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Case Study

Circular Plastics Value Creation Under Extended Producer Responsibility: A Triple Bottom Line Case Study of Banyan Nation

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Abstract

India's Extended Producer Responsibility (EPR) framework has increased the importance of recycling, recycled-content use, and traceability in plastic packaging. This study examines Banyan Nation, a Hyderabad-based plastics recycler, to understand how its publicly documented business model addresses the People, Planet, and Profit dimensions of the Triple Bottom Line and what potential scaling conditions the public records identify. The study draws on 13 publicly available government, institutional, company, and third-party documents, which the study analyzed manually using reflexive thematic analysis. Four of the thirteen describe the company directly, and two of them are written by third parties, so the analysis concerns a publicly documented business model rather than verified firm performance. The analysis identified five themes: People, Planet, Profit, stakeholder relationships, and conditions affecting scalability. Under the People dimension, informal waste pickers, kabadiwallas, and other recovery actors supply post-consumer plastic. Under the Planet dimension, the company emphasizes segregation, recycling quality, and traceability to produce recycled polyethylene and polypropylene resin suitable for formal manufacturing. Under the Profit dimension, EPR obligations and demand from brand owners create a market opportunity for quality-specified and documented recycled resin. The documentary record identifies municipal collection and segregation systems, relationships with informal recovery actors, consistent EPR implementation, sustained buyer demand, and the competitiveness of recycled material as potential scaling conditions. The evidence does not establish worker outcomes, environmental savings, or firm-level profitability. The study distinguishes four traceability dimensions and examines formal stakeholder authority alongside dependence on recovery actors for feedstock.

Categories: Social Innovation, Corporate Governance & Business Ethics, Sustainable Economic Development

Keywords: circular economy, plastic waste, extended producer responsibility, triple bottom line, stakeholder theory, informal sector

Introduction

India's plastic-waste system depends on a wide network of municipal bodies, informal waste workers, aggregators, recyclers, producers, and brand owners. Informal channels recover a substantial share of recyclable material, yet fragmented collection, contamination, and limited documentation can prevent recovered plastic from meeting the quality required for formal manufacturing (ILO, 2018) (Hahladakis and Iacovidou, 2018) (Venkatesh, 2023). The challenge is therefore not only to collect plastic waste but to convert recovered material into recycled plastic that can return to production with sufficient quality and reliability. India generated approximately 4.14 million tonnes of plastic waste in 2022-23, according to government data reported through the Press Information Bureau (MoEFCC, 2026). The parliamentary reply reports this as an aggregate plastic-waste figure and does not disaggregate it by polymer or packaging type; it should therefore not be read as evidence of Extended Producer Responsibility (EPR) performance. At the global level, The Pew Charitable Trusts projects annual plastic pollution to more than double by 2040 under a

business-as-usual trajectory (The Pew Charitable Trusts, 2025). At the same time, the social and environmental sides of recycling remain closely connected. Informal waste pickers and kabadiwallas play an important role in first-mile recovery, but many lack institutional recognition and social protection (ILO, 2018) (Venkatesh, 2023) (Nøklebye et al., 2023). Recovered plastic may also lose its circular value when poor segregation, contamination, or inconsistent quality prevent its use as a substitute for virgin material (Hahladakis and Iacovidou, 2018).

India's EPR framework has added a commercial and regulatory dimension to this problem. The Plastic Waste Management Rules and subsequent EPR Guidelines assign responsibilities to producers, importers, brand owners, plastic waste processors, and local bodies and require registration, recycling, recycled-content use, reporting, and related documentation (MoEFCC, 2016) (MoEFCC, 2022) (MoEFCC, 2024). These requirements can increase demand for recycled plastic that meets both manufacturing and compliance requirements. Their effectiveness, however, depends on the quality of the recycled material and the credibility of the systems used to document recycling and material movement.

Banyan Nation offers a useful case for examining these relationships. The Hyderabad-based recycler describes an operating model that combines post-consumer plastic sourcing, engagement with informal recovery networks, technology-enabled documentation, quality-controlled processing, and supplying recycled polyolefin resin to formal-sector buyers (MyGov, 2017) (Banyan Nation, 2026). The case is relevant to the Triple Bottom Line (TBL) because these activities bring together three connected concerns. The People dimension concerns the role of informal recovery actors in the supply chain; the Planet dimension concerns the quality, recycling, and traceability of recovered plastic; and the Profit dimension concerns the market for recycled resin created by formal buyers and EPR requirements. TBL serves as an analytical framework for examining the connections among reported social participation, recycling-related practices, and commercial conditions. The available documentary evidence does not independently establish improved worker welfare, measured environmental benefits, or firm-level profitability.

The literature reviewed in this study addresses informal recovery, recyclate quality, traceability, and EPR coordination, including research connecting several of these concerns. The question pursued here is how these relationships fit together within the publicly documented model of an Indian resin-producing enterprise, particularly where material access involves informal recovery networks while downstream sales depend on formal buyers and regulatory requirements. The study examines these connections and the dependencies potentially relevant to expansion, while distinguishing arrangements intended to pursue integrated People-Planet-Profit value from evidence that such value has been realized. Banyan Nation provides a bounded documentary case through which this question can be explored.

Against this background, the study addresses two research questions (RQs). RQ1: How is Banyan Nation’s documented operating model structured to pursue integrated People-Planet-Profit value? RQ2: What potential scaling conditions does the public documentary record identify for Banyan Nation’s circular-plastics model in India? The analysis focuses on post-consumer recycled polyolefin streams, principally polyethylene and polypropylene.

The study contributes an integrated documentary interpretation of the relationships among informal recovery actors, material quality, traceability, and EPR-related demand within Banyan Nation’s publicly described business model. TBL provides a structure for examining connections among social, environmental, and commercial concerns, while stakeholder salience and resource dependence inform the interpretation of external relationships potentially relevant to expansion. The contribution clarifies these connections and their evidentiary limits within a bounded case, rather than demonstrating causal effects, verified TBL performance, or achieved scalability.

This literature review establishes the study's analytical context. The review concludes by describing India’s circular-plastics context and Banyan Nation’s publicly documented business model.

Literature review

The literature relevant to this case spans circular-economy theory, plastic-recycling quality, traceability, informal recovery, EPR implementation, and the governance conditions affecting scale. Table *1* summarizes the principal concepts used in the study and the literature that supports each part of the analysis. The table provides a concise guide to the evidence

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base; methodological sources appear separately in Materials and methods; and the documents analyzed as case data appear in Table 3 and Appendix A.

Concept used in the study	Supporting literature
Triple Bottom Line and People-Planet-Profit integration	(Elkington, 1994) (Elkington, 2018)
Circular economy and material-value retention	(Ellen MacArthur Foundation, 2013) (OECD, 2022) (UNEP, 2023) (The Pew Charitable Trusts, 2025)
India's plastic-waste and EPR framework	(MoEFCC, 2016) (MoEFCC, 2022) (MoEFCC, 2024) (MoEFCC, 2026) (CPCB, 2026) (Pani and Pathak, 2021) (Gupta and Dash, 2023) (Dey and Ashok, 2025)
Informal recovery and worker inclusion	(ILO, 2018) (Venkatesh, 2023) (Velis et al., 2022) (Nøklebye et al., 2023) (Zisopoulos et al., 2023) (Cook et al., 2024)
Recyclate quality	(Hahladakis and Iacovidou, 2018)
Traceability in plastics value chains	(Gazeau et al., 2024) (Horn and Silvennoinen, 2025)
Comparable recycling and circular-economy cases	(Gall et al., 2020) (Bhadra and Mishra, 2021) (Cano et al., 2025) (Santana Valls et al., 2025) (Ramanathan et al., 2026)
Stakeholder theory	(Freeman, 1984) (Donaldson and Preston, 1995)
Stakeholder salience	(Mitchell et al., 1997)
Resource dependence	(Pfeffer and Salancik, 1978)
Municipal governance and fragmentation	(Mishra, 2024)

TABLE 1: Concepts and supporting literature

Source: Compiled by the authors.
CPCB, Central Pollution Control Board; EPR, Extended Producer Responsibility; ILO, International Labour Organization; MoEFCC, Ministry of Environment, Forest and Climate Change; OECD, Organisation for Economic Co-operation and Development; UNEP, United Nations Environment Programme

Circular economy, recyclate quality, and traceability

The circular economy seeks to keep materials in productive use rather than letting them move through a linear sequence of extraction, consumption, and disposal (Ellen MacArthur Foundation, 2013). For plastics, this requires more than collecting discarded material. Recovered plastic must be adequately segregated, cleaned, processed, and prepared for subsequent use to return to manufacturing rather than move into progressively lower-value applications or disposal. Wider circular-plastics strategies therefore combine recycling with measures aimed at reducing material use, reuse, product design, and improved waste-management systems (UNEP, 2023).

Material quality is central to this process. Contamination, mixed polymer streams, degradation, and variation in incoming feedstock can restrict the technical applications for which recycled plastic can be used (Hahladakis and Iacovidou, 2018). The OECD also shows that plastic recovery does not necessarily lead to effective recycling or the retention of material value (OECD, 2022). For a recycling business, the relevant issue is therefore not only the amount of plastic entering the system but whether recovered material can be converted into recyclate of quality acceptable to downstream users.

Traceability supports this process by making information about recycled material available across the value chain. Plastics-specific research identifies traceability as relevant to information on material composition, movement, technical properties, and compliance (Gazeau et al., 2024) (Horn and Silvennoinen, 2025). This information is especially important when recovered material moves through several actors before reaching a recycler or manufacturer.

For the present study, traceability is organized into four dimensions. Material traceability concerns the origin and movement of recovered plastic; transaction traceability concerns records of exchanges among recovery actors, aggregators, and recyclers; quality traceability concerns records linking identifiable material batches to their quality characteristics, processing histories, and test results; and compliance traceability concerns records used for regulatory reporting and EPR-related requirements. Table *2* summarizes these dimensions and the records through which each can be examined, together with the function each serves.

The functions listed in Table *2* concern information relevant to buyer assessment, social accountability, and EPR verification. Transaction records may inform scrutiny of exchanges with recovery actors but do not establish worker-welfare outcomes. Environmental assessment additionally requires lifecycle or material-flow evidence; traceability alone does not demonstrate environmental benefits. These functions may overlap, and the study examines what the available documents describe rather than assuming the functions have been achieved.

Traceability dimension	Meaning in the present study	Main issue addressed	Indicative records or evidence	Function served
Material traceability	Identification of the origin and movement of recovered plastic through collection and processing	Fragmented sourcing and incomplete records at the point of recovery	Source records, material-movement records, batch identification, processing records	Market confidence; EPR verification
Transaction traceability	Documentation of exchanges among recovery actors, aggregators, and recyclers	Informal or poorly documented transactions	Purchase records, payment records, transaction histories, purchase agreements	Market confidence; social accountability
Quality traceability	Records linking identifiable material batches to their quality characteristics, processing histories, and test results	Feedstock variability, contamination, and inconsistent recyclate quality	Batch identifiers linked to sampling, quality-test results, and processing records; product specifications state requirements but do not by themselves establish traceability	Market confidence

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Compliance traceability	Documentation of recycling and recycled-content activities for regulatory purposes	Verification of reported recycling and EPR-related activities	Registration records, EPR records, annual returns, audit or verification records	EPR verification

TABLE 2: Dimensions of traceability used in the study

Source: Developed by the authors from Hahladakis and Iacovidou (Hahladakis and Iacovidou, 2018), Gazeau et al. (Gazeau et al., 2024), Horn and Silvennoinen (Horn and Silvennoinen, 2025), and the EPR literature reviewed in this study.
Notes: The four dimensions are analytical categories used to organize the examination of documentation practices. The functions listed are those traceability can serve in a recycling value chain and are not claims about effects demonstrated for any particular firm. Case-specific evidence is not presented here; it is reported in the Results.
EPR, Extended Producer Responsibility

The four dimensions are related but are not interchangeable. A recycling system may maintain regulatory records while providing limited information on collection-stage transactions, and records of material movement do not necessarily establish the quality of an individual output batch. This distinction matters in the present case because post-consumer plastic moves from fragmented recovery networks into formal processing and eventually into markets where both material quality and documentary credibility matter. This analysis examines which dimensions the available case documents describe and where the evidence remains insufficient.

Informal Recovery and Social Inclusion

Informal recovery workers contribute substantially to recyclable-material collection in many low- and middle-income economies. The ILO documents the wider scale of informal employment and the limited employment and social protection available to many informal workers (ILO, 2018). In the waste sector, Venkatesh identifies waste pickers as important participants in recycling while highlighting their ongoing social and economic marginalization (Venkatesh, 2023). Cook et al. demonstrate, through a systematic scoping review, the material contribution that informal recyclers make to waste recovery and plastic-pollution mitigation (Cook et al., 2024).

Informal workers have both social and operational implications. Waste pickers, itinerant buyers, kabadiwallas, and aggregators can provide access to recyclable materials that formal systems may not recover efficiently. At the same time, involvement in a recycling value chain does not necessarily provide stable income, safer working conditions, bargaining power, or social protection. Inclusive recycling systems need to address barriers faced by informal recyclers alongside improvements in material recovery and quality (Velis et al., 2022), and regulatory changes in plastic-waste management can create socioeconomic consequences for disadvantaged groups when distributive effects are insufficiently considered (Nøklebye et al., 2023).

Evidence from comparable recycling chains reinforces this distinction: material sourced from informal waste pickers can meet formal-sector requirements when collection incentives, trust, and processing arrangements are appropriately aligned (Gall et al., 2020). Cano et al. show that a rigid-high-density polyethylene (HDPE) chain in Brazil can account for significant parts of recycling value through collection and sorting, even as informality remains embedded in the chain (Cano et al., 2025). These studies indicate that informal-sector participation matters for material recovery but should not, by itself, be taken as evidence of social improvement.

The case analysis examines how the firm's documented sourcing arrangements represent informal recovery; it does not determine whether participation changes workers' conditions.

EPR and Recycled-Plastics Markets

EPR assigns producers and other obligated entities responsibility for specified aspects of products and packaging after use. In India, the Plastic Waste Management Rules and subsequent amendments set out responsibilities for plastic-waste management, registration, recycling, recycled-content use, reporting, and compliance (MoEFCC, 2016) (MoEFCC, 2022) (MoEFCC, 2024). Consequently, the EPR framework links recycling activity to the regulatory obligations of producers, importers, and brand owners.

Previous research shows that effective EPR depends on more than formal rules. Pani and Pathak identify the regulatory and operational arrangements central to plastic-packaging EPR implementation in India (Pani and Pathak, 2021), while other studies point to difficulties relating to definitions, stakeholder participation, registration, and coordination and draw attention to weaknesses in verification and certificate-related governance (Gupta and Dash, 2023) (Dey and Ashok, 2025). These findings suggest that EPR's commercial significance for recyclers depends partly on the regulatory system's credibility and implementation.

Bhadra and Mishra's study of Recykal provides a relevant Indian comparison (Bhadra and Mishra, 2021). Recykal operates as a technology-driven organization linking waste generators, aggregators, recyclers, and producers. The authors link its EPR contribution to market expansion, economies of scale, and reduced uncertainty and describe information, monitoring, formalization, and coordination as key features of the model. This case shows how EPR can shape the organization of transactions and relationships within the waste-management value chain, although Banyan Nation differs from Recykal because the focal activity in the present study is producing recycled resin rather than providing producer-responsibility services.

For a recycler, EPR and recycled-content requirements can increase the relevance of material that meets both manufacturing and documentary requirements. This does not mean that regulation guarantees profitability. Commercial viability still depends on material quality, buyer demand, the cost of obtaining and processing feedstock, regulatory implementation, and the relative competitiveness of recycled and virgin material. It remains unclear how these implementation weaknesses affect a recycler whose output is recycled material rather than a compliance instrument.

Governance and Scalability

Recycling businesses operate within municipal, regulatory, and market systems that influence the availability and quality of recyclable material. Municipal collection and source segregation shape the composition of material entering the recycling chain, while fragmented institutional responsibilities can affect local implementation and infrastructure (Mishra, 2024). Examining plastic-waste management in South India, Ramanathan et al. also identify source segregation and stakeholder participation as important to downstream waste-management performance (Ramanathan et al., 2026).

Governance is equally relevant to EPR implementation. Comparative research indicates that regulatory requirements are less effective where institutional capacity, stakeholder coordination, verification, or infrastructure is weak. Santana Valls et al., studying flexible-plastic packaging, show that circular transitions depend on wider regulatory and market arrangements rather than recycling technology alone (Santana Valls et al., 2025). Indian research similarly identifies coordination and implementation problems across EPR stakeholders (Gupta and Dash, 2023).

Scalability in a recycling business should therefore not be understood simply as the ability to install additional processing capacity. Expansion also requires sufficient, reasonably consistent feedstock; functioning collection and segregation systems; ongoing relationships with recovery networks; credible regulatory implementation; downstream demand; and a market in which recycled material remains commercially viable. This study examines which potential scaling conditions the documentary record suggests for the case described below.

Case Description

India's Circular Plastics Context

Informal and semi-formal networks recover a substantial share of India's post-consumer recyclable plastic, in which waste pickers, itinerant buyers, kabadiwallas, and small scrap dealers collect and aggregate material from households, commercial establishments, and other waste sources (ILO, 2018) (Venkatesh, 2023). These networks provide access to material that may otherwise remain outside formal collection systems, but uneven segregation, handling, and record-keeping can affect the quality of plastic supplied for further processing.

Two terms recur in this analysis. Informal recovery actors collect, sort, or aggregate post-consumer material outside registered employment and without the employment or social protection associated with formal work, following the ILO's treatment of informal employment (ILO, 2018). In India's plastic chain, this includes waste pickers, itinerant buyers, and kabadiwallas, small scrap dealers who buy recyclable material from households and sell it up the chain. Semi-formal is used here for aggregators and dealers who hold some registration or a continuing commercial relationship with a registered buyer while still transacting largely in cash without documented terms. The distinction is analytical, and the coded corpus does not allow assigning individual actors in Banyan Nation's supply chain to either category. The relevant context for Banyan Nation is the connection between dispersed post-consumer recovery, manufacturing requirements for recycled resin, and India's EPR framework (Hahladakis and Iacovidou, 2018) (MoEFCC, 2016) (MoEFCC, 2022) (MoEFCC, 2024). The case description below focuses on how the company's public operating model connects these elements.

Banyan Nation and Its Business Model

Banyan Nation is a Hyderabad-based plastics-recycling enterprise whose public materials describe a business model connecting post-consumer plastic recovery with processing, quality control, technology-enabled documentation, and the production of recycled resin for formal-sector buyers. An early public description of the company appeared in a MyGov profile published in 2017 after it was recognized through the Intel and Department of Science and Technology Innovate for Digital India Challenge 2.0. The profile described the company's use of technology in waste management and its efforts to digitize parts of urban material recovery (MyGov, 2017). Because this source dates to 2017, it serves as a historical account of the company's reported activities at that time; it does not establish that those practices continued unchanged during the period covered by the more recent company material.

More recent company material describes Banyan Nation as processing post-consumer plastic into recycled polyolefin resin intended for product and packaging applications and reports technical, color, and odor characteristics of its recycled material (Banyan Nation, 2026). The business model therefore extends beyond waste collection or aggregation. Its stated downstream activity is converting recovered plastic into recycled resin that it can supply as a secondary raw material to formal manufacturers.

This case is limited to the post-consumer polyolefin streams documented for Banyan Nation, primarily polyethylene and polypropylene. This material boundary is relevant because collection, separation, processing, recyclate performance, and end-market requirements differ across polymers and packaging formats. The case therefore does not reflect the technical conditions of every form of plastic waste.

Recovery and Supply of Post-Consumer Plastic

The upstream part of Banyan Nation's documented business model concerns access to post-consumer plastic. Public descriptions refer to involvement with informal recyclers and other recovery actors, as well as the use of technology or data systems in the recovery process (MyGov, 2017) (Banyan Nation, 2026). These relationships connect the recycler with material collected through networks that extend beyond fully formal municipal or commercial collection systems.

This part of the model is relevant because the availability and condition of recovered plastic affect subsequent recycling. Informal recovery networks can access dispersed post-consumer material, while sorting and aggregation determine what reaches processing. The public sources establish the reported involvement of informal recovery actors but provide limited information on individual commercial relationships within the network. A 2025 sectoral assessment by the Council on Energy, Environment and Water (CEEW) describes Banyan as a vertically integrated recycler that covers

collection through resin production. The assessment reports that the company processes HDPE and polypropylene and references a data-based platform used in the recycling supply chain, as well as its engagement with informal recovery actors (CEEW, 2025).

Processing and Recycled-Resin Quality

Banyan Nation's public materials describe a processing stage that converts recovered post-consumer plastic into recycled resin for downstream manufacturing. The company reports sorting, washing, color sorting, extrusion, and pelletization as part of the recycling process, along with the resulting resin's technical, color, and odor characteristics (Banyan Nation, 2026). This emphasis on material characteristics reflects buyer requirements for recycled resin used in formal manufacturing.

Quality matters in post-consumer recycling because incoming material properties can vary by source, contamination, polymer type, and previous use. Inconsistent feedstock can affect both processing and the resulting recyclate's characteristics. The business model therefore places material preparation and quality control between first-mile recovery and downstream manufacturing, rather than treating collected waste volume as the only relevant measure.

Documentation and Traceability

Technology-enabled documentation is another feature reported in Banyan Nation's operating model. The MyGov profile described using technology to improve visibility in waste recovery, while more recent company material continues to link data and traceability to the recycling process (MyGov, 2017) (Banyan Nation, 2026). The CEEW assessment also describes a data-based platform for tracking elements of the recycling supply chain (CEEW, 2025).

In a recycling chain that extends from dispersed post-consumer recovery to formal manufacturing, documentation can record material movement, transactions, quality information, and regulatory activity. This study therefore examines traceability as a documented feature of the business model, using the four dimensions set out in Table *2*.

Downstream Buyers and Recycled-Material Demand

The downstream part of the business model concerns selling recycled resin to formal-sector manufacturers and brand owners. Banyan Nation's public materials describe recycled resin intended for product and packaging applications in formal manufacturing (Banyan Nation, 2026).

Buyer-side evidence is available through Reckitt's disclosure to the Ellen MacArthur Foundation Global Commitment. Reckitt reported that it was among the early buyers of Banyan Nation's post-consumer recycled-plastic solution and indicated continued engagement with the company on recycled-plastic use (Ellen MacArthur Foundation, 2021). The disclosure records a buyer relationship as of 2021 and does not establish that the relationship continued to the study's documentary cut-off.

Taken together, the public sources describe a model connecting post-consumer polyolefin recovery, processing and quality control, documentation, and supply to formal-sector buyers. The analysis that follows examines the relationships among these reported components rather than assuming that TBL outcomes have been achieved.

Analytical framework

The literature reviewed above identifies three recurring concerns in the circular-plastics value chain: the social position of actors responsible for material recovery, the environmental importance of returning recovered material to productive use, and the commercial conditions required for recycling to operate as a continuing business activity. The present study examines these concerns through the TBL and uses stakeholder salience and resource dependence to analyze the relationships that can support or constrain the model.

Triple Bottom Line

Elkington developed the TBL to broaden assessments of business performance beyond financial outcomes by considering People, Planet, and Profit (Elkington, 1994). Elkington later cautioned against reducing the framework to separate social, environmental, and economic reporting categories without examining how they are connected

(Elkington, 2018). This distinction matters in the present case because the study does not merely seek to identify one social activity, one environmental activity, and one commercial activity. It examines how these three dimensions connect within the documented recycling business model.

The People dimension concerns the participation and position of informal recovery actors who collect and supply post-consumer plastic. The analysis considers their role in material recovery and their relationship with the recycling business.

The Planet dimension concerns what happens to recovered plastic after collection. It focuses on segregation, processing, recyclate quality, and traceability because recycling's environmental purpose depends on whether recovered material can return to productive use.

The Profit dimension concerns the commercial basis for producing recycled material. It considers how recyclate quality, formal-sector buyer requirements, and EPR-related demand influence the market for recycled resin.

In each dimension, documented practice is distinguished from realized outcome. Employment and income conditions, measured environmental effects such as avoided emissions or reduced virgin-material use, and firm-level financial performance are treated as unverified wherever the public record does not reach them. For RQ1, TBL guides the examination of connections among the business model's reported social, environmental, and commercial elements.

Stakeholder Salience and Resource Dependence

A recycling model's ability to operate and expand also depends on actors outside the focal firm. Stakeholder theory recognizes that organizations connect with groups that can affect, or are affected by, their activities (Freeman, 1984) (Donaldson and Preston, 1995). In the present case, relevant stakeholders include regulators, municipal authorities, producers and brand owners, informal recovery actors and aggregators, and other organizations involved in the recycling value chain.

Stakeholder salience is assessed through power, legitimacy, and urgency. Power concerns a stakeholder's ability to influence organizational decisions or outcomes; legitimacy concerns the perceived appropriateness of the stakeholder's claim or relationship; and urgency concerns the extent to which a claim requires timely attention. These attributes provide a structured way to examine why some stakeholders receive greater formal attention than others (Mitchell et al., 1997).

Their application to a recycling system also requires attention to practical dependence. Regulators have formal authority through rules and enforcement, while producers and brand owners can shape demand for recycled materials through purchasing and compliance decisions. Municipal authorities influence collection and segregation conditions. Informal recovery actors may have relatively little formal authority, even though access to post-consumer material depends heavily on the networks in which they operate.

Resource-dependence theory addresses this distinction by explaining that organizations depend on external actors who control resources required for continued operation (Pfeffer and Salancik, 1978). In the Banyan Nation case, post-consumer plastic itself is a critical input. Actors involved in first-mile recovery may therefore matter operationally even when they have limited formal power.

Stakeholder salience guides interpretations of power, legitimacy, and urgency, while resource dependence directs attention to the resources and relationships relevant to continued operation (Mitchell et al., 1997) (Pfeffer and Salancik, 1978).

For RQ2, these perspectives are used together to examine the conditions associated with scalability. The analysis considers conditions beyond the recycler's processing capability, including material access, municipal collection and segregation, regulatory implementation, relationships with recovery actors, and continuing demand from formal-sector buyers. Stakeholder salience and resource dependence therefore provide the analytical basis for examining how these external relationships may support or constrain the expansion of the documented Banyan Nation model.

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Materials and methods

Research Design

This study used a qualitative, exploratory, document-based single-case design to examine Banyan Nation's publicly documented circular-plastics business model. A case-study approach was appropriate because the RQs concern how different parts of one business model are connected and which conditions may affect its scalability within India's EPR setting. The purpose was not to estimate the prevalence of these relationships across the recycling industry but to examine them within a clearly bounded case (Yin, 2018).

The analysis was organized around the two RQs presented in the Introduction. RQ1 examined how Banyan Nation's documented operating model is structured to pursue integrated People-Planet-Profit value. RQ2 examined the potential scaling conditions that the public documentary record identifies for the documented model. The TBL provided the analytical structure for RQ1, while stakeholder salience and resource-dependence reasoning examined the relationships relevant to RQ2.

The study relied entirely on publicly available documents. The study collected no interviews, surveys, site visits, observations, experiments, internal company records, transaction-level datasets, employee records, technical production records, or audited financial statements.

Case Selection

Banyan Nation was selected purposively because its publicly documented activities bring together the principal elements required to address the RQs. Available sources describe engagement with informal and semi-formal recovery networks, the processing of post-consumer polyolefins into recycled resin, the use of technology and documentation within the recycling chain, and the supply of recycled material to formal-sector buyers within India's EPR environment (MyGov, 2017) (CEEW, 2025) (Banyan Nation, 2026).

We selected the case for its relevance to the research problem, not because we assumed it represented the wider Indian recycling industry. It provides a setting to examine informal recovery, feedstock access, processing quality, traceability, regulation, buyer demand, and stakeholder relationships within the same documented business model.

The case's material scope is limited to the mechanical recycling of post-consumer polyolefin streams, principally polyethylene and polypropylene. Collection systems, separation requirements, processing technologies, material characteristics, and end markets differ across plastic categories. Therefore, the case is not used to make equivalent claims about polyethylene terephthalate, multilayer packaging, flexible packaging, composites, or other waste streams with different technical and commercial conditions.

Document Identification and Selection

Documents were identified in three steps. We assembled the statutory and administrative record for plastic-waste management and EPR in India from notified rules and the Central Pollution Control Board (CPCB) EPR portal. We identified institutional and multilateral reports on plastic recycling, circularity, and informal employment through the publishing organizations' own repositories. We identified company-specific material by searching for publicly retrievable documents naming Banyan Nation.

A document was included if it was publicly retrievable without subscription or permission, was published by a government body, a multilateral or research institution, or the company itself, and addressed at least one of four matters: India's plastic-waste or EPR requirements; post-consumer plastic recycling and recyclate quality; informal recovery work; or Banyan Nation's activities. Screening identified 15 such documents. We excluded two: the Ellen MacArthur Foundation circular-economy report, which we used to build the analytical framework rather than describe the case (Ellen MacArthur Foundation, 2013), and later CPCB information on the portal migration, which we consulted only to clarify an administrative change. The remaining 13 form the coded corpus reported in Table *3*. We did not treat peer-reviewed studies cited in the Literature review and Analytical framework as corpus candidates because they built the analytical framework rather than describing the case.

Documentary Sources

The coded corpus comprised 13 publicly available documents, identified as D1-D13 in Appendix A. Five were government or regulatory documents, four were multilateral or institutional reports, and four directly described Banyan Nation: two containing company-authored or company-supplied information and two providing third-party accounts. The corpus closed on June 21, 2026, and was extended on August 6, 2026, during revision to include D12 and D13. Where a webpage did not have a fixed publication date, we treated the version retrieved on the date shown in Appendix A as the analyzed record.

We used government and regulatory sources to establish India's plastic-waste and EPR framework, including formal responsibilities, registration, reporting, recycling obligations, and related administrative arrangements. Multilateral and institutional reports provided broader context on plastic recycling, circularity, plastic pollution, and informal employment. The four case-specific documents, namely the Banyan Nation website, the MyGov company profile published in 2017, the CEEW sectoral assessment, and the Reckitt disclosure reported through the Ellen MacArthur Foundation, were used to describe the company's publicly stated activities, technology, and development of the business model, together with third-party accounts of its processing and buyer relationships.

The corpus composition places an important limit on company-level interpretation: nine of the thirteen documents primarily establish the regulatory, environmental, or labor context, while four directly describe Banyan Nation. Two of those four contain company-authored or company-supplied information, and one reflects the company at an earlier stage of development. The remaining two are third-party accounts rather than audits of the firm. We therefore used all four to establish what the public describes about the business, rather than as independent evidence that particular social, environmental, operational, or financial outcomes have been achieved.

The coded corpus did not include peer-reviewed theoretical and comparative studies cited in the Literature review, Analytical framework, and Methods. We used them to develop the analytical framework and interpret the findings. We later consulted CPCB information on the transition from the former Plastic EPR Portal to the Common EPR Portal to clarify a regulatory development; we did not code it.

Table *3* summarizes the documentary corpus composition, the role assigned to each source category, and the evidentiary basis for using the sources. Document-level information is provided separately in Appendix A.

Source category	Documents	Number	Role in the analysis	Evidentiary use
Government and regulatory sources	D1: Plastic Waste Management Rules, 2016; D2: 2022 Amendment Rules and EPR Guidelines; D3: Plastic Waste Management (Amendment) Rules, 2024; D4: CPCB EPR portal, retrieved June 21, 2026; D5: 2026 parliamentary reply	5	Establish regulatory chronology, formal responsibilities, EPR requirements, reporting arrangements, and official plastic-waste context	Primary evidence for regulatory and official factual claims
Multilateral and institutional reports	D6: OECD (2022); D7: UNEP (2023); D8: ILO (2018); D9: The Pew Charitable Trusts (2025)	4	Establish wider context of plastic recycling, circularity, pollution, and informal employment	Contextual evidence within the scope of each source

Case-specific documents, company-authored	D10: Banyan Nation website, retrieved June 21, 2026; D11: MyGov company profile (2017)	2	Describe Banyan Nation's publicly stated activities, technology, operating model, and historical development	Descriptive company evidence; not independent verification of performance or impact
Case-specific documents, third party	D12: CEEW sectoral assessment (2025); D13: Reckitt disclosure reported through the Ellen MacArthur Foundation Global Commitment (2021); both accessed August 6, 2026	2	Provide sectoral and buyer-side accounts of the firm not authored by the company	Third-party descriptive evidence; not an audit of transactions, outcomes, or financial performance
Total coded corpus	D1-D13	13	Documentary material subjected to manual qualitative analysis	-
Theoretical and comparative literature	Peer-reviewed sources cited in the Literature review, Analytical framework, and Methods	-	Develop concepts and support interpretation and comparison with previous research	Not coded as case data

TABLE 3: Documentary corpus, evidentiary confidence, and role in the analysis

Source: Compiled by the authors from the documentary corpus identified in Appendix A.
CEEW, Council on Energy, Environment and Water; CPCB, Central Pollution Control Board; EPR, Extended Producer Responsibility; ILO, International Labour Organization; OECD, Organisation for Economic Co-operation and Development; UNEP, United Nations Environment Programme

The source categories in Table *3* were not treated as equivalent forms of evidence. Official sources established regulatory requirements and public data, whereas company-specific documents described Banyan Nation's own activities.

Unit of Analysis

The study distinguished between the documentary corpus and the coding unit. At the corpus level, each of the 13 sources constituted one document. At the coding level, the analysis focused on passages containing information relevant to one or both RQs. A coding unit could therefore consist of a sentence, paragraph, regulatory provision, or other self-contained documentary passage.

Relevant passages addressed informal recovery and access to post-consumer material; segregation and contamination; processing and recyclate quality; material, transaction, quality, or compliance traceability; EPR requirements and reporting arrangements; buyer demand and commercial conditions; stakeholder roles and relationships; municipal collection and segregation; regulatory implementation; or conditions affecting scalability.

The analysis considered the meaning of an extract together with its source. The analysis therefore considered who produced the document, its purpose, date, and the type of claim being made. For example, a government notification could establish a statutory requirement, whereas a company webpage could show that Banyan Nation publicly describes

a particular activity.

Data Analysis

The 13-document corpus was analyzed manually using reflexive thematic analysis (Braun and Clarke, 2006) (Braun and Clarke, 2019). No qualitative data-analysis software was used. Reflexive thematic analysis was appropriate because the study sought to identify and interpret recurring patterns across documentary sources rather than quantify the frequency of words, phrases, or categories.

Analysis began with repeated reading of all 13 documents. During the initial readings, attention focused on each document's content, source, purpose, date, and relevance to the two RQs. Preliminary notes captured recurring issues related to informal recovery, access to post-consumer plastic, segregation and contamination, recyclate quality, traceability, EPR requirements, buyer demand, stakeholder relationships, municipal conditions, regulatory implementation, and recycled-material markets.

Coding combined deductive and inductive reasoning. The deductive component drew on the analytical frameworks established before the analysis. The People, Planet, and Profit dimensions initially guided attention to RQ1, while power, legitimacy, and urgency informed the stakeholder analysis for RQ2. These concepts served as starting points rather than a closed coding scheme.

We developed inductive codes for issues the documents raised that the initial categories did not adequately capture. Appendix B sets out the full coding framework, including each deductive and inductive code's definition, the type of passage to which it was applied, and the documents in which it was applied. Appendix B also presents illustrative source extracts with document identifiers, passage locations, corresponding codes, and interpretive limits (Table *10*).

Coding was iterative and developed through repeated readings of the documents. A passage could receive more than one code when it addressed several aspects of the case. We revised, combined, or separated codes when subsequent readings changed our interpretation of earlier material. We then grouped related codes into candidate themes.

We reviewed candidate themes against the relevant documentary extracts and the corpus as a whole. We retained a theme only when it had clear documentary support and contributed directly to one of the RQs. We combined overlapping themes, narrowed or removed themes with insufficient support, and retained contradictory or qualifying evidence. The Results section presents the final themes and maps them to RQ1 and RQ2, along with their principal documentary sources.

The themes interpret patterns in the documentary record. They are not statistically tested relationships and are not treated as measured organizational outcomes.

Stakeholder-Salience Analysis

Stakeholder analysis examined relationships relevant to the business model's scalability. We assessed stakeholder salience using three attributes: power, legitimacy, and urgency. The classifications were qualitative and case-specific; we did not calculate a numerical index or composite salience score (Mitchell et al., 1997). Power concerned documented authority or potential influence over regulatory requirements, purchasing, collection infrastructure, or material access. Legitimacy concerned recognition of a stakeholder's role or claim, with statutory responsibilities, reported commercial relationships, and functional participation distinguished. Urgency concerns documented time-sensitive claims and the consequences of delayed attention. Table *6* presents descriptive assessments rather than High, Medium, or Low ratings because the sources do not provide a consistent basis for ordinal comparison across stakeholder groups. System-level regulatory obligations are distinguished from evidence of firm-specific relationships. "Not established" indicates insufficient documentary evidence, rather than low salience.

The analysis considered material-access roles separately from stakeholder salience, using resource-dependence reasoning (Pfeffer and Salancik, 1978). Table *6* describes whether actors are reported to enable physical access to post-consumer material. These roles are described without ordinal rankings because the corpus does not measure their relative contributions, control over supply, or substitutability.

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Material-access roles were not treated as a fourth attribute of stakeholder salience. The classifications are interpretive readings of the documentary record, not measurements. Not established indicates insufficient evidence and should not be interpreted as low salience. The supporting passages and qualifications are reported immediately below Table 6.

Evidentiary Boundaries

The study assessed documentary evidence by the type of claim it could reasonably support. The study anchored regulatory obligations and administrative arrangements in government notifications and CPCB material. Institutional sources supported broader claims about plastic recycling, circularity, pollution, and informal employment. The study used peer-reviewed research to interpret and compare theories. The study used company-specific documents primarily to describe Banyan Nation's reported operating model.

This distinction was necessary because the study used TBL and stakeholder salience as analytical frameworks from the beginning. Predetermined frameworks can risk interpreting evidence only in ways that confirm them. To reduce this risk, we retained inductive codes alongside the initial categories, did not discard evidence that did not fit a favorable People-Planet-Profit interpretation, and required themes to remain traceable to the documentary material.

For example, we treated municipal segregation capacity, EPR implementation, and virgin-resin prices as external conditions affecting scalability rather than forcing them into a positive TBL category. Similarly, we did not automatically interpret the presence of informal recovery actors in a supply chain as improved social inclusion, and we did not automatically treat documentation as proof of material quality or effective recycling.

We also distinguished the absence of evidence from evidence of absence. The corpus contains no direct worker testimony demonstrating higher income, safer working conditions, greater bargaining power, or improved social protection. It also lacks independently verified batch-level traceability, a longitudinal series of resin-quality test results, audited company profitability, or independent firm-level verification of all EPR-related activities. These gaps limit the claims that can be made; they do not establish whether the outcomes occurred. Where possible, we compared descriptions across different source categories. We checked official regulatory claims against government or CPCB material, anchored contextual claims in institutional evidence, and compared company descriptions with third-party sectoral and buyer-side documents in the corpus. These comparisons strengthen the interpretation of the regulatory context and the broad structure of the documented business model.

Ethics Statement

The study used only publicly available documentary material and involved no human participants, identifiable private data, or intervention.

Results

The manual thematic analysis identified five themes. For RQ1, the themes were organized around the TBL: People, Planet, and Profit. The People theme concerns the role of informal recovery actors in supplying post-consumer material; the Planet theme concerns recyclate quality and traceability; and the Profit theme concerns the market for recycled resin within the EPR setting. For RQ2, the analysis identified themes on stakeholder relationships and the broader governance and market conditions that are associated with scalability.

Table 4 summarizes the five themes and identifies the principal documentary evidence supporting each one. It also states the main evidentiary limitation for each theme so that documented business practices are not interpreted as verified social, environmental, or financial outcomes.

Research question	Area of finding	Principal documentary evidence	Main evidentiary limitation

RQ1 - People	Informal recovery actors and feedstock access	(MyGov, 2017) (Banyan Nation, 2026) (ILO, 2018) (CEEW, 2025)	Participation is documented, but worker income, safety, bargaining conditions, and social protection are not established
RQ1 - Planet	Recyclate quality and traceability	(Banyan Nation, 2026) (MyGov, 2017) (CPCB, 2026) (MoEFCC, 2022) (CEEW, 2025)	Quality and traceability are described, but batch-level performance and firm-level compliance are not independently verified
RQ1 - Profit	EPR-linked demand and formal-sector market	(MoEFCC, 2016) (MoEFCC, 2022) (MoEFCC, 2024) (MoEFCC, 2026) (CPCB, 2026) (Banyan Nation, 2026) (Ellen MacArthur Foundation, 2021)	The documents establish a commercial setting for recycled resin but do not establish firm-level profitability
RQ2	Stakeholder relationships and dependence	(MoEFCC, 2016) (MoEFCC, 2022) (MoEFCC, 2024) (MoEFCC, 2026) (ILO, 2018) (MyGov, 2017) (Banyan Nation, 2026) (CEEW, 2025) (Ellen MacArthur Foundation, 2021)	Stakeholder positions are interpreted from documents rather than from interviews with the stakeholders themselves
RQ2	Governance and market conditions associated with scale	(MoEFCC, 2016) (MoEFCC, 2022) (MoEFCC, 2024) (MoEFCC, 2026) (CPCB, 2026) (OECD, 2022)	The documents identify relevant conditions but do not measure their effect on Banyan Nation's growth

TABLE 4: Themes mapped to research questions

Source: Developed by the authors from the coded documentary corpus identified in Appendix A.
CEEW, Council on Energy, Environment and Water; CPCB, Central Pollution Control Board; EPR, Extended Producer Responsibility; ILO, International Labour Organization; MoEFCC, Ministry of Environment, Forest and Climate Change; OECD, Organisation for Economic Co-operation and Development; RQ, Research Question

RQ1: People, Planet, and Profit

People: informal recovery actors and material supply: The People dimension concerns the role of informal and semi-formal recovery actors within the documented supply chain. Banyan Nation's public materials describe engagement with informal recyclers and other recovery networks that collect and aggregate post-consumer plastic (MyGov, 2017) (Banyan Nation, 2026), and the CEEW sectoral assessment also describes the company's engagement with informal recovery actors (CEEW, 2025). Within the business model, these actors contribute to access to material that originates outside fully formalized collection systems.

Their role is therefore relevant not only socially but operationally. Recyclers require a continuing supply of post-consumer material, and informal recovery networks provide access to dispersed waste streams that may otherwise be difficult to reach. The documentary evidence supports the conclusion that informal recovery actors participate in Banyan Nation's

reported supply arrangements and contribute to feedstock access.

The evidence does not, however, establish that this participation has improved the conditions under which informal workers operate. The corpus contains no worker-level information on wages, payment security, occupational safety, bargaining power, employment status, or social protection. The broader evidence concerns the vulnerability of informal employment, but it does not measure the conditions of workers associated with Banyan Nation. The People finding therefore focuses on documented participation in the recycling supply chain and its relationship to material access.

Planet: recyclate quality and traceability: The Planet dimension concerns whether recovered plastic can be processed into material suitable for renewed productive use. Banyan Nation's public materials describe sorting, washing, color sorting, extrusion, and pelletization and report technical, color, and odor characteristics for recycled resin (Banyan Nation, 2026). These activities place material quality between post-consumer recovery and downstream manufacturing.

Quality matters because recovered plastic has limited circular value when contamination or inconsistent material characteristics prevent formal manufacturers from using it. The documented model therefore emphasizes converting recovered polyolefin into recycled resin rather than plastic collection alone.

Applying the four traceability dimensions defined earlier in Table *2* shows differences in the strength of the documentary evidence. Material traceability is partially described through reported sourcing from informal recovery networks and the use of technology in parts of the recovery process; the CEEW assessment also refers to a data-based platform used in the recycling supply chain (CEEW, 2025). Transaction traceability is much less clearly documented because the coded corpus contains no payment records, purchase histories, contracts, or other transaction-level evidence involving recovery actors. Company materials describe technical, color, and odor specifications for the recycled resin. These specifications document claimed product characteristics but do not, by themselves, establish quality traceability, which would require records linking specific batches to their testing and processing histories. Compliance traceability is established at the regulatory-system level through CPCB and EPR documentation. After the initial corpus closed, CPCB stated that the former Plastic EPR Portal was discontinued effective June 28, 2026, and that user data were migrated to the Common EPR Portal. This later portal change was treated as revision-stage clarification rather than coded case data. The reviewed material contained no independently retrievable firm-level record for Banyan Nation, so firm-level compliance remains unverified.

These distinctions matter because documenting one part of the recycling chain does not establish the others. Regulatory reporting alone does not demonstrate material quality, and descriptions of technology-enabled material tracking do not establish transparency in individual transactions with informal suppliers. The corpus describes information potentially relevant to buyer assessment and documents system-level regulatory requirements. It does not establish increased buyer confidence or verify firm-level EPR compliance.

The documentary evidence also does not quantify environmental outcomes. The study includes no lifecycle assessment, material-flow analysis, or independently verified environmental accounting. The Planet finding is therefore narrower: Banyan Nation's documented model addresses segregation, processing quality, and traceability, which matter for returning recovered polyolefin to manufacturing, but the study does not measure the net environmental benefit.

Profit: EPR-linked demand and the market for recycled resin: The Profit dimension concerns the commercial setting in which recycled resin is produced and sold. India's EPR framework establishes recycling, recycled-content, registration, reporting, and other responsibilities for producers, importers, brand owners, and plastic waste processors (MoEFCC, 2016) (MoEFCC, 2022) (MoEFCC, 2024) (CPCB, 2026). These requirements create a regulatory setting in which recycled material and supporting documentation can become relevant to formal-sector buyers.

Banyan Nation's public materials describe recycled resin intended for formal manufacturing applications (Banyan Nation, 2026), and a buyer disclosure reports that Reckitt was among the early purchasers of the company's post-consumer recycled plastic (Ellen MacArthur Foundation, 2021). Read together with the EPR documents, the evidence indicates a

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commercial relationship between recycled-resin availability, buyer requirements, and regulatory demand for recycling and recycled-content use. Material quality matters because manufacturers need recycled resin that meets production requirements, while documentation matters where buyers must also demonstrate compliance with EPR obligations.

The evidence does not establish this business model's financial performance. The corpus contains no internal financial statements, contract prices, procurement volumes, contribution margins, or other firm-level data from which Banyan Nation's profitability can be determined. The finding is that EPR and formal-sector purchasing requirements provide a market context for quality-specified and documented recycled resin; profitability remains unverified.

Disconfirming Evidence and Alternative Readings

Not all coded material fitted a straightforward People-Planet-Profit interpretation. Virgin-resin price conditions, municipal segregation capacity, and EPR implementation credibility emerged as constraints rather than positive TBL outcomes and were retained as governance and market conditions.

The documents also permit an alternative reading of the apparent connection between traceability and informal-sector engagement. Both may appear together in public descriptions because they contribute to the credibility of the business model for formal buyers, rather than because they are integrated to the same extent in day-to-day operating practice. The documentary design cannot distinguish conclusively between these interpretations. Transaction records, worker accounts, process data, and buyer procurement evidence would be needed to establish how closely the public description matches operating practice.

Integrated People-Planet-Profit Findings

The three dimensions are connected within the documented business model rather than operating as separate sustainability activities. Informal recovery actors contribute to access to post-consumer material; segregation and processing influence the quality of the material entering and leaving the recycling process; quality and traceability affect the suitability and credibility of recycled resin for formal buyers; and EPR requirements shape the market environment in which recycled material is purchased.

Table *5* brings these findings together and shows what the documentary evidence establishes under each TBL dimension and what remains unverified.

TBL dimension	Finding from the documentary analysis	What the evidence supports	What remains unverified
People	Informal and semi-formal recovery actors participate in the supply of post-consumer plastic	Their participation contributes to access to recovered material within the documented supply chain	Improved wages, safety, bargaining power, job security, or social protection
Planet	The model emphasizes segregation, processing quality, and traceability in producing recycled polyolefin resin	These practices address conditions required for recovered plastic to return to formal manufacturing	Net environmental savings, independently verified batch-level quality, and complete material traceability
Profit	EPR requirements and formal-sector demand create a market setting for recycled resin	Quality and documentation are commercially relevant where buyers require recycled material and regulatory compliance	Firm-level profitability, price premium, procurement advantage, and the financial contribution of EPR-linked demand

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TABLE 5: Summary of People-Planet-Profit findings

Source: Developed by the authors from the coded documentary corpus identified in Appendix A.
EPR, Extended Producer Responsibility; TBL, Triple Bottom Line

Figure *1* summarizes the reported relationships among recovery, processing, documentation, and market demand, together with their evidentiary limits.

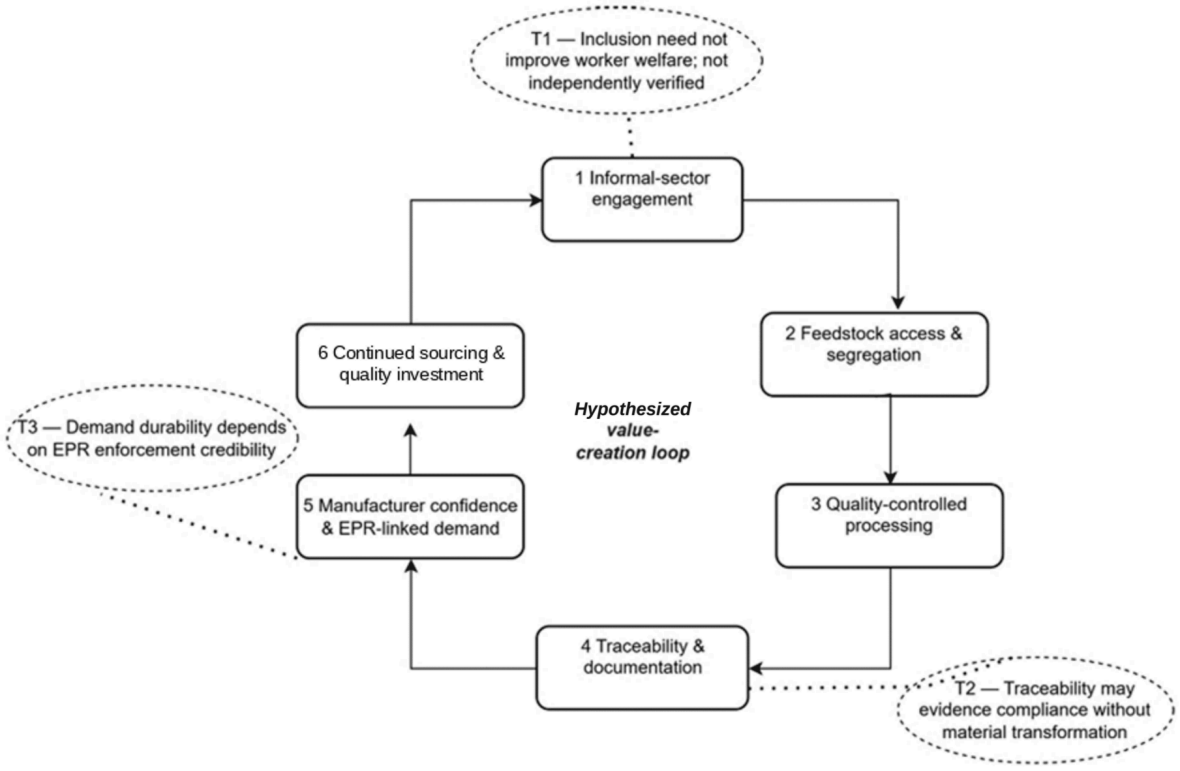


FIGURE 1: People-Planet-Profit relationships in Banyan Nation's documented model

Source: Conceptualized and drawn by the authors from the documentary analysis.
Notes: The figure summarizes relationships identified from the documentary evidence. It does not represent a statistically tested or independently verified causal model. Informal-sector participation does not establish improved worker outcomes; documentation does not by itself establish physical material transformation; and EPR-linked demand depends on credible implementation and continuing buyer demand. No revenue, margin, or reinvestment data are presented in this study; no financial return or reinvestment relationship is inferred.
EPR, Extended Producer Responsibility

RQ2: Stakeholder Relationships and Scalability

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Banyan Nation does not control all the conditions required for its documented business model to operate or expand. Material recovery depends on informal and municipal systems; EPR is established and administered through government institutions; producers and brand owners influence demand for recycled resin; and technology supports processing and documentation. Stakeholders therefore differ in both formal authority and practical importance to the recycling chain.

Table *6* summarizes documented stakeholder authority and recognition, the limits of evidence on urgency, and reported roles in material access. Documentary support and qualifications follow the table.

Stakeholder group	Power	Legitimacy	Urgency	Documented role and supporting evidence	Potential relevance to expansion
Regulators	Statutory authority to prescribe and enforce requirements; firm-specific influence is not assessed.	Established through responsibilities assigned under the regulatory framework.	Regulatory deadlines and enforcement notices establish time-sensitive obligations at system level; firm-specific urgency is not established.	D1–D3 establish regulatory responsibilities and EPR requirements. D5 reports enforcement action concerning unmet targets and annual returns.	Regulatory requirements and their enforcement may influence the conditions under which expansion is pursued.
Formal buyers and brand owners	Purchasing decisions provide a potential source of influence; the extent of bargaining power over Banyan Nation is not established.	A reported commercial relationship is supported by the buyer disclosure.	Not established in the reviewed documents.	D13 identifies Reckitt as an early buyer of Banyan Nation's recycled plastic. D10 describes supplying recycled resin to formal buyers.	Continued buyer demand and acceptance of recycled resin may support expansion; their stability and scale are not established.
Municipal bodies	Statutory authority over specified local waste-management functions; influence over Banyan Nation is not established.	Established through local waste-management responsibilities.	Not established in the reviewed documents.	D1, Rule 6(1)–(2), assigns local bodies responsibility for plastic-waste management infrastructure and systems, including ensuring that the recyclable plastic-waste fraction is channelized to recyclers under Rule 6(2)(c). This does not establish a specific municipal arrangement with Banyan Nation.	Collection and channelization arrangements may affect access to recyclable material.

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Informal recovery actors and aggregators	Bargaining power and influence over firm decisions are not established.	Reported participation supports recognition as operational stakeholders; formal recognition and representation are not established.	Not established in the reviewed documents.	D10 and D12 describe engagement with informal collection and aggregation networks. These accounts do not establish supply shares or worker outcomes.	Relationships with recovery actors may be relevant to feedstock access; the extent of dependence is not quantified.
Technology providers	Not established in the reviewed documents.	Provider-specific stakeholder relationships are not established.	Not established in the reviewed documents.	D11 and D12 describe digital tools or a data platform. They do not establish the identity, contractual position, or influence of external technology providers.	Digital capabilities may support information management, but the documents do not establish dependence on external providers.

TABLE 6: Documentary assessment of stakeholder attributes and potential relevance to expansion

Source: Authors' documentary analysis of D1–D3, D5, and D10–D13, as identified in Appendix A.
Notes: "Not established" indicates insufficient documentary evidence and does not mean "Low". Assessments distinguish statutory responsibilities from reported firm-level relationships and are qualitative interpretations rather than measured stakeholder attributes. Potential relevance to expansion indicates analytical interpretation, not demonstrated scalability. Third-party accounts and buyer disclosures do not constitute independent verification of sustainability outcomes.
EPR, Extended Producer Responsibility; D, document identifier in Appendix A

Regulators: D1, Rule 12, identifies enforcement authorities. D5, the paragraph beginning "In order to ensure compliance", reports dated CPCB notices concerning EPR targets and annual returns. These support statutory power, legitimacy, and time-sensitive regulatory demands at the system level, not an observed enforcement relationship with Banyan Nation.

Producers and brand owners: D13, "Increasing post-consumer recycled content in plastic packaging", identifies Reckitt as an early buyer. This supports commercial legitimacy and the purchasing-authority interpretation. It does not establish bargaining strength, current procurement volumes, or urgency in the firm-specific relationship.

Municipal authorities: D1, Rule 6(1) to (2), establishes infrastructure and material-channelization responsibilities; Rule 6(4) provides for bye-laws. These support statutory authority and legitimacy. They do not quantify Banyan Nation's reliance on particular municipal systems or establish urgency of municipal claims on the firm.

Informal recovery actors: D10, the opening company description, and D12, "Inspiration from a success story", describe participation in collection and aggregation. This supports functional recognition and a material-access role. The passages do not establish contractual recognition, bargaining strength, time-sensitive claims, supply shares, or lack of substitutes.

Technology and data providers: D11, the paragraph describing the Warangal pilot, identifies technologies used historically; D12 describes a company data platform. This supports the presence of technology functions, but not current external providers' contractual authority, legitimacy, urgency, or physical-feedstock control.

The analysis further identifies four conditions the documentary record associates with the documented model's scalability. First, municipal collection and source segregation affect the condition of the material reaching recyclers. Poor segregation increases contamination and adds sorting and processing requirements for downstream recyclers. Expanding processing capacity alone cannot fix poor feedstock quality when the problem originates earlier in the recovery chain.

Second, relationships with informal and semi-formal recovery networks affect access to post-consumer material. These networks are locally embedded and depend on continuing commercial and social relationships. Expansion into new locations may require establishing and adapting material-supply relationships alongside processing capacity; the corpus does not document how Banyan Nation has managed such expansion.

Third, EPR implementation and continuing buyer demand influence the market for recycled resin. EPR requirements can support demand where producers and brand owners must meet recycling and recycled-content obligations and where reporting and verification are credible. Weak or inconsistent implementation would reduce the commercial significance of documented recycled material.

Fourth, recycled resin's competitiveness relative to virgin material affects the strength of market demand. Where recycled resin faces significant price competition from virgin polymer, regulatory requirements, buyer commitments, product quality, and reliable supply become more important to maintaining demand.

Taken together, the documentary analysis identifies potential scaling conditions relating to feedstock quality and availability, recovery networks, municipal systems, EPR implementation, buyer demand, and resin competitiveness. These conditions are informed by case descriptions and wider contextual evidence; their effects on Banyan Nation's expansion are not measured.

Discussion

The Banyan Nation case provides a useful view of how a recycling business can connect post-consumer material recovery with recycled-resin production and formal-sector demand under India's EPR framework. The findings indicate that the three elements examined through the TBL are related, not independent. At the same time, the documentary evidence does not show that these relationships automatically produce better worker conditions, measurable environmental gains, or firm-level profitability.

This interpretation is consistent with earlier recycling research while also showing why the relationships need to be examined together. Material supplied through informal recovery systems can meet formal-sector requirements when collection, trust, incentives, and processing are appropriately aligned (Gall et al., 2020). The Recykal case similarly shows how information and coordination can connect previously fragmented participants in the Indian waste-management system and support EPR-related activity (Bhadra and Mishra, 2021). Banyan Nation differs because its central activity is processing recovered plastic into recycled resin rather than coordinating producer-responsibility services, but both cases illustrate the importance of connecting actors across different parts of the recycling chain.

People, Planet, and Profit in the recycling model

The People finding highlights the importance of informal recovery actors to the material supply recycling depends on. Their contribution is not peripheral to the business model because access to dispersed post-consumer plastic can depend on waste pickers, kabadiwallas, aggregators, and other recovery actors. This aligns with literature that recognizes informal recyclers as significant participants in circular-economy systems (Velis et al., 2022) (Venkatesh, 2023) (Zisopoulos et al., 2023).

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The case also shows why participation should not be equated with social improvement. Cano et al. show that a rigid-HDPE chain in Brazil can account for significant parts of recycling value through collection and sorting, even as informality remains embedded in the chain (Cano et al., 2025). Social value in a recycling business therefore requires evidence about the conditions under which workers participate, not merely evidence that they are incorporated into the supply chain.

The Planet finding shifts attention from the quantity of plastic collected to the quality of the material returned to production. Recyclate quality is central to recovered plastic's ability to remain in circular use (Hahladakis and Iacovidou, 2018). The Banyan Nation case supports this argument because its public materials emphasize processing, contamination control, technical characteristics, color, and odor rather than presenting collection volume as the only indicator of recycling performance.

Traceability complements material quality but does not replace it. Traceability can improve information concerning the origin, movement, composition, and regulatory status of recycled material (Gazeau et al., 2024) (Horn and Silvennoinen, 2025). The findings from Banyan Nation indicate why different forms of traceability should remain separate. Records concerning regulatory compliance do not necessarily establish the quality of an individual resin batch, while information on material movement does not necessarily establish the conditions of transactions with informal suppliers. The distinction between material, transaction, quality, and compliance traceability therefore helps avoid treating documentation as equivalent to physical recycling performance.

The Planet dimension therefore concerns reported practices intended to address recognized barriers to higher-value recycling, particularly contamination, processing quality, and traceability, rather than independently measured environmental performance.

The Profit finding shows how regulation and market demand can influence the commercial position of recycled material. India's EPR framework places recycling and recycled-content responsibilities on producers and brand owners, creating a setting in which documented recycled material can become commercially relevant. EPR implementation depends on the institutional arrangements that translate producer responsibility into recycling activity (Pani and Pathak, 2021).

Banyan Nation's documented model suggests that recycled material acquires greater commercial relevance when quality, documentation, and formal buyer demand are connected.

EPR, however, does not guarantee profitability. India's EPR environment still faces implementation, coordination, registration, and verification challenges (Gupta and Dash, 2023) (Dey and Ashok, 2025). The commercial case for recycled resin therefore depends on credible enforcement, sustained buyer commitments, product quality, processing costs, and competition from virgin material.

Stakeholder relationships and scalability

The potential scaling conditions identified in the Results are consistent with literature emphasizing collection systems, stakeholder relationships, and regulatory implementation. Their relevance to this case remains an interpretation of the documents rather than a measured explanation of growth.

Source segregation and stakeholder participation are important to plastic-waste management in South India, while institutional and legal fragmentation can continue to constrain urban waste management (Ramanathan et al., 2026) (Mishra, 2024). Increasing processing capacity without addressing the quality and reliability of incoming material may therefore be insufficient for expansion.

Relationships with informal recovery networks create a second scaling issue. Formalization may improve documentation and visibility, but its social consequences require attention. Plastic-control policies can impose disproportionate burdens on unorganized recycling actors when they do not adequately consider their economic position (Nøklebye et al., 2023).

EPR-related incentives may explain investment in processing and documentation, but evaluating this would require firm-level procurement and investment evidence.

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The relative price and performance of recycled and virgin resin remain contextual market considerations; the corpus cannot quantify their contribution to Banyan Nation's expansion.

Managerial implications

The case has several practical implications for recycling businesses and their buyers. First, feedstock relationships, processing quality, and traceability should be managed as connected parts of the same value chain. Improving processing technology cannot fully compensate for highly contaminated or unreliable incoming material, and sophisticated documentation cannot compensate for weak material quality.

For recyclers, relationships with recovery actors therefore deserve the same operational attention as processing capacity. Reliable material supply depends on continuing access to recovery and aggregation networks, while consistent output depends on segregation and feedstock quality. As relationships with informal suppliers become more formalized, attention to pricing, payment arrangements, grievance processes, and worker safety can reduce the risk that improved documentation is achieved without improving the conditions under which material is recovered.

For producers and brand owners, recycled-content procurement should go beyond acquiring EPR-related documentation. Buyers need confidence in the material they purchase, particularly where recycled resin enters formal manufacturing applications. Quality specifications, material records, supplier due diligence, and credible chain-of-custody information can therefore complement regulatory documentation.

Table *7* consolidates the scalability findings and their practical implications. The managerial responses in the table are derived from the case analysis and relevant literature; they are not practices observed at Banyan Nation.

Scaling condition	Why it matters	Managerial implication
Municipal collection and source segregation	Poor segregation increases contamination, material loss, and downstream processing requirements	Work with collection and municipal partners to improve segregation and monitor changes in incoming feedstock quality
Relationships with informal recovery actors	Access to locally embedded recovery networks may influence feedstock availability during expansion	Develop stable sourcing relationships with transparent commercial arrangements and appropriate channels for grievance and worker concerns
Recyclate quality and traceability	Formal manufacturers require reliable material characteristics, while regulatory and procurement systems require credible documentation	Maintain quality-control records and material traceability alongside regulatory documentation rather than treating compliance records as a substitute for product quality
EPR implementation and buyer commitment	Weak or inconsistent implementation can reduce demand for genuinely recycled and documented material	Avoid relying solely on certificate-related demand and develop longer-term relationships with buyers committed to recycled-content procurement
Competition from virgin resin	Lower virgin-material prices can reduce the commercial attractiveness of recycled resin	Compete on consistency, quality, traceability, and reliable supply in addition to price

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TABLE 7: Potential scaling conditions and derived managerial implications

Source: Developed by the authors from the documentary analysis and the literature discussed in this study.
Note: The managerial implications are derived from the conditions identified in the analysis and were not observed as Banyan Nation practices.
EPR, Extended Producer Responsibility

Policy implications

The findings also have implications for implementing EPR and municipal plastic-waste management. EPR can support a market for recycled material only when regulatory requirements are implemented credibly enough to influence actual recycling and procurement decisions. Registration and certificate systems are therefore most useful when they are supported by meaningful verification of material processing and reporting.

Regulatory reporting should distinguish between documentary compliance and evidence of material recycling. This matters most where EPR certificates or reported recycled quantities influence commercial transactions. Verification systems that connect reported quantities with credible processor and material records can strengthen confidence among regulators, producers, recyclers, and buyers.

Municipal collection and source segregation require comparable attention because recycling quality begins before material reaches a processing facility. Local bodies influence collection arrangements, segregation practices, and recovery infrastructure and can therefore affect both the amount and condition of recyclable feedstock. Improvements at this stage can reduce contamination and downstream processing burdens.

Policy for informal recovery actors should also recognize their contribution to material flows. Formalization that improves documentation but displaces workers or weakens their livelihoods would create a social cost in a system that still depends on their recovery activities. The findings therefore support approaches that combine improved material recovery and traceability with recognition of the workers involved in first-mile collection. This is consistent with Velis et al. (Velis et al., 2022) and Nøklebye et al. (Nøklebye et al., 2023), who emphasize the need to consider inclusion and distributional consequences alongside plastic-waste policy.

Contribution

The study contributes an integrated documentary interpretation of a recycled-resin producer's publicly described operating model. It connects informal recovery, material quality, traceability, and EPR-related demand while distinguishing reported arrangements from demonstrated outcomes.

The four traceability dimensions provide a structure for identifying the information described in the sources and the records needed for stronger assessment. The available documents do not establish why some dimensions are more visible than others. Future research may explain this through accountability pressure, but this case does not demonstrate such a mechanism.

Using stakeholder salience alongside resource dependence distinguishes documented authority and recognition from reported material-access roles. This combined interpretation highlights recovery actors without assuming that their participation establishes low bargaining power, irreplaceability, or a particular level of managerial attention.

TBL organizes the examination of relationships among social participation, recycling practices, and commercial conditions. The case does not test causal relationships among the dimensions or determine which dependency most strongly constrains expansion.

Limitations and future research

The findings should be interpreted within the limits of a single documentary case. Four of the thirteen documents in the coded corpus directly describe Banyan Nation, two contain company-authored or company-supplied information, and the two third-party accounts are not audits of the firm. The study therefore establishes the structure of the publicly documented business model more confidently than its realized social, environmental, or financial outcomes.

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Future research should examine these outcomes using primary and operational evidence. Interviews with waste pickers, kabadiwallas, managers, municipal actors, regulators, and buyers could examine how the relationships identified in the documentary record operate in practice. Transaction and material records could assess material, transaction, quality, and compliance traceability separately, while lifecycle assessment and material-flow analysis would be required to establish environmental effects. Access to procurement, cost, and revenue data would also be necessary to evaluate the commercial contribution of EPR-linked demand.

Comparative case studies across recycling firms and locations could determine whether the relationships observed in this case also occur under different municipal, regulatory, and market conditions. Such work would also help establish whether findings from post-consumer polyethylene and polypropylene recycling apply to other plastic streams or remain specific to the material and processing conditions examined here.

Conclusions

This study examined Banyan Nation as a documentary case of circular-plastics value creation under India's EPR framework. In response to RQ1, the findings indicate that the documented business model connects the three dimensions of the TBL. The People dimension concerns the participation of informal recovery actors in supplying post-consumer plastic; the Planet dimension concerns segregation, processing quality, and traceability that support returning recovered plastic to manufacturing; and the Profit dimension concerns the market for quality-specified recycled material supported by formal-sector demand and EPR requirements. The available documentary evidence does not independently establish worker-welfare, environmental, or profitability outcomes.

In response to RQ2, the documentary record identifies potential scaling conditions that extend beyond processing capacity: material availability and quality, municipal collection and segregation, relationships with informal recovery networks, credible EPR implementation, sustained buyer demand, and the competitiveness of recycled resin. The stakeholder analysis distinguishes documented authority from reported roles in first-mile recovery but does not establish the relative bargaining power or indispensability of recovery actors. The study provides a documentary interpretation of the relationships among recovery actors, material quality, traceability, and EPR-related demand. Its contribution lies in clarifying these relationships and their evidentiary limits within the documented case; it does not establish general causal mechanisms, verified TBL performance, or achieved scalability. The conclusions are bounded to the documented mechanical recycling of post-consumer polyethylene and polypropylene and should not be generalized unchanged to other streams, technologies, or the wider recycling sector.

Appendices

Appendix A

ID	Document	Source category	Date or retrieval date	Unit of analysis and material coded	Evidentiary confidence
D1	Plastic Waste Management Rules, 2016 (G.S.R. 320(E))	Government/regulatory	2016	Notified rule text and schedules; responsibilities of local bodies, producers, and waste generators	High for the provisions of the identified regulatory instrument; not evidence of firm-level compliance

D2	PWM (Amendment) Rules, 2022 and EPR Guidelines for plastic packaging (G.S.R. 133(E))	Government/regulatory	2022	Notified text and Schedule II; registration, targets, reporting, and certificate provisions	High for the provisions of the identified regulatory instrument; not evidence of firm-level compliance
D3	PWM (Amendment) Rules, 2024 (G.S.R. 201(E))	Government/regulatory	2024	Notified rule text; definitions, registration, and compliance obligations	High for the provisions of the identified regulatory instrument; not evidence of firm-level compliance
D4	CPCB Centralised Extended Producer Responsibility Portal for Plastic Packaging	Government/regulatory (web)	Retrieved June 21, 2026	Public pages as retrieved; portal architecture for registration, certificate generation, credit transfer, and annual returns	High for system architecture; not evidence of firm-level compliance
D5	Plastic Waste Management, Lok Sabha Unstarred Question No. 5020, Press Information Bureau	Government data	2026	Text of the parliamentary reply; generation figures, registration counts, reported recycling volumes, and enforcement action including show-cause notices and inspection totals	High for reported figures; not disaggregated at material level
D6	OECD, Global Plastics Outlook	Multilateral	2022	Full report; global recycling rates and plastics-system context	High
D7	UNEP, Turning Off the Tap	Multilateral	2023	Full report; systems approach to plastic pollution	High

D8	ILO, Women and Men in the Informal Economy (3rd ed.)	Institutional	2018	Full report; scale of informal employment and associated vulnerabilities	High for 2018 global and regional conditions; not current India-specific data
D9	The Pew Charitable Trusts, Breaking the Plastic Wave 2025	Institutional	2025	Full report; pollution projections and intervention scenarios	High
D10	Banyan Nation company website, About Us	Company	Retrieved June 21, 2026	Pages as retrieved; publicly stated operating model, processing description, and resin characteristics	Medium-Low; company-authored
D11	MyGov profile, Intel and DST Innovate for Digital India Challenge 2.0	Company/public	2017	Article text; historical description of waste-management technology and digitization	Medium-Low; historical
D12	CEEW, sectoral assessment of plastic-waste recycling in India	Research institution	2025; retrieved August 6, 2026	Report sections describing the firm; vertically integrated processing of HDPE and PP, data platform used in the supply chain, and engagement with informal recovery actors	Medium; third-party sectoral description, not verification of transactions or outcomes
D13	Ellen MacArthur Foundation, record of Reckitt's Global Commitment disclosure	Buyer disclosure (third party)	2021; retrieved August 6, 2026	Disclosure text naming the firm as an early supplier of post-consumer recycled plastic and reporting continued engagement	Medium-Low; third-party buyer-reported relationship as of 2021, not an independent audit or evidence of current performance

TABLE 8: Appendix A: Documents included in the analyzed corpus

Source: Compiled by the authors.
Notes: Evidentiary confidence indicates the source's suitability for the stated analytical use, considering provenance, purpose, date, and corroboration. The labels are qualitative judgments, not numerical quality scores or measures of confidence in Banyan Nation's performance. The corpus was closed on June 21, 2026, and extended on August 6, 2026, to include D12 and D13. D4 was retrieved before the Plastic EPR Portal was discontinued with effect from June 28, 2026, and its registered-unit data migrated to the Common EPR Portal; the content analyzed is the version retrieved on June 21, 2026.
CEEW, Council on Energy, Environment and Water; CPCB, Central Pollution Control Board; DST, Department of Science and Technology; EPR, Extended Producer Responsibility; HDPE, High-density Polyethylene; ILO, International Labour Organization; OECD, Organisation for Economic Co-operation and Development; PP, Polypropylene; PWM, Plastic Waste Management; UNEP, United Nations Environment Programme

Appendix B

Code	Origin	Applied to passages that	Documents in which the code was applied
People: informal participation	Deductive	Describe waste pickers, kabadiwallas, or aggregators supplying post-consumer material	D8, D10, D11, D12
Planet: segregation and processing quality	Deductive	Describe sorting, washing, contamination control, extrusion, or pelletization	D10, D12
Planet: traceability	Deductive	Describe records, data systems, or material tracking	D4, D10, D11, D12
Profit: EPR obligation	Deductive	State a registration, recycling, recycled-content, or reporting requirement	D1–D5
Profit: buyer demand	Deductive	Describe formal-sector purchasing of recycled resin	D10, D13
Power	Deductive	Indicate authority over regulation, procurement, infrastructure, or material access	D1–D5, D8, D10–D13
Legitimacy	Deductive	Recognize a statutory or established commercial role, or describe functional participation; distinguish the basis of recognition	D1–D5, D8, D10–D13

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Urgency	Deductive	Describe time-sensitive stakeholder claims and the consequences of delayed attention	D1–D5, D8, D10–D13
Feedstock access	Inductive	Refer to the availability or reliability of incoming post-consumer material	D8, D10, D11, D12
Material provenance	Inductive	Refer to the origin of recovered material	D10, D11, D12
Transaction documentation	Inductive	Refer to records of exchange between recovery actors and buyers	D11, D12
Quality consistency	Inductive	Refer to variability or uniformity of recyclate properties	D10
Compliance evidence	Inductive	Refer to registration, returns, certificates, or audit	D2, D4, D5
Buyer requirements	Inductive	Describe a specification or condition imposed by a downstream manufacturer	D10, D13
EPR-linked demand	Inductive	Link recycled-material demand to producer-responsibility obligations	D1–D5
Municipal infrastructure	Inductive	Refer to collection, segregation, or local waste-management capacity	D1, D5, D6, D7
Enforcement credibility	Inductive	Refer to verification, implementation weakness, or non-compliance	D4, D5
Virgin-resin price conditions	Inductive	Refer to competition between recycled and virgin polymer	D6, D9
Worker-outcome uncertainty	Inductive	Describe participation without wage, safety, bargaining, or protection information	D8, D10, D11, D12

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Decoupling of documentation from material	Inductive	Indicate that a record may exist without a corresponding physical transformation	D2, D4

TABLE 9: Appendix B: Coding framework

Source: Developed by the authors from the analytical frameworks and the coded documentary corpus identified in Appendix A.
Notes: Deductive codes were derived from the Triple Bottom Line and stakeholder-salience frameworks; inductive codes were developed from the documents during analysis. Document IDs are defined in Appendix A.
EPR, Extended Producer Responsibility

Document and locator	Short source extract	Illustrative code	Interpretation and limit
D10—About Us, second opening company paragraph	"integrating with informal sector collectors and aggregators across India"	People: informal participation; Feedstock access	Reported participation and sourcing role; no worker-welfare outcome or supply share established.
D11—MyGov, paragraph beginning "To manage the 62 million tonnes…"	"on-field bin sensors, GPS truck routers, landfill management toolkits and back-end visualization and analytic engines"	Planet: traceability	Historical municipal-waste monitoring pilot; not evidence of current complete resin chain of custody.
D12—CEEW, "Inspiration from a success story"; corresponding PDF p. 3	"developed a data-based platform to track the plastic waste recycling supply chain"	Planet: traceability	Reported tracking function; does not specify transaction records or batch-linked quality histories.
D13—Reckitt, "Increasing post-consumer recycled content in plastic packaging"; "Building the PCR infrastructure"	"Reckitt was one of first buyers of Banyan Nation's 'better plastic' PCR solution"	Profit: buyer demand	Buyer-reported purchasing relationship; no margin, current volume, or profitability established.
D1—Plastic Waste Management Rules, 2016, rule 6(2)(c)	"ensuring channelization of recyclable plastic waste fraction to recyclers"	Municipal infrastructure; Legitimacy	Statutory responsibility of local bodies; not a measure of firm-specific municipal dependence.

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D5—PIB reply, March 23, 2026; paragraph beginning "In order to ensure compliance…"	"for non-fulfilment of EPR targets and non-submission of Annual Returns"	Enforcement credibility; Compliance evidence	Context reports enforcement notices; does not establish Banyan Nation's compliance.

TABLE 10: Appendix B: Illustrative documentary extracts, corresponding codes, and analytical interpretations

Source: Selected passages from documents identified in Appendix A. Extracts illustrate the relationship between source text, codes, and interpretation; they do not independently verify the outcomes described by the sources.
Notes: Document identifiers correspond to Appendix A. One illustrative extract is presented for each of six selected documents; the table does not reproduce every document or code application. Code labels correspond to the framework in Appendix B.
CEEW, Council on Energy, Environment and Water; EPR, Extended Producer Responsibility; PCR, Post-consumer Recycled; PIB, Press Information Bureau; GPS, Global Positioning System

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Meenakshi Sharma, Sujit Kumar Dubey

Acquisition, analysis, or interpretation of data: Meenakshi Sharma

Drafting of the manuscript: Meenakshi Sharma

Critical review of the manuscript for important intellectual content: Meenakshi Sharma, Sujit Kumar Dubey

Supervision: Sujit Kumar Dubey

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- **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work.
- **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
- **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Data Availability Statements

All documents analyzed in this study are publicly available and identified individually in Appendix A, with source, type, date or retrieval date, and unit of analysis. No primary data were generated. The coding framework and analytical memos are available from the corresponding author upon reasonable request.

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