Rwanda, Ghana, Chile, and India). The purpose of this analysis was to help ensure that the policy pillars which would emerge from the workshop discussion in Accra would be reflective, to the furthest extents possible, of both the local realities and those in the broader Global South context.

Building on the scoping, a stakeholder mapping was conducted to ensure the process was both inclusive and representative. Stakeholders included ministries (Environment, Agriculture, Finance, Local Government, Education), regulatory agencies (Environmental Protection Agency, Ghana Standards Authority), local municipalities, large companies, SMEs, research institutions, civil society groups, and critically, the informal waste sector. Methods of analysis followed established typologies for stakeholder engagement in natural resource management, which categorise actors by their interests, influence, and potential roles in governance [48]. This mapping was essential for identifying implementation-critical actors across the plastics and substitutes value chain and for structuring mixed-group deliberation during the Accra stakeholder policy co-creation workshop (discussed in detail below), in a way that reduced elite capture and ensured that workshop outputs reflected both regulatory realities and on-the-ground operational constraints.

The inclusion of the informal economy was particularly important. Studies in Ghana and other African countries show that informal workers collect between 60% and 80% of recyclable materials, yet are often excluded from policy design, undermining both equity and implementation [39, 63].

A structured policy co-creation workshop was then held in Accra in October 2024 in collaboration with relevant authorities within the government of Ghana. Its purpose was to identify the key policy gaps and recommendations needed to support the local production and commercialisation of emerging plastic alternatives and non-plastic substitutes in Ghana.

This workshop formed the core of the methodological approach used to develop the policy blueprint. It was designed as a highly structured exercise in which 57 participants worked in mixed groups comprising government, industry, civil society, and informal-sector actors to identify policy gaps and propose policy recommendations [38].

It was designed as a structured policy-prototyping exercise with a staged agenda where participants were asked to discuss and identify the key policy actions needed to enhance the local production and adoption of plastic alternatives and non-plastic substitutes in Ghana. To minimise sectoral bias and support cross validation, participants were assigned to six mixed working groups based on stakeholder mapping. Each group worked through the same prompts and reported back in a plenary. This design created

a common basis for cross-group comparison during the later synthesis stage and served as an initial procedural safeguard against single-sector dominance in the generation of policy recommendations. Workshop outputs were captured through systematic digital note-taking by the research team which were later consolidated.

The 57[3] workshop participants were selected through a purposive sampling approach. This was justified by the need to ensure that the workshop captured the breadth of actors who shape, implement and are affected by plastic waste pollution, its governance, and the emerging plastic alternatives and non-plastic substitutes ecosystem in Ghana.

Representation was drawn from government ministries, regulatory agencies, large and small private-sector firms, civil society organisations, local research institutions and informal actors. This approach to sampling was guided by a stakeholder mapping exercise conducted during the scoping phase, which categorised actors by influence, interest and relevance to the plastics and plastic alternatives value chain in Ghana.

Stakeholders were identified and prioritised based on four criteria; (a) their relevance to the plastics and substitutes value chain (production, distribution, consumption, recovery, and disposal), (b) the strength of their institutional mandate and decision-making leverage, including roles in policy formulation, standard-setting, enforcement, procurement, and industrial support, (c) their implementation responsibilities and operational expertise, with particular attention to SMEs and municipal or service-level actors who translate policy into practice on the ground, and (d) considerations of equity and the need to prioritise voices most likely to bear the costs or face constraints when policy is implemented.

Workshop participants were then organised into six mixed working groups during the workshop to purposively ensure cross-sectoral composition. Each group included at least one representative from government, private industry, civil society and the informal sector. This group approach proved essential to supporting the triangulation of perspectives, reducing sectoral bias and facilitating the co-development of policy insights.

To derive the six thematic pillars of the policy blueprint, all workshop outputs were consolidated and subjected to a structured qualitative synthesis. These materials included facilitator notes, completed templates, and flipcharts from each of the six mixed working groups.

The analysis did not employ qualitative software. This was because the dataset was workshop-generated and highly structured, with the primary analytical task being the transparent consolidation and comparison of outputs across six mixed working groups rather than line-by-line coding of a large corpus of interview material. Under these conditions, an inductive manual synthesis was considered more appropriate to the policy-prototyping purpose of the exercise.

Two members of the authoring team first conducted a structured extraction of materials (facilitator notes, completed templates, and flipcharts) from each of the six mixed working groups using a common extraction logic focused on policy problems, proposed instruments, implementation barriers, enabling conditions, and potential indicators. Initial thematic clustering was then undertaken by grouping extracted items according to their policy function (e.g., regulatory, economic, coordination/governance,

[3] The number 57 is within the range of what is considered sufficient when the aim of the researcher is to qualitatively explore/unpack the differences among respondent categories (Saunders, M. N., & Townsend, K. (2016). Reporting and justifying the number of interview participants in organization and workplace re-search. British Journal of Management, 27(4), 836– 852).

behavioural, innovation, monitoring). The team then iteratively refined these clusters through repeated comparison across the six mixed working groups, with attention to convergence (priorities raised across multiple groups) and divergence (sector-specific concerns).

Several steps were taken to reduce interpretive bias during this process. First, all six groups worked through the same discussion prompts, which improved comparability across outputs. Second, group composition was deliberately mixed across government, industry, civil society, and informal-sector actors, thereby reducing the likelihood that any one institutional perspective would dominate the initial generation of recommendations. Third, clustering decisions were discussed and reconciled through author deliberation and consensus rather than being determined by a single analyst. Fourth, preliminary pillar structures were presented back to participants in plenary sessions during the workshop, where participants were invited to identify omissions, mischaracterisations, or areas of overemphasis. This appraisal was informed by existing scholarship on policy mixes, which stresses that coherence and consistency are as important as instrument diversity [14, 49]. This systematic framework is a direct testament to the effectiveness of the co-creation methodology.

We did not calculate a formal intercoder reliability coefficient, as the exercise was not designed as a conventional qualitative coding study aimed at producing replicable code frequencies from a large textual dataset. Rather, it was a structured co-creation and policy-prototyping exercise in which credibility was supported through analyst triangulation, repeated comparison across groups, participant validation in plenary, and a subsequent refinement process with Ghanaian policymakers focused on coherence, duplication, and feasibility. Through this iterative process, six cross-cutting themes consistently emerged across the workshop outputs: (1) stakeholder coordination challenges, (2) fiscal and financial barriers, (3) regulatory gaps, (4) behavioural and cultural drivers, (5) technological and material innovation needs, and (6) monitoring and compliance weaknesses. These were subsequently formalised as the six pillars of the policy blueprint matrix for plastic alternatives.

Iterative validation was undertaken as a quasi-feasibility and coherence check. Following the initial clustering and plenary confirmation during the workshop, the draft policy blueprint structure was refined through further review with Ghanaian policymakers to ensure clarity, internal consistency, and alignment with Ghana's institutional and market constraints. This stage also functioned as a final interpretive check on the synthesis by testing whether the clustered themes remained faithful to the priorities expressed during the workshop and whether any over-aggregation or omission had occurred.

This further refinement focused on the removal of duplications across the six pillars and ensuring that relevant policy instruments were clear. The workshop process was completed by an implementation-focused launch co-organised with Ghanaian policymakers where government acceptance of the blueprint and intention to implement it were publicly affirmed[4]

[4] Ghana Web, *Ghana takes historic step towards reducing plastic waste with national policy blueprint*, https://www.ghanaweb.com/GhanaHomePage/business/Ghana-takes-historic-step-towards-reducing-plastic-waste-with-national-policy-blueprint-2007421, Accessed 5th March 2026.

The resulting matrix is therefore best understood as a co-created policy prototype grounded in applied engagement and structured synthesis, suitable for further testing and refinement through additional country applications.

## 4 The policy blueprint matrix for plastic alternatives

The policy blueprint matrix for plastic alternatives constitutes the central output of a policy research and development process conducted in Ghana. Developed through extensive stakeholder co-creation and comparative policy synthesis process as described in Sect. 3, it offers a structured yet flexible roadmap for other Global South countries seeking to transition from conventional plastic products (particularly those of a single-use nature) and towards plastic alternatives and non-plastic substitutes.

This section draws directly on the consolidated outputs of the Accra (October 2024) co-creation workshop. Across all six mixed working groups, participants generated structured outputs in response to the same discussion prompts related to the adoption of plastic alternatives and non-plastic substitutes in Ghana (specifically related to policy gaps, proposed instruments, enabling conditions, barriers, and potential indicators). These outputs were consolidated and subjected to structured synthesis, as discussed in Sect. 3, producing six recurrent themes (which later became the six pillars of the blueprint following synthesis) that consistently appeared across groups and were confirmed during plenary report-back. These themes were then interpreted and refined in light of the theoretical frameworks set out in Sect. 2, which helped clarify their systemic significance, their interrelationships, and their relevance for designing an integrated policy architecture.

The qualitative inputs from government, industry, and civil society representatives at the workshop were thematically analysed to identify recurring priorities and relationships, which were subsequently synthesised into: (a) stakeholder networks and institutional coordination, (b) economic incentives and market instruments, (c) regulatory standards and legal frameworks, (d) public awareness and behavioural change, (e) research and development, and (f) monitoring and evaluation. Across the six pillars, the matrix addresses waste prevention through demand-side reduction (behavioural change and procurement rules), supply-side substitution at source (standards and economic incentives for producers of plastic alternatives), and institutional capacity to maintain a preventative approach to plastic pollution (monitoring and enforcement). The pillars therefore shift much of the policy emphasis upstream in focusing reducing plastic generation at source. Additionally, the pillars represent the formalised themes that emerged through synthesis and iterative clustering of the workshop notes from all six mixed working groups and were subsequently validated in plenary. Table 2 below summarises the matrix, followed by an expanded narrative that situates each pillar within empirical findings and theoretical perspectives. To reflect the adaptive and phased logic of the blueprint more clearly, Table 2 also includes an indicative sequencing column which highlights the distinction between early enabling actions and longer-term institutional, market, and compliance measures, recognising that implementation pathways will vary across contexts.

To make the empirical grounding of the matrix more visible, it is useful to highlight a small number of workshop-derived illustrations from the Ghana case. These are not presented as verbatim quotations or as standalone case narratives, but as concise examples

of the recurring tensions and areas of convergence that shaped the final matrix as set out above.

Across the workshop held in Accra, participants repeatedly returned to three practical issues: (a) overlapping institutional mandates and weak inter-agency coordination, (b) the high relative cost of substitutes and limited SME access to finance, and, (c) uncertainty around legal definitions, certification, and testing capacity. These recurrent concerns helped structure the eventual formalisation of the Stakeholder Networks, Economic Incentives, and Regulatory Standards pillars.

The policy research and development process behind the policy blueprint confirmed that fragmented governance is one of the most persistent barriers to effective plastic policy implementation in the Global South. In Ghana, overlapping mandates between the Ministry of Environment, Science, and Technology (MEST), the Ministry of Trade and Industry, and the Ghana Standards Authority led to inconsistent enforcement and duplication of effort. Similar fragmentation has been documented in Kenya and Indonesia, where weak coordination undermines policy coherence [6, 15].

The blueprint therefore emphasises the creation of multi-stakeholder platforms as part of the first pillar, to formalise cross-sectoral collaboration and coordinate upstream plastic waste prevention measures. Workshop participants repeatedly identified fragmented mandates and weak inter-agency coordination as a primary implementation barrier, motivating the emphasis on formalised coordination platforms under this pillar.

Such arrangements mirror successful experiences in Rwanda, where the Environmental Management Authority works directly with local cooperatives and customs units, and in Chile, where the Plastics Pact institutionalised voluntary collaboration with measurable commitments [59].

By integrating informal waste workers, SMEs, and civil society into the policy ecosystem, stakeholder networks ensure inclusivity and legitimacy. This aligns with the principle of subsidiarity - that decisions should be made at the lowest effective level - and with polycentric governance theory, which underscores the value of multi-level coordination for adaptive policy learning [4, 40].

The second pillar (economic incentives) represent the financial backbone of the blueprint. Across the six mixed workshop groups, participants emphasised cost differentials and limited SME access to finance as the most immediate constraints on substitution, motivating the fiscal and procurement instruments summarised under this pillar. In many contexts across the Global South, the cost differentials between conventional plastics and alternatives remain the single largest obstacle to market adoption [36].

A particularly clear point of convergence across stakeholder groups was that alternatives could not be scaled simply through normative encouragement or bans on conventional single-use plastics alone. Participants repeatedly stressed that locally operating firms, especially SMEs, faced higher production costs, limited access to affordable capital, and uncertain demand. This helps explain why the blueprint gives such prominence to concessional finance, fiscal relief, and public procurement as enabling instruments rather than treating substitution as a purely regulatory issue.

To address this more directly, the blueprint integrates a mix of fiscal and financial instruments designed to make alternatives competitive while discouraging virgin plastic use and incentivising a plastic waste prevention-centred approach in commercial spaces.

**Table 2** Policy blueprint matrix for plastic alternatives and non-plastic substitutes

| Pillar | Examples of policy instruments and tools | Examples of implementation challenges | Illustrative cases | Potential indicators for scalability and monitoring | Indicative policy sequencing |
|---|---|---|---|---|---|
| 1. Stakeholder networks | Multi-stakeholder taskforces; inter-ministerial coordination units; producer responsibility organisations (PROs); national transition councils; municipal partnerships; formal representation of informal workers' associations and waste-picker cooperatives in coordination platforms | Fragmented mandates; weak coordination across ministries; exclusion of informal sector; limited data sharing | Rwanda Environmental Management Authority [5], Chile's Plastics Pact [59] | Number of coordination platforms; participation of informal workers; frequency of inter-ministerial meetings; stakeholder satisfaction levels | Short term: establish multi-stakeholder taskforces, inter-ministerial coordination platforms. Medium to long term: institutionalise coordination through permanent transition councils, formal municipal partnerships, and data-sharing mechanisms. |
| 2. Economic incentives | VAT exemptions for plastic alternatives, green credit facilities, innovation grants; public procurement quotas, eco-levies on virgin plastics, EPR fees | Fiscal constraints; risk of elite capture; lack of SME access to finance; exclusion of informal operators from finance support; fluctuating global prices for alternatives | Rwanda's tax relief for compliant manufacturers [19]; India's concessional loans for compostable materials [13]; | Volume of concessional finance disbursed; number of SMEs supported; number of informal or semi-formal enterprises accessing transition finance; share of sustainable materials in procurement; reduction in virgin plastic imports | Short term: introduce targeted pilot incentives such as VAT relief, concessional finance windows, and green procurement pilots. Medium to long term: embed incentives in industrial policy, and institutionalise financing mechanisms for SMEs and local innovation. |
| 3. Regulatory standards and legal frameworks | National biodegradability standards, packaging and labelling laws; phased bans; conformity assessment and certification systems; regional standards harmonisation; transitional compliance support and simplified guidance for informal producers and traders. | Limited testing infrastructure; weak enforcement; lack of alignment with global norms; informal imports of banned items; risk that poorly sequenced standards may exclude informal market actors without providing transition pathways. | Rwanda's plastic bag ban [5] ; South Africa's EPR framework [37], | Number of accredited laboratories; compliance rate among producers; share of trade covered by harmonised standards; enforcement actions per year | Short term: develop legal definitions, product standards, labelling rules, and transitional compliance guidance. Medium to long term: phase in bans, strengthen conformity assessment systems, expand accredited testing infrastructure, and pursue regional standards harmonisation. |
| 4. Public awareness and behavioural change | Nationwide awareness campaigns; integration in school curricula; deposit-return schemes (DRS); "opt-out" systems for single-use items; normalise community reuse/refill initiatives to address plastic pollution from plastic bottles and plastic water sachets as a form of upstream waste prevention mechanism; engagement of informal vendors, market traders, and community recovery actors as trusted messengers and delivery partners | Low awareness; cultural attachment to plastics; perception of high costs for substitutes; weak consumer feedback systems; number of community initiatives involving informal actors or market associations | Kenya's national mobilisation during bag ban [64]; Ghana's GRIPE take-back initiatives [44], India's Swachh Bharat Abhiyan [44] | Changes in per capita plastic consumption; DRS participation rates; behavioural survey indices; number of active community initiatives | Short term: launch public awareness campaigns, pilot community initiatives, and test behavioural nudges in targeted sectors. Medium to long term: integrate sustainable consumption into school curricula, normalise reuse systems, and embed behaviour-change incentives in mainstream retail and service delivery. |

**Table 2** (continued)

| Pillar | Examples of policy instruments and tools | Examples of implementation challenges | Illustrative cases | Potential indicators for scalability and monitoring | Indicative policy sequencing |
|---|---|---|---|---|---|
| 5. Research, development, and innovation research and development (R&D) | Public-private R&D hubs; grants for local material innovation; patent support; technology transfer agreements; valorisation of agricultural residues; inculcate upstream waste prevention approaches through redesign of plastic waste systems alongside material substitution; co-design processes that incorporate informal-sector knowledge on reuse, repair, recovery, and local material practices | Dependence on imported technology; limited R&D budgets; weak linkages between universities and SMEs; intellectual property constraints; limited institutional recognition of informal knowledge and practice. | Ghana's cassava-based biopolymers [3], Bangladesh's jute bio composites, Kenya's seaweed packaging trials [55] | R&D investment as percentage of GDP; number of patents registered for plastic alternatives; number of public–private partnerships; number of innovation pilots involving informal-sector or community-based actors; share of locally sourced feedstocks in production | Short term: support pilot R&D partnerships, feasibility studies, and early-stage grants for local material innovation.<br>Medium to long term: build public-private innovation hubs, strengthen technology transfer systems, and expand domestic production capacity based on locally viable feedstocks. |
| 6. Monitoring, evaluation, and compliance | National plastics and alternatives dashboards; compliance audits; trade tracking systems; annual progress reports; community monitoring platforms; participatory monitoring arrangements involving informal workers, local traders, and community-based recovery networks. | Poor data coordination; limited enforcement staff; non-standardised reporting; weak transparency | South Africa's EPR data system [37]; Rwanda's customs surveillance [6,19]; UNCTAD trade-monitoring collaboration [55] | Publication of annual dashboard; compliance rates; EPR registrations; decrease in illegal imports of banned products; single-use plastic consumption per capita; volumes of virgin plastics imported; number of community-based or informal-sector monitoring inputs integrated into reporting systems | Short term: define core reporting metrics, establish baseline datasets, and begin pilot compliance audits or reporting platforms.<br>Medium to long term: institutionalise national dashboards, annual reporting systems, interoperable data governance arrangements, and routine enforcement review mechanisms. |

Example measures highlighted at the workshop and in the blueprint include VAT exemptions for verified substitutes, low-interest green loans, and innovation grants for local material development. Additionally, green public procurement policies have the potential to create guaranteed demand for alternatives, while eco-levies and EPR fees can be helpful in internalising the environmental costs of plastics. Recent research has shown that these combined incentives can effectively redirect industrial investment when supported by transparent administration and stakeholder buy-in [12, 41].

Regulatory standards (related to the third pillar) ensure predictability and quality assurance within the market for plastic alternatives and non-plastic substitutes. Participants highlighted gaps in legal definitions, certification, and testing capacity as drivers of market uncertainty (and potentially greenwashing), thus justifying a focus on the need for clear standards for plastic alternatives and non-plastic substitutes.

Here, the workshop revealed an important implementation tension: while there was broad support for promoting alternatives, participants also expressed concern that poorly defined standards could allow low-quality or misleadingly labelled products to enter the market. In this sense, support for substitutes was accompanied by a clear consensus that standards, conformity assessment, and testing infrastructure would be necessary to prevent greenwashing and build market confidence.

Without harmonised definitions of 'biodegradable' or 'compostable', both producers and consumers face uncertainty, eroding confidence in substitutes. Research suggests that a significant proportion of Global South countries such as Ghana, lack the accredited and requisite infrastructure for product testing, thus impeding adoption and enforcement [28]. The blueprint therefore prioritises the establishment of domestic conformity assessment systems aligned with international standards such as ISO 17,088. It also emphasizes a phase-out of single-use plastics as a waste prevention-oriented regulatory instrument.

Behavioural change (related to the fourth pillar) is the social engine of the plastics transition. Informal vendors, market associations, and community-based recovery actors can also function as trusted intermediaries in this pillar, helping to communicate, demonstrate, and normalise alternatives in everyday commercial settings. Participants across all workshop groups highlighted this as a key area for driving the acceptance and adoption of plastic alternatives in Ghana.

As behavioural research demonstrates, people's actions are influenced less by knowledge than by convenience, habit, and social norms [8, 52]. In Global South countries like Ghana, plastics are perceived as modern, hygienic, and convenient–meanings deeply embedded in consumer culture [23]. To reshape these perceptions, the blueprint highlights integrated behavioural interventions that amalgamate education, financial incentives, and social nudges.

These include the introduction of school-based curricula on sustainable consumption, and the significance of plastic alternative and non-plastic substitutes. Community-led campaigns-using local languages and trusted cultural institutions–are also critical to building ownership. Examples from Kenya's bag ban [64] and India's Swachh Bharat Abhiyan demonstrate how aligning environmental goals with civic pride can shift norms at scale. In linking behavioural strategies to regulatory and economic measures, the blueprint ensures that legal and commercial changes translate into lasting changes in lifestyle and consumption patterns.

Research and innovation (related to the fifth pillar) are the drivers of long-term sustainability impacts. Global South countries have significant untapped potential to use agricultural residues—especially coconut husks and cassava starch–as feedstocks for biodegradable materials [3]. Building on this logic, workshop participants emphasized the strategic importance of grounding substitution pathways in locally sourced bio-based materials that demonstrate both high environmental impact and practical feasibility. This pillar should therefore be read as incorporating not only formal laboratory-based innovation, but also locally embedded practical knowledge held by informal actors involved in reuse, material recovery, and low-cost product adaptation.

Examples discussed included agricultural and biomass residues that could serve as feedstocks for locally produced plastic alternatives and non-plastic substitutes. This aligns with broader evidence that locally embedded circular bioeconomy strategies can support both substitution and green industrialisation, provided that lifecycle impacts, supply-chain reliability, and infrastructure constraints are addressed [2, 10, 50, 57]. However, weak research–industry linkages and limited financing hinder the development and commercialisation of innovative plastic alternatives and non-plastic substitutes [47].

The blueprint therefore highlights the need for public–private research and development consortia, government innovation funds, and regional technology transfer partnerships. These measures accelerate local material innovation, reduce import dependence, and generate high-value jobs. Bangladesh's jute-based composites and Kenya's seaweed packaging pilots demonstrate how indigenous feedstocks can create globally competitive alternatives [50, 54].

The Blueprint's final pillar on monitoring, evaluation and compliance, highlights the importance of tracking the progress of measures initiated to enhance the adoption of plastic alternatives and non-plastic substitutes, and the impacts that those measures have on the plastics transition. It is the case in many Global South countries that data on plastic flows, imports, and substitutes in Ghana are fragmented across agencies. This obscures progress and undermines accountability [60].

The blueprint addresses this through the suggestion of a National Plastics and Alternatives Monitoring Dashboard, which can help inculcate customs data, extended producer responsibility reports, and municipal waste statistics into a single transparency portal. Community-based and informal-sector reporting can form an important part of such monitoring systems, particularly in contexts where official data remain fragmented and where informal actors observe material flows, product uptake, and compliance issues in real time.

Taken together, the six pillars of the policy blueprint matrix constitute a comprehensive, replicable and adaptable policy ecosystem for Global South countries eager to accelerate a transition towards plastic alternatives and non-plastic substitutes.

## 5 Discussion: comparative relevance–Rwanda, Chile, Ghana and India

The policy blueprint matrix for plastic alternatives is designed to serve as a transferable framework that can guide national and subnational policy transitions toward plastic alternatives and non-plastic substitutes. Its architecture is both diagnostic and prescriptive; diagnostic in its ability to identify governance and policy gaps, and prescriptive in outlining actionable pathways suited to distinct political economies.

This section explores the comparative relevance of the blueprint through illustrative country examples from Rwanda, Ghana, Chile, and India - using these cases to highlight how the six pillars surface common implementation constraints and trade-offs, and to draw practical lessons for scalability, equity, and alignment with evolving global policy directions.

These Global South examples were selected for their regional diversity and varying governance traditions, as well as for the characteristic they all share of having the common goal of reducing dependency on conventional single-use plastics through efforts and policies which scale the local production and adoption of plastic alternatives.

Rwanda represents a paradigmatic case of decisive regulatory intervention underpinned by centralised governance and policy coherence. Since 2008, the country has implemented one of the world's most stringent bans on plastic bags and, later, single-use plastics. The success of these measures is often attributed to the alignment of political will, institutional coordination, and community mobilisation [6, 18].

The Rwandan experience strongly validates the Regulatory Standards and Stakeholder Networks pillars of the Policy Blueprint Matrix. The Rwanda Environment Management Authority (REMA) provides a clear locus of responsibility and authority, coordinating ministries, customs, and local governments. Enforcement is visible and consistent, supported by grassroots-level engagement through community work programmes (Umuganda). This tight coupling between national legislation and local participation demonstrates the value of subsidiarity in ensuring compliance [40].

However, Rwanda's model also reveals the limitations of top-down regulation when economic incentives and innovation ecosystems are underdeveloped. The absence of a robust domestic alternative-materials industry has led to dependence on imports and limited technological diversification [54]. The Rwandan case thus underscores that regulation without complementary economic and innovation policy pillars, as the Policy Blueprint lays out, can achieve compliance but risks stalling long-term transformation.

Ghana represents a model of policy co-creation and stakeholder inclusion having provided the testing ground for developing the policy blueprint matrix for plastic alternatives. The process demonstrated how an inclusive, evidence-based approach can address institutional fragmentation and inform policy coherence, whilst at the same time exemplifying the challenges and opportunities of policy co-creation in a lower-middle-income democracy marked by institutional pluralism and a large informal economy [30].

Research suggests that whiles Ghana's regulatory landscape is fragmented, it possesses significant adaptive capacity when guided by inclusive stakeholder processes [35]. The potential for the formation of multi-sectoral networks in Ghana such as GRIPE, which includes organisations like the Ghana Standards Authority, the Ghana Environmental Protection Authority, academia, private firms, and informal waste picker cooperatives, demonstrates the extent of the beneficial gains which stand to be made through collaborative governance–particularly where enforcement capacity is weak [7]. This validates the blueprint's emphasis on Stakeholder Networks and Monitoring and Compliance as foundational pillars.

At the same time, Ghana's experience revealed structural fiscal and infrastructural barriers. SMEs producing alternatives such as cassava- and cocoa-based packaging faced high costs of production and limited access to finance–confirming the necessity of targeted Economic Incentives [17].

Shifting focus to South America, Chile offers a distinctive Latin American example of integrating circular economy principles into national legislation. Its 2016 Framework Law on Extended Producer Responsibility (EPR) and subsequent Circular Economy Roadmap (2021–2040) have established clear producer obligations and recycling targets [59]. Chile's approach aligns closely with the Economic Incentives, Regulatory Standards, and Monitoring and Compliance pillars of the blueprint, illustrating how fiscal and legal mechanisms can converge to institutionalise producer responsibility.

Unlike Rwanda's enforcement-led model, Chile's transition towards plastic alternatives and non-plastic substitutes has been driven by market-based governance and industry participation [19]. The Plastics Pact Chile - a voluntary multi-stakeholder agreement supported by the Ministry of Environment - has encouraged businesses to redesign packaging, invest in alternative materials, and share data on circularity [16]. This aligns with the Stakeholder Networks pillar of the policy blueprint, demonstrating that when private-sector leadership is coupled with transparent monitoring, voluntary measures can achieve substantial behavioural and industrial shifts.

However, the Chilean model also exposes trade-offs; EPR costs are often passed to consumers, raising affordability concerns for low-income groups [41]. Furthermore, local innovation clusters remain dependent on imported biopolymers, highlighting the need for stronger research and development investments [51]. Nevertheless, Chile's experience shows how integrated legal, fiscal, and voluntary approaches can collectively operationalise a circular economy agenda in an upper-middle-income context.

In the heart of Asia, India provides a hybrid example where high regulatory standards exist within an uneven and porous implementation environment. The 2022 national ban on single-use plastics was a landmark step, but its enforcement has been patchy across states [12]. India's federal structure complicates uniform application, as local authorities vary in capacity and political commitment.

Nonetheless, India's policy landscape demonstrates the potential of large-scale behavioural and economic interventions. The Swachh Bharat Abhiyan campaign has successfully embedded environmental cleanliness into the public consciousness, while initiatives like the Plastic Waste Management Rules (2016, amended 2021) and EPR obligations for producers have created a strong regulatory foundation. Furthermore, the proliferation of compostable packaging start-ups–supported by concessional loans and incubation grants– reflects a strong innovation drive [50].

India's experience validates the Economic Incentives, Behavioural Change, and R&D pillars of the blueprint, showing that hybrid models which combine top-down regulation with decentralised innovation can achieve momentum even within complex governance systems. However, disparities in enforcement and limited monitoring capacity in India's case underscore the continuing need for institutional coordination and data-driven compliance frameworks [25].

Three key patterns emerge across the four cases highlighted:

a) No single policy instrument delivers systemic change when it comes to enhancing the transition to plastic alternatives and non-plastic substitutes in Global South countries.
b) There is the capacity for governance and the political will to drive transition-enabling policies which can determine sequencing, as demonstrated in Rwanda and Chile where strong institutional leadership can be seen accelerating the adoption of policy structures.

c) Local innovation ecosystems are essential to the long-term success of efforts to transition to plastic alternatives and non-plastic substitutes in Global South countries. A dependence on imports of biopolymers or bio-based materials to produce plastic alternatives and non-plastic substitutes undermines the autonomy of Global South countries whilst impacting the affordability of plastic alternatives and non-plastic substitutes for local populations. This makes local research and development and technology a central tenet to consider in developing policy structures which enhance the local production and adoption of plastic alternative productions and non-plastic substitutes.

This evidence suggests that the policy blueprint matrix for plastic alternatives is contextually adaptable; it can function within both centralised and decentralised systems, provided that the interplay amongst its six pillars is maintained. Having said that, it is worth highlighting that the application of the matrix requires careful navigation of policy trade-offs which sit between a tri-partite of influencing drivers; (a) environmental targets, (b) considerations of economic feasibility, and (c) factors of social equity and fairness.

One of such trade-offs is observable where the need for stringent regulation meets the need for industrial competitiveness. Rapid implementation of bans without adequate market readiness can suppress local enterprise and encourage smuggling, as seen in Kenya and Nigeria [6]. The policy blueprint matrix may help to mitigate this by sequencing legal measures with financial incentives and innovation support–ensuring that regulatory ambition is matched by supply-side capacity.

A second trade-off can be seen in the consideration of fiscal constraints versus inclusivity. Subsidising plastic alternatives and non-plastic substitutes and offering tax exemptions may involve some short-term public revenue losses [62]. Yet evidence from Rwanda and Chile shows that these costs are offset over time through job creation and import substitution [58]. The blueprint's integrated monitoring pillar can enable governments to evaluate these trade-offs transparently, recalibrating measures as fiscal space evolves.

A third potential trade-off involves behavioural inertia versus affordability. Alternatives often remain more expensive or less convenient than conventional single-use plastics, especially for low-income consumers. Behavioural interventions—such as deposit-return systems or loyalty schemes–help bridge this gap, but they must be designed to avoid regressive effects [8, 52].

## 6 Limitations

This study has several limitations which should be made explicit in interpreting the policy blueprint matrix. First, the matrix is grounded primarily in a single structured participatory policy co-creation workshop conducted in Accra, Ghana, in October 2024. Although the workshop brought together 57 participants from government, industry, civil society, research institutions, and the informal sector, the evidence base remains anchored in one national setting. The framework should therefore be understood as a Ghana-grounded policy prototype and organising framework rather than as a fully validated model applicable uniformly across all Global South contexts.

Secondly, while the co-creation design sought to reduce bias through purposive cross-sector sampling, mixed-group deliberation, common discussion prompts, repeated

comparison across groups, and plenary validation, the workshop-derived outputs may still reflect stakeholder positionalities, institutional priorities, and the practical constraints of a time-bounded participatory exercise. As such, the synthesis should not be read as a structured and policy-oriented consolidation of the priorities which surfaced through this particular co-creation process.

Thirdly, the study does not provide longitudinal validation of implementation outcomes. Although the blueprint has since progressed to national-level acceptance in Ghana, this article does not evaluate implementation over time and does not yet test whether the proposed pillars generate measurable effects in practice across sectors or jurisdictions. The policy blueprint is therefore proposed rather than empirically validated through longitudinal policy tracking.

These limitations do not negate the value of the blueprint, rather they define its present scope. They also point directly to priorities for future research, including comparative replication in additional Global South settings, further participatory refinement across different governance contexts, and longitudinal evaluation of implementation, feasibility, equity impacts, and reductions in dependence on single-use plastics.

## 7 Conclusions and policy implications

Plastic pollution has emerged as one of the defining environmental and socio-economic challenges of the 21st century, intersecting with global trade, public health, and climate governance. For countries in the Global South, the problem is both urgent and multidimensional: it involves not only environmental degradation but also questions of justice, development, and sovereignty.

The policy blueprint matrix for plastic alternatives, developed through a stakeholder co-creation process in Ghana, responds to this complexity by providing a systemic, evidence-based policy roadmap for accelerating the production and adoption of plastic alternatives and non-plastic substitutes. Nonetheless, and as already indicated in the limitations section, the matrix is grounded in a single participatory workshop-based co-creation exercise held in Accra, Ghana, in 2024, and should therefore viewed as an initial policy prototype and organising framework. Since its co-creation, the blueprint has progressed to national-level acceptance by Ghanaian authorities, and has been made subject to a long-term implementation plan.[5]

The research findings presented throughout this paper reveal that effective plastic transition policies in the Global South depend on institutional integration, policy coherence, and social legitimacy. To enhance the practical usability of the framework, the policy and practice implications can be understood in phased terms, distinguishing between immediate enabling actions, medium-term institutional and market reforms, and longer-term transformation priorities.

The blueprint's design draws on four complementary theoretical foundations: circular economy thinking, which calls for resource regeneration and reduced waste; policy mix theory, which emphasises the complementarities among instruments; multi-level governance, which recognises that responsibility must be shared across scales; and behavioural science, which can help ensure that policies reflect how people actually act rather than how policymakers assume they should. Through its synthesis of these perspectives,

[5] United Nations Trad and Development, *Africa: Rethinking plastics to unlock industrial potential*, Available at: https://unctad.org/news/africa-rethinking-plastics-unlock-industrial-potential, Accessed 5th March 2026.

the blueprint provides a unifying framework that links local contextual realities with global ambitions, and highlights waste prevention as an upstream governance objective by addressing plastic pollution at source.

The evidence from comparable contexts, Rwanda, Ghana, Chile, and India, confirms the blueprint's relevance and adaptability. In Rwanda, success has been driven by strong political commitment and centralised enforcement capacity, demonstrating how coherent governance and social mobilisation can produce rapid change. However, it also shows that regulation alone is insufficient without parallel support for innovation and investment in alternatives. Ghana, by contrast, illustrates the power of participatory policy design. The co-creation process undertaken in Ghana to develop the policy blueprint demonstrates that inclusive, iterative governance can overcome fragmentation, build legitimacy, and generate evidence-based policy instruments. Chile's circular economy framework exemplifies how market-based governance, legal predictability, and corporate collaboration can operationalise producer responsibility while maintaining competitiveness. India, with its federal complexity, illustrates that hybrid approaches can generate progress even in decentralised systems.

Taken together, these cases demonstrate the applicability and coherence of the six-pillar structure across diverse contexts. They also highlight that successful plastic transitions are not the product of isolated interventions, but of policy coherence across institutions and instruments. The matrix thus serves as a diagnostic and prescriptive tool; diagnostic in identifying governance, fiscal, and behavioural gaps, and prescriptive in mapping out the sequenced integration of measures needed for sustained change.

Beyond its national application, the Global South Policy Blueprint Matrix holds strategic relevance for international environmental governance. It provides a framework for aligning domestic policies with emerging multilateral frameworks such as the Global Plastics Treaty negotiation process (INC), the WTO Dialogue on Plastics Pollution, and UNCTAD's trade-related sustainability initiatives [54]. The blueprint's architecture is inherently compatible with these frameworks: its stakeholder pillar advances inclusive governance, its economic and innovation pillars support fair trade and technology transfer, and its regulatory and monitoring pillars align with global compliance systems. In this way, the blueprint acts as a bridge between international commitments and local implementation, enabling the Global South to articulate coherent national strategies while engaging in global negotiations from a position of strength.

The policy implications of this work are both immediate and far-reaching. Immediate actions should focus on enabling conditions for implementation. The first priority is to reduce institutional fragmentation by establishing or empowering inter-ministerial coordination mechanisms that connect environment, trade, standards, finance, and local government functions. A second immediate priority is to clarify the regulatory and market conditions under which plastic alternatives and non-plastic substitutes can be credibly promoted, including clearer definitions, transitional standards guidance, and early stakeholder coordination with producers, municipalities, civil society, and informal-sector actors.

Governments and development partners can also use the immediate phase to pilot targeted financial instruments, such as concessional finance windows, procurement pilots, or innovation grants, in order to reduce early market barriers and demonstrate feasibility.

Medium-term reforms should focus on institutional consolidation and market development. At this stage, governments need to align fiscal, industrial, and environmental policy so that taxation, trade, procurement, and investment frameworks no longer favour virgin plastics or inadvertently penalise substitutes. This period is also critical for strengthening standards and testing infrastructure, expanding access to finance for SMEs and local producers, and building more systematic monitoring and reporting arrangements. Collaboration between universities, research institutions, firms, and public agencies should be strengthened to support local innovation ecosystems capable of developing and commercialising context-appropriate alternative materials.

Long-term transformation priorities should focus on structural change in production systems, consumption practices, and regional governance architectures. Over time, the blueprint points toward a broader transition in which plastic alternatives and non-plastic substitutes are embedded in circular and inclusive industrial strategies rather than treated as isolated environmental interventions. This includes investing in domestic innovation capacity, strengthening regional standards harmonisation, deepening South–South collaboration, and building adaptive governance systems able to respond to shifting technologies, markets, and social practices. In this longer horizon, the transition is not only about substituting materials, but about reconfiguring the institutional and economic conditions that sustain plastic dependence.

On account of the foregoing, future research should (a) replicate the co-creation process in additional Global South settings to test whether the six pillars hold or require adaptation, (b) undertake structured comparative case analysis of implementation conditions and outcomes, and (c) evaluate the blueprint longitudinally in pilot sectors to assess feasibility, equity impacts, and measurable reductions in plastic leakage.

The policy blueprint matrix also has the potential to redefine the Global South's role in international environmental policymaking. Rather than being a perceived policy recipient, the Global South can draw from the blueprint in taking a demonstrable lead in shaping pragmatic, context-aware policy structures which advance Global South interests in addressing plastic pollution. The stakeholder co-creation process undertaken in Accra, Ghana, to develop it demonstrates that innovation in policy design need not only come from the Global North, and that policy innovations can indeed emerge from within developing contexts that blend global principles with local practice, embodying a new paradigm which views the plastics transition as a societal transformation toward inclusive, circular, and resilient development.

**Acknowledgements**

The development of the *Policy Blueprint for Plastic Alternatives and Non-Plastic Substitutes in Ghana* was informed by valuable stakeholder perspectives gathered during a stakeholder workshop held in Accra in October 2024. We gratefully acknowledge the participation and perspectives shared by representatives from government agencies, private sector entities, development partners, and civil society organisations. Our sincere appreciation goes to: Ministry of Environment, Science and Technology (Ghana), Ministry of Finance (Ghana), Ministry of Sanitation and Water Resources (Ghana), Environmental Protection Agency of Ghana, Ghana Standards Authority, Volta River Authority (Ghana), Accra School of Hygiene (Ghana), Blue Skies Ghana Ltd, Coca-Cola Ghana, HPW Ghana, Golden Exotics Ltd (Ghana), DercolBags Packaging Ltd (Ghana), RiverRecycle (Ghana), Jospong Group (Ghana), Zoomlion Ghana, Sesa Recycling Ltd. (Ghana), Chaint Africa (Ghana), Faivich Enterprise (Ghana), Food and Beverages Association of Ghana, GIZ Ghana, Plastic Punch (Ghana), A Rocha Ghana, Recycle Up Ghana, Ghana National Plastic Action Partnership, Circular Economy Ghana, BESNET Ghana, Africa Skills Hub (Ghana), Coco360 Ghana Ltd, Fru Veg Farms Ltd (Ghana).

**Author contributions**

Conceptualization: EL; Methodology: EL, EA; Validation: EL, EA, CU, OO, AHF; Formal analysis: EL, EA, OO, CU, AHF; Investigation: EL, EA, OO, CU; Resources: EL, OO; Data curation: EL, EA, OO, CU, AHF; Writing—original draft: EL, EA; Writing, review and editing: EL, EA, CU, OO, AHF; Visualization: EL, EA; Supervision: EL; Project administration: EL; Funding acquisition: EL. All authors revised the manuscript and approved the final version.

**Funding**
This research was supported by funding from the UK Foreign and Commonwealth Development Office (FCDO), UNCTAD, and UK International Development and under the Sustainable Manufacturing and Environmental Pollution (SMEP) Programme (Grant No. SMEP C_004_Blue Skies_0932).

**Data availability**
Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

## Declarations

**Ethics approval and consent to participate**
Ethical approval was not required for this study. The paper is based on policy analysis, literature review, and anonymised, aggregated insights from a multi-stakeholder policy co-creation workshop, and did not involve human subjects research, personal data collection, or any intervention involving individual participants. Not applicable. This study did not involve research participation by individual human subjects requiring formal consent to participate.

**Consent for publication**
declaration: Not applicable. The manuscript does not contain any individual personal data, images, or identifiable information requiring consent for publication.

**Clinical trial registration**
Not applicable. This study did not involve a clinical trial or any interventional healthrelated research requiring registration.

**Competing interests**
The authors declare no competing interests.

Received: 27 November 2025 / Accepted: 25 May 2026
Published online: 09 June 2026

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