

Big Ideas Big Impact

Discussion Series

Ideas That Move Markets

Curated by:



Innovation, Design Thinking, Entrepreneurship, Acceleration,
Technology and Experimentation

Big Ideas Big Impact: Discussion Series

Big Ideas Big Impact is a curated program that turns high-conviction theses into **operable actions**. We synthesize the best external research, add analysis and synthesis, and deliver **actionable insights, priority stakeholders to engage, and an ecosystem roadmap**, so readers can spot growth areas, substantiate claims with **established cases and investment theses**, and move to action.

Why we do this

- Move beyond talk: **evidence** → **pilots** → **scale**
- Help founders, investors, and stakeholders act with confidence
- Bridge **policy signals** and **P&L realities** across sectors

Who it's for

- Founders, operators, procurement/QA, and investors who can deploy **capital, capacity, or channels now**.

What we cover

- **Investable theses:** who's saying what—and why it matters
- **Case excerpts & proofs:** revenue, profitability signals, certifications, offtakes
- **Entry playbooks:** capital & skills needed, first **12–18 months**, key KPIs
- **Opportunity maps:** now-ready plays vs **12–18-month** builds
- **Ecosystem & intros:** labs, standards, incubators, strategic partners

How we work

- **Curation, not claims** — sources attributed; unknowns clearly marked
- **Operator-first** — line compatibility, QA, unit economics, uptime
- **Actionable** — checklists, templates, and a network you can tap

Program Flow and Topics

A series of discussions on high-growth, high-impact segments. For each segment, we curate & synthesize external investment theses and operating insights, then host a live discussion with stakeholders leading the next big shift.

IDEATE launches the series with **CleanTech** — Volume 1: **Sustainable Packaging**.

Sustainable Packaging — now a compliance-and-cost reality driven by EPR/food-contact rules; brands seek line-compatible, certified materials with parity economics.

What you'll find

- **Investable theses:** who says what, and why it matters.
- **Case excerpts & proofs:** revenue, profitability signals, certifications, offtakes.
- **Entry playbooks:** first 12–18 months—capital, skills, KPIs, risk radar.
- **Opportunity map:** Now-ready vs 12–18-month builds, with go-to stakeholders.

Upcoming Volumes to Expect:

- AgriBusiness — waste-to-value, bio-inputs, climate-smart supply chains
- Circular Fashion — recycled fibers, dye-less/low-chem, traceability
- Sustainable Infrastructure — low-carbon materials, water reuse, distributed energy

Signals & examples (publicly disclosed highlights)

- **Lucro Plastecycle:** FY24 revenue ~₹88.9 Cr, PAT ~₹6.25 Cr; **HUL** approved 14.3% stake → PCR flex can be profitable with blue-chip validation.
- **Recykal:** FY24 gross revenue ~₹712–718 Cr → Digital EPR & marketplace workflows can scale nationally.
- **Srichakra Polyplast:** **EFSA** positive opinion (food-grade rPET) → export-ready bottle-to-bottle paths.

Why this segment

- **Policy pull → contractable demand:** India EPR (CPCB), EU PPWR, US SB-54.
- **Buyer pull:** brands need **line-compatible, certified** alternatives with clear unit economics.
- **Visible profit paths:** recurring **B2B materials, Digital EPR**, and spec-parity products.
- **India advantage:** deep converter base, emerging QA/test capacity, cost-competitive operations.

Use these as “case notes”, not endorsements; full sources in References.

Sustainable Packaging Curated Investment Theses (2025)

Draft for Discussion

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Executive Summary

Purpose

Curate **investable theses** and **proof-led plays** that make money under today's rules and buyer specs—so operators and investors can act now.

• What the cases show (proof)

- PCR flex can be profitable: Lucro **FY24 ₹88.9 Cr revenue; ₹6.25 Cr PAT.**
- Digital EPR scales fast (watch margins): Recykal **FY24 gross revenue ~₹712–718 Cr.**
- Food-grade unlocks export: Srichakra holds **EFSA positive opinion for rPET.**
- Spec-led materials adoption: Bambrew **FY23 ₹43.5 Cr revenue**; enterprise trials pulling PFAS-free fibre barriers.
- Validation events: **HUL's 14.3% stake in Lucro**; multi-brand QA acceptances.

• Where the money is (next 12–18 months)

- **Now-ready: rPET/rPE/rPP** B2B to brands/converters; **Digital EPR & traceability.**
- **Build bets: PCR flexible films** (post line-trials), **mono-material laminates, MLP→boards/ pallets.**
- **Longer-cycle, high-potential: Chemical recycling** (pyrolysis + purification), **PHA bioplastics** (targeted, high-value SKUs).

• Operating principles

- Offtake-before-CAPEX; certify early (EFSA/BIS/ISCC)
- Run 3 QA-pass lots; publish pilot P&L vs virgin (FDA, 2011; ISPE, 2016/2017).
- No guesses—undisclosed data is marked, not inferred

• Quick Tips

- Back models that meet regs, win demand, scale on existing lines (APR, 2024; RecyClass, 2025; CPCB, 2025).
- Prefer capital-light, data-rich; our network unlocks pilots and channels
- Anchor decisions on unit economics, not funding headlines

• CAPEX shorthand (India, 12–24m)

- Low ₹0.5–10 Cr (Digital EPR)
- Medium ₹10–75 Cr (materials/ films)
- High ₹75–300 Cr (mechanical PCR)
- Very High ₹300 Cr+ (chemical recycling, PHA).

Investment Theses

- [Circulate Capital's 2024 Year in Review – Circulate Capital](#)
- [Building a Waste-Free World: Local Resilience, Global Reach – Closed Loop Partners 2024 Impact Report](#)
- [Emerald Sustainable Packaging Innovation Fund Supplemental Prospectus – Emerald Innovation Fund ILP, May 2025](#)
- [Investing In The Waste and Circularity Sector In India An Introductory Guide – Climake-ANDE, September 2024](#)
- [KKR Global Impact Investment in CMC Packaging Automation – Impact Capital Managers, Tideline, 2024](#)
- [Plastics Circularity Investment Tracker – The Circulate Initiative, July 2024](#)
- [Investing In The Waste And Circularity Sector In India Plastic Waste And Circularity Guide – Climake-ANDE, January 2025](#)
- [ClimateTech Commentary: Why Blume Ventures invested in Bambrew – Omega Files, April 2024.](#)

Thematic Landscape of Investment in Sustainable Packaging

Theme	Typical Stage of Traction	Geo-focused Activity	Common Models	First External Capital	Useful Ecosystem Support
T1 Materials (advanced paper + PFAS-free barriers)	Seed → A	India / EU / US	Materials + tooling; converter-ready SKUs	\$50k–\$150k first cheques	Converter pilots; food-contact labs (FSSAI/ BIS); QA partners
T2 Reuse (closed-loop B2B)	Pre-seed → Seed	India tier-1 / SEA	Ops network + SaaS (washing, routing, deposits)	\$25k–\$100k	Route partners; QSR/enterprise cafeterias; hygiene certification
T3 Digital EPR & Traceability	Pre-seed → Seed	India / SEA	B2B SaaS / data infra; marketplaces; dDRS pilots	\$25k–\$100k	Brand/EPR intros; PROs/ULBs; LCA/test labs
T4 Infra (India/SEA circularity)	Seed → A	India / SEA	Sorting; film washing; PCR resin/films; contracts-first	\$50k–\$150k	Offtake contracts; supply aggregators; converter trials

- A neutral view of where activity is emerging across the four themes (T1–T4), typical venture stages, geographies, common business models, and useful ecosystem support.
- India-first, globally aware: India/SEA demand is rising; EU/US rules influence specs & buyers.
- These are first-ticket ranges for India/SEA. For US/EU, expect ~3–5× higher.

Sources: ANDE 2025; CLP 2024; FSSAI 2025; BIS 2025; TCI PCIT 2024–25; CPCB 2025; Circulate Capital 2024

Cross-Cutting Policy & Market Signals (2025)

- **India — Plastic Waste Mgmt (PWM) & EPR (CPCB portal)**
 - Live since 2022, with 2024–2025 circulars clarifying targets & audits.
 - Auditable producer reporting + recycler documentation → paid demand for verified recovery & recycled content.
 - What it drives: T3 Digital EPR (data/marketplaces) and T4 Infra (sorting/ film washing/ PCR); T1 must prove food-contact.
- **EU — Packaging & Packaging Waste Regulation (PPWR) (EUR-Lex, 2025; European Commission, 2025)**
 - Entered into force: Feb-11-2025; general application starts Aug-12-2026.
 - Tightens rules on reduction, recyclability, recycled content, reuse → spec changes for global brands.
- **US — State EPR (anchor: California SB-54) (CalRecycle, 2025)**
 - PRO (CAA) approved; program builds toward 2032 targets: 100% recyclable/compostable, 25% plastic source reduction, 65% recycling.
 - Pull-through for design-to-recycle, data/traceability, and PCR adoption.
- **Corporate & Consumer signals**
 - Major FMCGs/retailers upgrading pack specs (PFAS-free, mono-material, higher PCR) to hit 2025/2030 goals. (Ellen MacArthur Foundation Global Commitment, 2024).
 - 2025 surveys: “Recyclability” ranks as the top sustainability attribute influencing purchase; willingness for refill/ reuse rises when convenience is high (McKinsey, 2025; Closed Loop Partners – Reuse Consumer Report, 2024).

India: CPCB EPR portal & PWM notifications (2022–2025)

EU: PPWR text (Official Journal), implementation fiches

US: CalRecycle / Circular Action Alliance (SB-54)

Corporate/consumer: EMF Global Commitment updates; 2024–2025 packaging consumer studies

Theses Synthesis

Opportunities:

- Fastest to revenue: rPET / rPE / rPP sold B2B to brands & converters (Tracxn–Lucro, 2025; EFSA–Srichakra, 2022; EMF Global Commitment, 2024).
- Recurring engines: EPR SaaS + marketplace workflows for compliance and recovery (Entrackr/ Fintrackr–Recykal FY24, 2025; CPCB EPR Portal, 2022–25).
- Scale unlocks: improve yield, cut energy/ton, lift utilization with uptime/OEE discipline (ISO 22400, 2014; LeanProduction OEE, 2025).
- Proof that converts: 3 QA-pass lots + certification + pilot P&L vs virgin (FDA Process Validation, 2011; ISPE PPQ, 2017/2020).

Capital Requirements:

- Asset-light digital: EPR/traceability marketplaces (e.g., Recykal) — low CAPEX
- Mechanical recycling: rPET/rPE/rPP plants (e.g., Srichakra, Banyan, Lucro) — high CAPEX
- Materials manufacturing: fiber/alt-materials (e.g., Bambrew) — medium CAPEX
- Chemical recycling: pyrolysis + purification (e.g., PolyCycl) — very high CAPEX
- Biotech: PHA bioplastics (e.g., Terra Bioware) — high CAPEX + long R&D

Red Flags

- Single buyer,
- Uncertified food-contact,
- Unhedged feedstock.

Decision Rules

- Pause if
- Offtake <50%,
 - QA rejects >5%,
 - Uptime <70%

Reading Capital Requirements

CapEx	Approximate Range
• Low Capex	₹0.5–10 Cr (≈ \$0.06–1.2M)
• Medium Capex	₹10–75 Cr (≈ \$1.2–9M)
• High Capex	₹75–300 Cr (≈ \$9–36M)
• Very High Capex	₹300 Cr+ (≈ \$36M+)

Sources: ANDE 2025; CLP 2024; Circulate Capital 2024; CE Delft, 2022/2024; European Bioplastics, 2024; ACS Omega review, 2025; Tracxn–Lucro, 2025; EFSA–Srichakra, 2022; Entrackr/Fintrackr–Recykal FY24, 2025; ISO 22400, 2014; LeanProduction OEE, 2025; FDA Process Validation, 2011; ISPE PPQ, 2017/2020

Select Case Excerpts

Ventures	Bambrew	Lucro Plastecycle	Srichakra Polyplast
Founder/s	Vaibhav Anant; Kunal Prasad	Ujwal Desai; Saumil Desai	Chandra Sekhar Reddy; Rajasekhar Yarlagadda; Srinivas Chakravarthy
Inception Year	2018	2012	2010
Core Idea	Sustainable fibre / alt-material packaging	Circular flexibles: PCR compounds/films & end products	Bottle-to-bottle rPET (food-grade) + polyolefins
HQ	Bengaluru, India	Mumbai/Thane, India	Hyderabad, India
Geographic Focus	India; sells to North America, UK, Middle East (incl. Dubai), Australia	India (pan-India); exports incl. US & Europe	India; exports to Europe; US-eligible after FDA LNO (2025)
Current Stage	Series A / Growth	Growth; strategic minority stake by HUL (2025)	Growth; EFSA-positive safety assessment (2022)
Current Valuation	~ ₹230 Cr	~ ₹700 Cr	~ ₹751 Cr
Funding Raised (highlights)	Pre-Series A (2022); ₹60 Cr Series A (Mar 2024); ₹90 Cr round (Jul 2025)	Circulate Capital (2020; follow-on 2022); HUL 14.3% stake approved (Mar 2025)	Circulate Capital (2020); capex expansions 2021–25
Investors (notable)	Blume Ventures; Ashok Goel; Enrission; Blue Ashva; Mumbai Angels	Circulate Capital; HUL (strategic)	Circulate Capital
Revenue & Profitability	FY23 revenue ₹43.5 Cr; net loss ₹18.0 Cr	FY24 revenue ₹88.9 Cr; net profit ₹6.25 Cr; EBITDA ~13.3%	FY24 revenue ~₹110 Cr (approx.); EBITDA up ~19.9% YoY
Profitability / Strength Signals	Rapid scale-up; global customer footprint	Sustained profit growth; blue-chip offtakes; strategic support	EFSA 2022; multiple Starlinger lines; FDA LNO/ FSSAI listings enable export

Select Case Excerpts

Ventures	Terra Bioware Biomaterials	Recykal	Banyan Nation	PolyCycl
Founder/s	Shruti Singh	Abhay Deshpande; Anirudha Jalan; Abhishek Deshpande; Ekta Narain; Vikram Prabhakar	Mani Kishore Vajipeyajula & Rajkiran Madangopal	Amit Tandon
Inception Year	2022	2016	2013	2016
Core Idea	PHA bioplastics (bio-based materials)	Digital EPR, marketplace & traceability for waste	rPE/rPP for FMCG rigid packaging; traceable PCR supply	Chemical recycling to circular oils; feedstock preparation
HQ	Bengaluru, India	Hyderabad, India	Hyderabad, India	Kalka (Haryana), India
Geographic Focus	Early stage	Pan-India enterprise & govt workflows	India focus; shipments to Middle East, Europe, SE Asia	India; commercial focus building
Current Stage	Pre-seed / R&D→pilot	Pre-Series B (Apr 2024)	Growth; Series B noted (2023)	Seed / pilot
Current Valuation	Not publicly disclosed	~ ₹1,180 crore (as of Feb 2024)	Not publicly disclosed	~ ₹611 Cr
Funding Raised (highlights)	Pre-seed (2023) led by Rebalance; NITI Aayog Grant: US\$ 120k (2022)	₹110 Cr pre-Series B (Apr 2024); total raised >\$35–38M to date	~ US \$800 K over 6 rounds	~\$1.08M seed/early
Investors (notable)	Rebalance	360 ONE Asset; prior: Morgan Stanley, Circulate Capital, Triton, select angels	Artha Venture Fund, CIIE, Unreasonable Capital	TSM Ventures, Aarem Ventures
Revenue & Profitability	Not publicly disclosed	FY24 gross revenue ₹712 Cr; net loss ₹34 Cr	FY24 revenue ~₹60.9 Cr	~US\$25k (FY23–24) (pilot)
Profitability / Strength Signals	Hello Tomorrow “Deep Tech Pioneer” recognition	Large enterprise & ULB footprint; recurring EPR workflows	1.5–2B+ bottles on shelf using Banyan PCR; capacity ramp to 50k TPA. customers include blue-chip FMCG/lubes	Strategic partnership with Re Sustainability; dedicated R&D centre

Sources: Rebalance, 2024; Hello Tomorrow, 2025; Entrackr/Fintrackr, 2025; Banyan Nation site, 2024–25; Outlook Business, 2025; Sustainable Plastics, 2025

Case Synthesis

1. **Policy creates durable, spec-driven demand:** EPR + food-contact rules make sustainability a must-buy, not optional (*CPCB 2022–25; FSSAI 2025; EU PPWR 2025*).
2. **B2B materials win fastest on revenue:** rPET/rPE/rPP monetize via recurring, spec-locked supply; capacity ramps and QA keep growth compounding (*Lucro FY24 results; Srichakra EFSA/Starlinger; Banyan customer traction*).
3. **Digital EPR is becoming core infrastructure:** Recykal's nationwide scale shows compliance + marketplace workflows create sticky revenue (*Recykal FY24 scale & revenue*).
4. **Proof beats pitch—certifications + offtake before CAPEX:** EFSA/FSSAI/BIS approvals and brand QA unlock premium; multi-year offtake/strategic ties (HUL–Lucro; Starlinger–Srichakra; Dow–Lucro) de-risk scale-up (*EFSA/FSSAI/BIS; HUL stake; Starlinger lines*).
5. **Scale economics hinge on operations, not hype:** Yield, energy/ton, uptime, and stable feedstock separate profitable PCR plants; Lucro profitability underscores this (*OEE/ISO 22400 guidance; Lucro FY24*).
6. **Bioplastics are moving from niche to targeted scale:** PHA near-term wins in high-value applications; market capacity is growing (*EUBP 2024 market data; PHA reviews*).
7. **Chemical recycling = longer-cycle, high-potential bet:** PolyCycl's continuous pyrolysis + purification positions for integration with polymer chains—needs certification and locked offtake to pencil (*Gen-VI launch notes; offtake basics*).

Open Opportunities – Technologies Available for Licensing/ Commercialisation

- **CSIR-CSMCRI — Seaweed-based biodegradable film**

- **What:** Thin films for dry/non-aqueous food packs; seaweed formulation
- **Readiness:** Listed in **Technologies**; available for tech transfer/licensing
- **Ask:** Licensees for pilot-to-commercial scale lines
- **Status date:** 2025 (technology listing live)

Sources: CSIR-CSMCRI technology page.

- **IIT Madras — Agri-waste/mycelium foam packaging**

- **What:** Compostable foam alternative to EPS/EPE from agri residues
- **Readiness:** Lab-proven; team plans startup (**NatureWrks**) & industry collabs
- **Ask:** Commercial partners for pilot lines & certifications
- **Status date:** Jul 31, 2025

Sources: IIT Madras press; New Indian Express; Times of India.

- **CSIR-NIIST — Compostable bio-coating for paper/fiber**

- **What:** Plant-oil-based bio-resin coating; liners for bags, pouches, containers
- **Readiness:** Described as deployable alt to plastic liners; tech page live
- **Ask:** Licensees/scale partners (paper converters, packaging OEMs)
- **Status date:** 2024–2025

Sources: CSIR-NIIST tech note.

- **CSIR ecosystem — Start-up & tech-transfer pipeline (multiple labs)**

- **What:** Ongoing **CSIR Start-Up Conclave** & tech-transfer programmes
- **Readiness:** Cross-lab portfolios incl. packaging/circularity; TT certificates issued
- **Ask:** Entrepreneurs to license CSIR IP; investors for spin-outs
- **Status date:** May–Sep 2025 events/bulletins

Sources: CSIR bulletins; Tol coverage of CSIR conclaves.

Refer: references section for detailed source list

Recent Activities/ Potential Investment Entry Points

- **Dharaksha Ecosolutions — Mycelium packaging from crop stubble (India)**
 - Founders: Arpit Dhupar (CEO); Anand Bodh
 - Current valuation & investors: Valuation not publicly disclosed;
 - ₹24.8 Cr seed (Sep 2024) led by Avaana Capital; Momentum Capital participated.
 - Project: Scale mycelium protective-packaging lines; expand supply to FMCG/electronics (e.g., Dabur, Havells).
 - Ask for the project: Growth capital for capacity, tooling & QA; multi-year offtake MOUs with brands/converters.
 - Verification info: Seed round and customers; company site/press.
 - Contact info: dharaksha.com

Sources: Packaging Gateway/Yahoo; Momentum Capital note; TOI profile; company site.

- **Craste — Mycelium & crop-waste fiber packaging, FUMA boards (India)**
 - Founders: Shubham Singh; Dr. Himansha Singh
 - Current valuation & investors: Valuation undisclosed; Techstars alum; supported by Marico Innovation Foundation (Scale-Up).
 - Project: Commission additional pulp/molded fiber and FUMA board lines; B2B protective/industrial packaging.
 - Ask for the project: Project finance/asset leasing for lines; converter/brand pilots; distributor partnerships.
 - Verification info: Techstars profile; MIF program page.
 - Contact info: shubham@craste.co • craste.co/contact

Sources: Techstars profile; Marico Innovation Foundation; Govt. startup listing.

Recent Activities/ Potential Investment Entry Points

- **PeelON — Compostable films that extend produce shelf-life (India/US)**
- Founders: Dr. Taraka Ramji Moturu; V. Ravi Sankar Ummidi
- Current valuation & investors: US\$7.9M post-money; US\$1M seed (Aug 2025) led by growX Ventures; (per press, other angels).
- Project: Scale Visakhapatnam production; retail & agri-supply pilots in India/US; traceability add-ons.
- Ask for the project: Working capital for scale; retail/mandi pilots; cold-chain & marketplace integrations.
- Verification info: ET funding/valuation; Tech in Asia coverage; company site.
- Contact info: hello@peelon.co • peelon.co

Sources: Economic Times; Tech in Asia; company LinkedIn/site.

- **GreenPod Labs — Plant-extract active packaging sachets (India)**
- Founders: Deepak Rajmohan (CEO); Vijayanand Rao (CBO)
- Current valuation & investors: Valuation undisclosed; backed by grants (RKVY/NIDHI), Rockstart Agri; MIF Scale-Up (2023–25).
- Project: Expand contract manufacturing; nationwide distribution to retailers/FPOs; category-specific SKUs.
- Ask for the project: Growth/working capital; retail chains & exporters for paid pilots/offtake.
- Verification info: MIF case study; incubator profile; company site.
- Contact info: info@greenpodlabs.com • greenpodlabs.com

Sources: MIF case study; IIT-H iTIC profile; WEF page; company site.

Recent Activities/ Potential Investment Entry Points

- **ReCircle — EPR, Plastic Credits & Traceability (ClimaOne)**
- Founders: Rahul Nainani; Gurashish Singh Sahni.
- Current valuation & investors: Valuation undisclosed; investors include Flipkart Ventures, 3i Partners, Acumen (pre-Series A, 2023) and Venture Catalysts, Mumbai Angels (bridge, Sep 2024).
- Project (example): Scale ClimaOne across brands/ULBs; forward-integrate into recycling unit.
- Ask for the project: Bridge/growth capital; PRO/brand partnerships; offtake for traceable PCR.
- Verification info: Bridge round (ET/Entrackr); product (ReCircle site).
- Contact: info@recircle.in • +91 90042 40004 • recircle.in/contact-us.

Refer: references section for detailed source list

Entering India's Sustainable Packaging Segment

- **Capital & infrastructure (first 12–24 months)**

- Permits & compliance: EPR, PCB consents, HAZOP/EHS (chem), food-contact (rPET)
- Core equipment: wash/sort/extrusion/SSP; reactors/bioreactors; QA lab & testing
- Working capital: feedstock, utilities, logistics, spares
- Data stack: traceability, QC, EPR reporting (cloud)
- Funding path: grants/accelerators → impact/VC → strategic brand partnerships

- **Growth triggers**

- EPR mandates & rising recycled-content targets
- Strategic stakes by FMCGs validate demand & offtake
- Export demand for certified food-grade rPET/PCR
- Digitised compliance enables asset-light models

- **Risk radar**

- Feedstock volatility: quality, moisture, contamination, seasonality
- Price parity vs virgin resin; margin compression in downcycles
- Certification lead-times delaying revenue (EFSA/BIS/brand QA)
- Scale-up risk in chem/biotech yields; reactor reliability
- Permitting/EHS lapses; reputational risk from “greenwashing”

Sources: CPCB 2022–25; MPCB 2025; IEC-61882/CCPS; FSSAI 2025; Starlinger; CIPET; ANDE 2024; CLP 2024/25; ISCC 2025; ISEAL 2025; Circulate Capital 2024/25; HUL–Lucro 2025; EFSA opinions; India permits rPET for food contact, 2025; CLP/TCI 2024–25; CE Delft 2022–24; PHA reviews 2024–25

Ecosystem Support by IDEATE Lab, JGU

Sustainable Packaging Entrepreneurs

- **Navin Singhania, Founder-Barracuda Technologies Inc.**
 - He has commissioned a modular, near-zero-liquid-discharge biorefinery in India that fractionates agri-waste into cellulose, lignin, and bio-silica for packaging and materials uses. He is a biomass-fractionation specialist, he's advancing decentralized, low-CAPEX fiber feedstocks to unlock circular materials for molded fiber and related applications.
 - <https://www.linkedin.com/in/navin-singhania-091947/>
- **Jonathan Levine, Cofounder and CEO-Folia Materials**
 - Folia Materials makes plant-based, PFAS-free coatings that turn ordinary paper into high-performance, recyclable packaging, drop-in on existing lines. They've also debuted a claimed first: a 100% paper microwave susceptor, enabling paper to replace plastic in hot-food and shelf-stable formats.
 - <https://www.linkedin.com/in/jonathan-levine-phd/>
- **Ankit Gupta, Founder and MD-NaturTrust; Joint Managing Director-Holostik**
 - Ankit Gupta is Founder & MD of NaturTrust, a manufacturer of certified compostable packaging. He leads NaturTrust's development and export of compostable bags/films for global brands, advancing bio-based alternatives in mainstream packaging.
 - <https://www.linkedin.com/in/ankit-gupta-holostik/>

Technical Support

- **Research Centre for Digital Circular Economy for Sustainable Development Goals (DCE-SDG)**
 - A Circular Economy knowledge hub; mission anchored on collaboration, global partnerships, leadership in emerging themes, and translating research to impact for SMEs and students.
 - <https://jgu.edu.in/jgbs/research/exploring-environmental-frontiers-unveiling-insights-labs-research>
- **CIPET : IPT & CSTS – MURTHAL**
 - Government institute (CIPET) centre in Murthal, Haryana; serves the plastics & allied industry with academics + technical support. It is a Independent materials & product testing for rPET/rPE/rPP and packaging components; supports spec compliance and buyer QA.
 - <https://www.cipet.gov.in/centres/cipet-murthal/introduction.php>

Curated Segment Opportunities

Ecosystem You Can Tap – India

Regulators & Standards

- **MoEFCC; CPCB & SPCBs** — EPR rules, compliance oversight
- **BIS** — packaging & food-contact standards
- **FSSAI** — food-contact materials compliance
- **DPIIT** — policy, industry facilitation

• R&D, Testing & Training

- **Indian Institute of Packaging (IIP)** — testing, training, design labs
- **CIPET** — polymer R&D, testing, tooling, skilling
- **CSIR-NCL & CSIR network** — polymer science & recycling research
- **SIES School of Packaging** — academic programs, industry projects

• India — Alliances & Platforms

- **India Plastics Pact (CII × WWF)** — targets, design guidelines
- **CII; FICCI sustainability forums** — policy dialogues, industry convening
- **CPCB EPR Portal** — PIBO/PRO registrations, reporting
- **ULBs & Swachh Bharat Mission** — collection pilots, infra programs

Refer: references section for detailed source list

Ecosystem You Can Tap – Global

- **Standards & Certifications**

- ISO; ASTM — packaging, environment, test methods
- CEN/EN (e.g., EN 13427) — EU packaging standards
- APR Design Guide (US) — design-for-recycling criteria
- RecyClass (EU) — recyclability & recycled-content guidance
- How2Recycle; OPRL — on-pack recyclability labels
- FSC; PEFC — certified sustainable fiber
- ISCC PLUS — chain-of-custody for bio/chem recycling
- Cradle to Cradle — material health & circularity certification

- **Investors, Accelerators & Labs**

- Circulate Capital; Closed Loop Partners — circular economy investors
- Plug and Play Sustainability; MassChallenge — accelerator support
- Brand & converter labs — Dow, Amcor, UFlex, Huhtamaki pilot lines

- **Alliances & NGOs**

- Ellen MacArthur Foundation — Global Commitment, Plastics Pacts
- CEFLEX — flexible packaging circularity (Europe)
- Consumer Goods Forum — brand action on plastics
- Alliance to End Plastic Waste — projects, innovation support
- The Recycling Partnership (US) — collection infrastructure & grants
- WRAP (UK) — policy tools, pact implementation

Refer: references section for detailed source list

Ecosystem You Can Tap: Major Incubators

India

- Venture Center (CSIR-NCL), Pune — Deep-tech materials/polymer incubation; labs & pilot support.
- CIPET Incubation (Innovex/SARP) — Polymer engineering, testing, tooling; recyclable packaging development.
- C-CAMP, Bengaluru — Bio/biomaterials incubation; bioplastics, enzymes, fermentation scale-up.
- IIT Madras Incubation Cell (IITMIC) — Deep-tech/commercialization; materials & manufacturing startups.
- SINE, IIT Bombay — Engineering/manufacturing incubator; process, equipment, and materials plays.
- AIC T-Hub (Sustainability tracks) — Circular economy, EPR/waste-tech cohorts; market access.
- Social Alpha (Climate/Circularity) — Impact-focused venture programs; grants, pilots, ecosystem links.

Global

- Closed Loop Partners — Center for the Circular Economy — Packaging pilots; NextGen-style challenges.
- AEPW × Plug and Play (End Plastic Waste) — Multi-hub accelerator for collection, sorting, recycling.
- Greentown Labs (Circularity Challenges) — Materials/circular plastics with corporate partners.
- Circular Valley Accelerator (Germany) — Packaging & plastics within circular economy focus.
- EIT Climate-KIC / Amazon Sustainability Accelerator — Climate cohorts including packaging circularity.
- Plug and Play — Sustainability — Global network; packaging, recycling, materials tracks.
- NextCycle (US) — State programs accelerating circular packaging projects and end-markets.

Refer: references section for detailed source list

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List of Abbreviations

- **EPR — Extended Producer Responsibility**
Producers must collect/recycle a quota of their packaging.
- **PRO — Producer Responsibility Organization**
Third-party that manages EPR obligations for brands.
- **ULB — Urban Local Body**
City/municipal authority (collection, bylaws, enforcement).
- **PCR — Post-Consumer Recycled (material)**
Resin/fiber sourced from consumer waste (e.g., rPET).
- **rPET / rHDPE / rPP**
Recycled PET / High-Density PE / Polypropylene resins.
- **PPWR — Packaging & Packaging Waste Regulation (EU)**
EU law setting recyclability, reduction, and content targets.
- **CPCB — Central Pollution Control Board (India)**
National regulator; oversees EPR portal and compliance.
- **SB-54 (California)**
State law mandating recyclability, source reduction, EPR.
- **CAA PRO — Circular Action Alliance PRO**
California's approved PRO under SB-54.
- **LCA — Life-Cycle Assessment**
Method to quantify environmental impacts end-to-end.
- **RTP — Returnable Transport Packaging**
Reusable crates/totes/pallets for B2B logistics.
- **SKU — Stock-Keeping Unit**
A specific product/pack variant.
- **QA — Quality Assurance**
Lab/line testing and compliance validation.
- **KPI — Key Performance Indicator**
Metric used to judge progress/success.
- **MoU — Memorandum of Understanding**
Non-binding agreement (e.g., feedstock/offtake intent).
- **PO — Purchase Order**
Binding order for goods/services.
- **NRR — Net Revenue Retention**
Revenue growth from existing customers (incl. upsell).
- **ROI — Return on Investment**
Financial gain relative to cost.
- **Capex / Opex**
Capital expenditure / operating expense.
- **PFAS — Per-/Polyfluoroalkyl Substances**
Persistent “forever chemicals” used in some barriers.
- **MRF — Materials Recovery Facility**
Sorting plant for collected recyclables.
- **MLP — Multi-Layer Plastic**
Laminates/films made of multiple polymers.
- **PE / PP / PET / HDPE / LDPE**
Polyethylene / Polypropylene / Polyethylene Terephthalate / High- / Low-Density PE.

Technical Terms

- **Mono-material**
Pack made from one polymer family.
Why: Easier to sort/recycle; higher end-market value.
- **Barrier coating**
Layer that resists oxygen, water, oil, or grease.
Why: Protects food; must meet spec without PFAS.
- **OTR / WVTR**
Oxygen / Water-Vapor Transmission Rate.
Why: Core performance specs for food shelf-life.
- **Food-contact (migration) testing**
Lab tests for chemical transfer into food.
Why: Mandatory compliance before commercial use.
- **Intrinsic Viscosity (IV)**
Polymer chain length proxy (e.g., for rPET).
Why: Indicates strength/processing; buyer acceptance.
- **Solid-State Polycondensation (SSP)**
Heat treatment to rebuild PET IV.
Why: Enables food-grade rPET pellets.
- **Pellet spec acceptance (converter lots passed)**
Buyer QA sign-off on resin/film batches.
Why: Real-world proof your output meets spec.
- **Advanced (chemical) recycling**
Converts plastics to oils/monomers.
Why: Potential for hard-to-recycle films; economics uncertain.
- **Mechanical recycling**
Wash, grind, melt, re-pelletize plastics.
Why: Lowest cost/energy when feedstock is clean.
- **Film washing line**
Process to clean flexible films before reprocessing.
Why: Unlocks PCR from flexibles; yield driver.
- **Feedstock contracts / traceability**
Secured waste supply with audit trail.
Why: De-risks plants; needed for EPR claims.
- **Offtake agreement / cover**
Buyer commitment to take output volumes.
Why: Bankability; reduces market risk.
- **Utilisation (plant)**
Actual production as a % of capacity.
Why: Core profitability and cash-flow driver.
- **Route density (reuse ops)**
Returns per pickup route.
Why: Lowers cost-per-cycle; key to unit economics.
- **Return rate / Breakage rate (reuse)**
% items returned / % items damaged.
Why: Determines viability vs single-use cost.
- **Cost-per-cycle (reuse)**
Total cost per reuse (clean, move, manage).
Why: Must beat disposable baseline by ~10%+.
- **Chain-of-custody / Traceability**
Verified material movement and ownership records.
Why: Underpins EPR, recycled-content and audit claims.
- **Line compatibility / Line speed**
How well a new pack runs on existing machines.
Why: Procurement gate; target ≥90% of incumbent.