REWEAVE
A PROGRAM BY envíu

Issues to Action:

Exploring India's Textile Waste Landscape

Jan, 2025

REWEAVE

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The fashion industry is one of the most wasteful in the world, but with waste comes opportunity— chance to redesign systems, rethink consumption, and create a future that values sustainability over disposability.

In this Report

Background

1

Introduction to Enviu & Reweave

Enviu drives systemic change by developing innovative and impactful solutions. One of our focus areas is transforming the textile value chain to promote sustainability and circularity.

2

Scope & approach of the issue analysis

Our issue analysis focused on urban textile household waste, incorporated both primary and secondary research to identify challenges and opportunities.

System Overview

3

Current landscape of textile waste in India

Lower-grade mechanical recycling solutions in India predominantly process cotton-rich pre-consumer waste and imported post-consumer waste. Consequently, most domestic textile discards are sent to landfills. The informal and unregulated nature of the textile waste ecosystem further exacerbates social issues within the supply chain.

4

Mapping post-consumer waste systems in an urban context

Slightly over 10% of textile discards are integrated into circular value chains, with NGOs and Waghris serving as the primary channels for recoverable materials. A significant portion of textiles ends up in landfills, primarily due to consumer disposal through mixed waste streams or the inability of aggregators to find suitable buyers.

Root Causes & Way Forward

5

Root causes and leverage points for systemic change

We have identified six key leverage points to drive systemic change. Central to this is increasing the demand for recycled products, which is essential for establishing viable business models within the supply chain.

6

Current system interventions we are working on

We are currently developing four interventions aimed at boosting demand for recycled products and enhancing the financial viability of textile waste sorters and collectors.

Annex

Detailed stakeholder mapping

01.

Introduction to Enviu & Reweave

Enviu's Approach

Enviu creates system change by building innovative and impactful solutions in four domains in four regions since 2004.

Contributing to most SDGs
Core: 1 | 3 | 8 | 12 | 13 | 14 | 15

ZERO WASTE

Normalizing zero-waste consumption by preventing usage of single-use packaging.

AGRI-FOOD

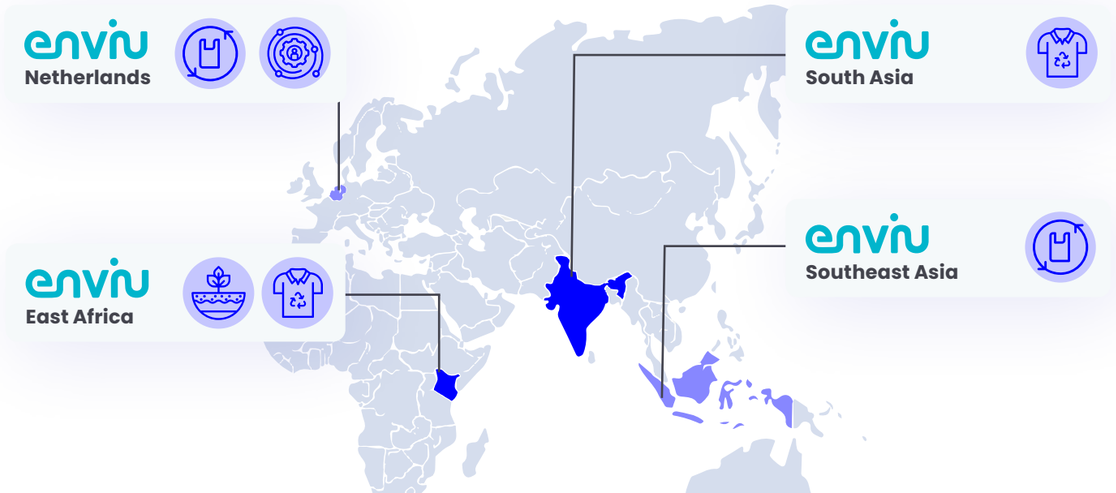
Paving the way towards regenerative agriculture and 0% food loss chain.

MOBILITY

Shaping inclusive economies and infrastructure to enable powered citizens.

TEXTILE

Developing business models to build a fair and circular textile value chain.



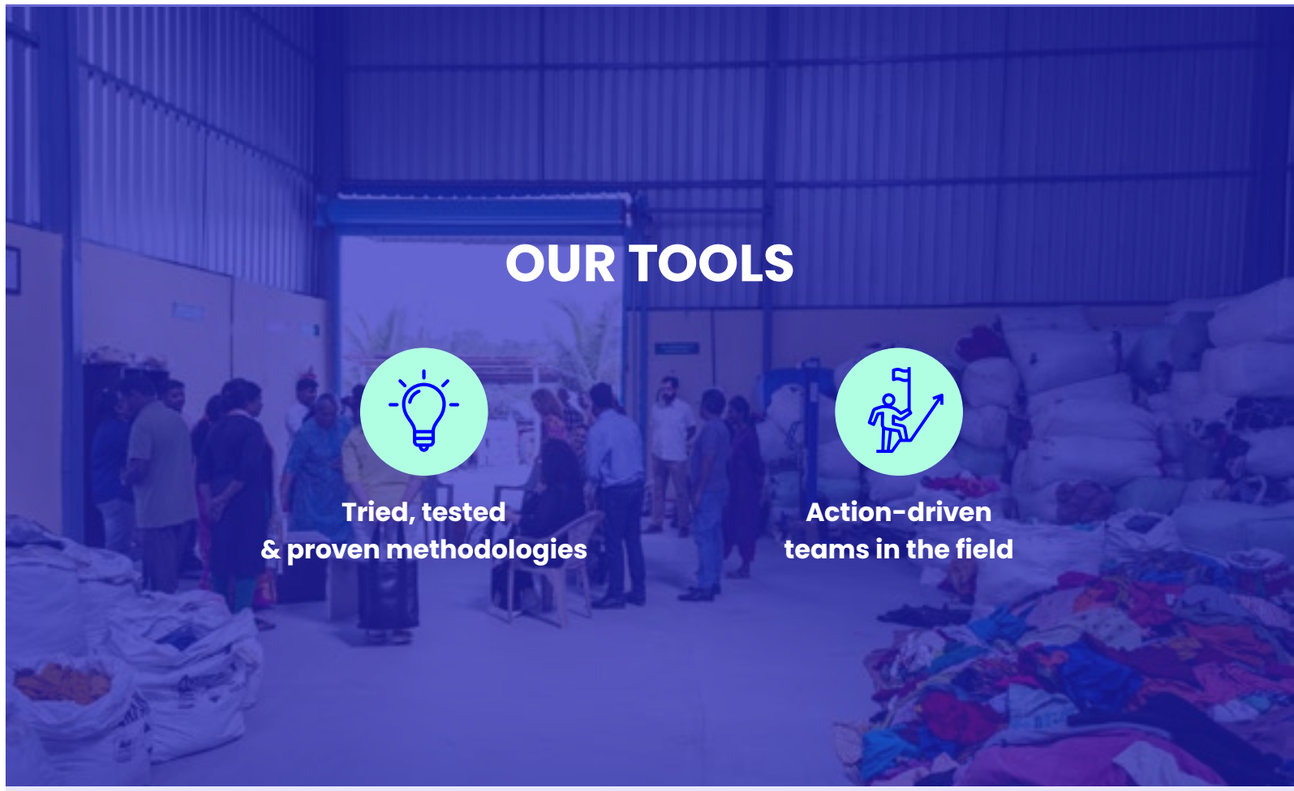
Enabling change in four steps

01. **Identify root causes, leverage points, and opportunities**

02. **Ideate and validate multiple system changing models.**

03. **Interventions that create a direct positive impact.**

04. **Influence and inspire market participants by showcasing new models.**



OUR TOOLS

Tried, tested & proven methodologies

Action-driven teams in the field

Over the past 20 years, this approach has proven to be a success, thanks to our partners and stakeholders who facilitated our bold ideas.

REWEAVE

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Reweave, a program by Enviu, builds **disruptive ventures** aimed at solving the social and environmental problems in the textile industry in India, Bangladesh, and Kenya with **current focus on building solutions for the textile waste.**

Our Vision

A circular and inclusive textile industry.

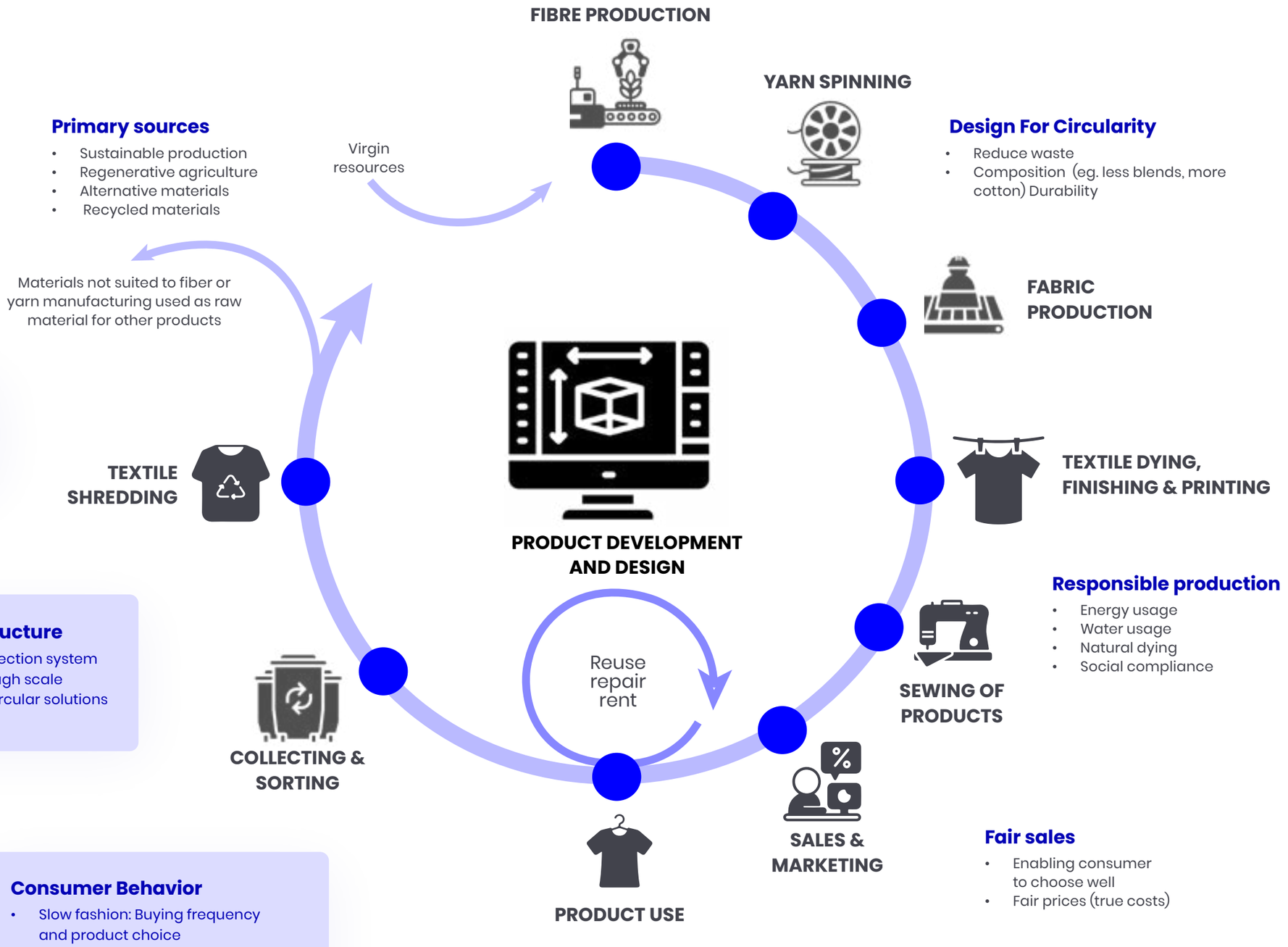
Our Mission

Build disruptive ventures that drive systemic change toward a circular and inclusive textile value chain.

Our North Star

Divert 20,000 tonnes of textile waste while generating 400,000 person days of direct and indirect employment, by 2027.

Our vision: moving from a linear to a circular and inclusive system in India, current solution building focused on closing the loop for waste



Primary sources

- Sustainable production
- Regenerative agriculture
- Alternative materials
- Recycled materials

Design For Circularity

- Reduce waste
- Composition (eg. less blends, more cotton) Durability

Circular solutions

- Fill gaps for materials
- Build solutions locally

Collection Infrastructure

- Build accessible collection system
- Ensure viability through scale
- Market linkages to circular solutions
- Social compliance

Responsible production

- Energy usage
- Water usage
- Natural dying
- Social compliance

Fair sales

- Enabling consumer to choose well
- Fair prices (true costs)

Consumer Behavior

- Slow fashion: Buying frequency and product choice
- Washing and repair
- Conscious and proper disposal

Circularity Supporting Policies

- Local policieS (consumer and production incentive
- International policies (consumer and buyer incentives)

02.

Scope & Approach

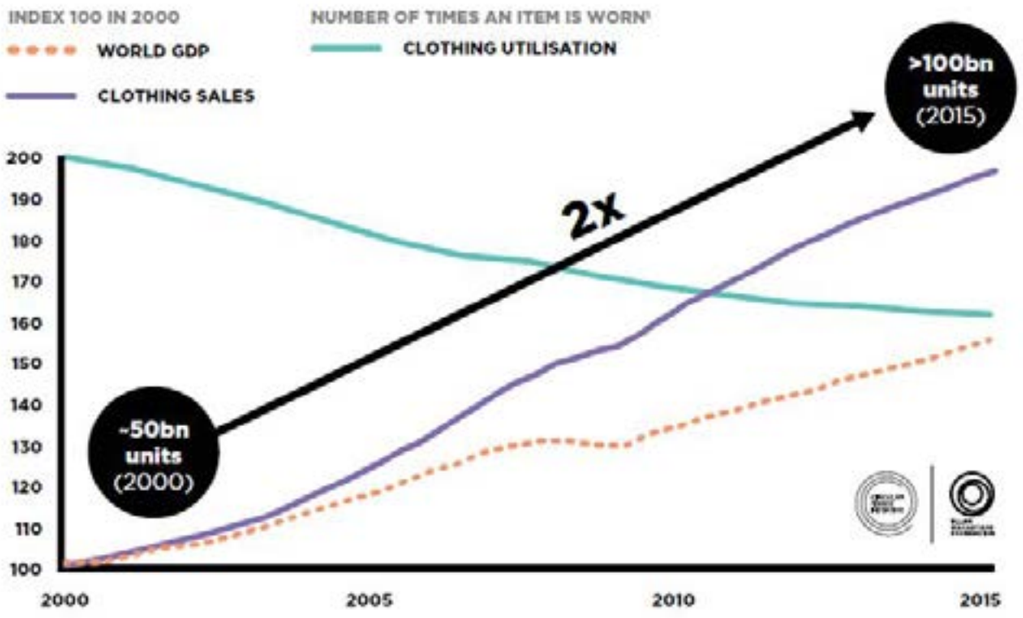
Globally, the textile industry conceals a growing environmental challenge that demands our attention

The textile industry, a cornerstone of our modern lifestyle, is woven into the fabric of our daily existence.

Production amounts are increasing, while life-time is decreasing

- Population growth
- Fast fashion
- Rate of discarding clothes
- Limited demand for second-hand and upcycled textiles

GROWTH OF CLOTHING SALES AND DECLINE IN CLOTHING UTILISATION SINCE 2000:



* Source: Euromonitor Internat ional Apparel & Footware 2016 Edition, World Bank, World development indicators – GD 2017

Fresh water usage

Water pollution

Greenhouse gases

Waste generation

Energy consumption

While several environmental issues need attention in the value chain, our issue analysis focuses on post-production waste

		WATER POLLUTION / CHEMICAL WASTE	FRESH WATER USAGE	ENERGY CONSUMPTION	GREEN HOUSE GASES	WASTE GENERATION
Raw materials	Raw material production is polluting and depleting		●			
Yarn production			●	●	●	
Fabric production (weaving/ knitting)	Yarn production and wet process is water, chemical and energy intensive, with enormous hazardous waste streams			●	●	
Wet processing (dyeing*/ finishing/ printing/ washing)		●	●			
Garment (sewing/ cutting)	~15% of fabric end up at cutting floor				●	●
Retailer	~30% of collections never sold				●	●
Consumers	Microfibers released with washing, and inability to recycle results in landfill and incineration	●				●
Post consumer					●	●

* Dyeing/ coloring can happen at multiple stages in the value chain: fiber dyeing/ yarn dyeing/ fabric dyeing (or even printing)

Our issue analysis will zoom in to the post consumer waste issue in the value chain.

INDIVIDUAL GAIN, COLLECTIVE PAIN: stakeholders are driven by lowering costs and increasing profits, thereby fueling linear production and consumption

Most stakeholders are driven by lowering costs and increasing profits, thereby fueling linear production and consumption

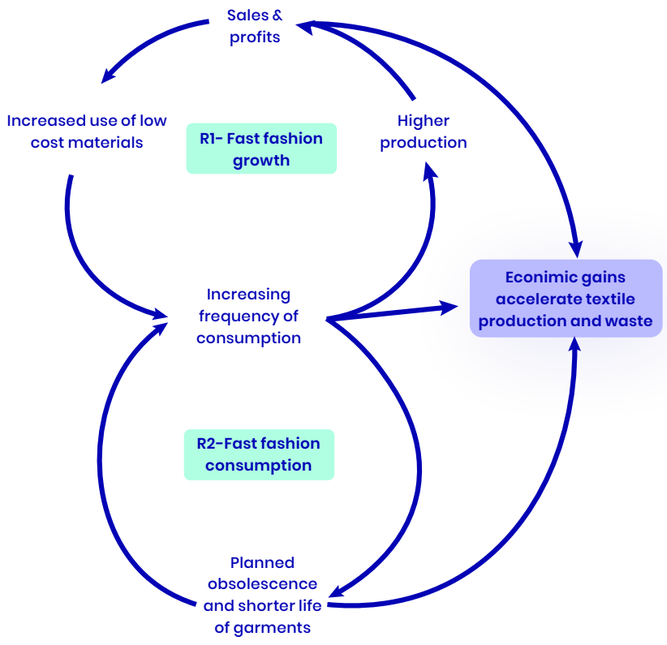
	BRANDS	MANUFACTURERS	RETAILERS	CONSUMERS	COLLECTORS & AGGREGATORS	CIRCULAR BUSINESSES
ACT	Places orders with spinning mills & manufacturers	Makes finished products and engages various sub contractors	Sells the finished products (garments, home textiles)	Buys the products, uses them and discards them	Collects, sorts & aggregates discarded textiles	Processes and sells products made/ collected from discards
KEY DRIVERS	**Increasing sales & profits** **Increasing frequency of purchase** **Traceability** **Compliance** **Good brand image** **Sustainability**	**Sales orders** **Profit margins** **Lowering costs** **Optimal asset utilization**	**Sales** Offering variety of choices **Profit margins** Frequent purchases	**Low prices** Variety of choices Latest fashion trends Ease in shopping Convenience (in disposal)	Income (Margins) Good quality feedstock Fast turnover (quick offtake) Offtake of all waste streams	Impact Sustainability Keeping the business alive Consistent supply and quality of feedstock

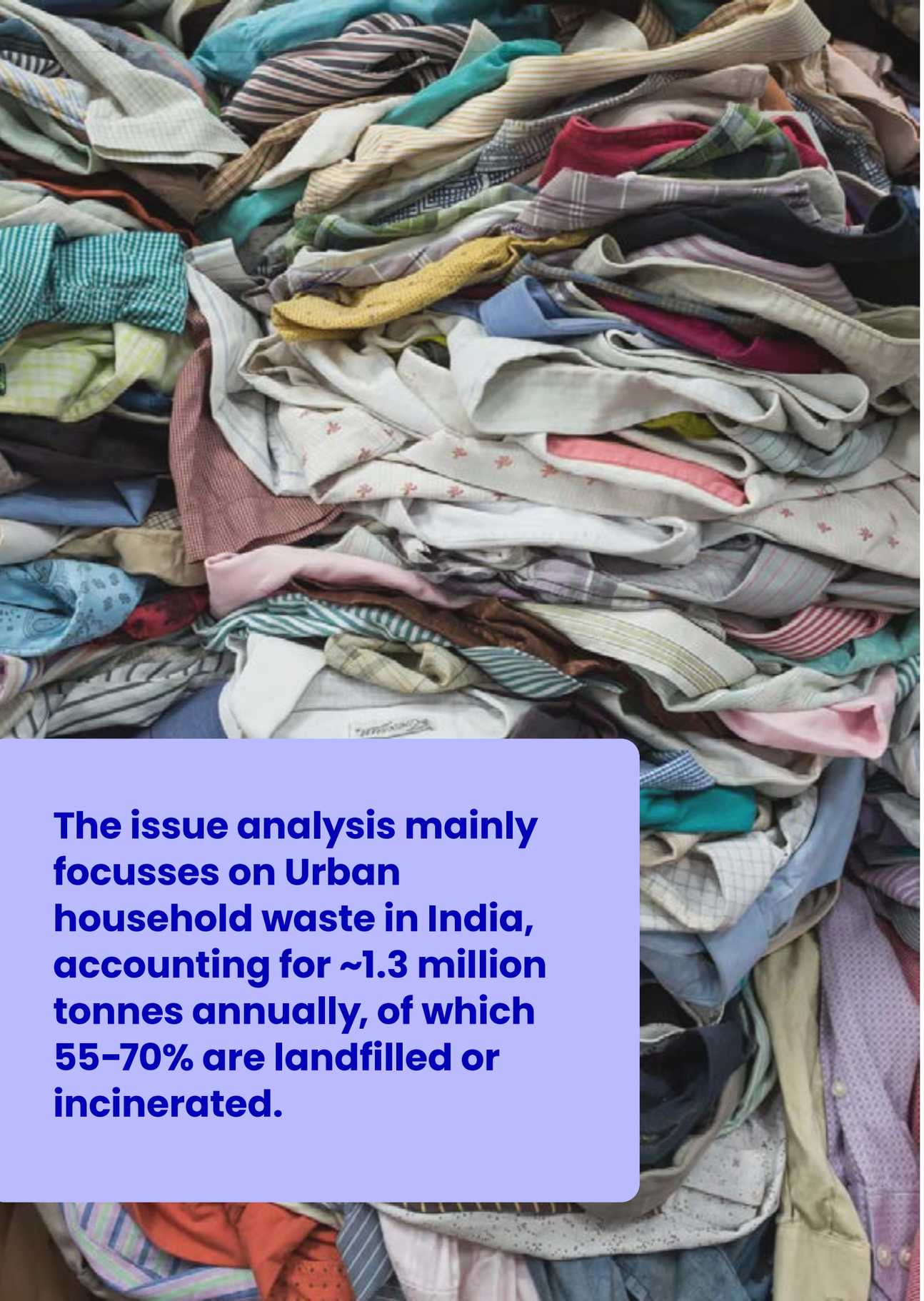
Note that this is a very generalistic overview, and each group of stakeholders has outliers with different drivers

The fast fashion system can be classified as TRAGEDY OF THE COMMONS; brands, manufacturers & consumers chase short-term gains and convenience, leading to increasing textile waste & negative environmental outcomes for everyone in the long run.

Balancing feedback loops are not in place:

- No resource depletion
- No reduced environmental capacity
- Limited regulatory environmental clean-up and pressure on the industry – this has only just started recently in US/EU
- Limited regulatory or social pushback on overuse of resources and exploited labor





The issue analysis mainly focusses on Urban household waste in India, accounting for ~1.3 million tonnes annually, of which 55-70% are landfilled or incinerated.

Type

Pre-consumer waste
Moderate severity
- 42% by volume
- 1% is landfilled and incinerated

Domestic Post consumer waste
High severity
- 51% by volume
- 55-70% is landfilled and incinerated

Imported waste
Very low severity
- 7% by volume
- <1% is incinerated

Geography

Urban ~2mn tonnes
High severity
- High population density
- Higher frequency of purchase and disposal
- ~36% of population
- 53% share by volume

Rural ~1.9mn tonnes
Moderate severity
- Lower population density
- Lower frequency of purchase and disposal
- ~64% of population
- 47% share by volume

Source

Household ~1.3mn tonnes
High severity
- 65-70% by volume
- 55-70% prone to landfills, incineration

Institutional ~0.7 mn tonnes
Moderate severity
- 30-35% by volume
- Less prone to landfills

The approach

Phase 1

- Secondary research
- Stakeholder mapping
- Primary research
- Innovation scoping

Phase 2

- Synthesis
- Issue analysis & prioritization
- Follow up research
- Validation/verification of issues
- Focused issue-innovation mapping

Phase 3

- Ideation sprint
- Hypothesis testing
- Shortlisting high potential venture ideas
- Knowledge sharing

OVERVIEW OF PRIMARY RESEARCH INTERVIEWS/ FIELD VISITS

CATEGORY OF STAKEHOLDERS	SEGMENT	NUMBER OF STAKEHOLDERS INTERVIEWED
Virgin material suppliers	Garment manufacturing (cutting, making)	6n*
	Knitting and Weaving	4
	Spinning	5
	Misc - dyeing, bleaching, other processing, wholesalers	3
Brands	Mid-sized clothing brands	5
	Refurbish/Remanufacture (Upcycler)	4
	Recycled clothing brand	1
	Thrift Shop (Market/stores)	7
Waste Collectors	Domestic/post-consumer	9
	Pre consumer	7
Solution providers	Small Scale	6
	Large Scale	5
Ecosystem Enablers	Associations/Federation	2
	Tech Platform	3
	NGO/Cooperatives	4
	Research and Academic Institutions	2

*n: number of factories

03.

Current landscape of textile waste in India

As a leading textile producer and consumer, India generates 7.2 million tonnes of textile waste annually, accounting for 8% of the global textile waste.

~90 MILLION TONNES GLOBAL TEXTILE WASTE

Of the estimated textile waste generated globally in 2021–22, India accounted for: 7.2 million tonnes

Pre-consumer waste:
3.26 million tonnes

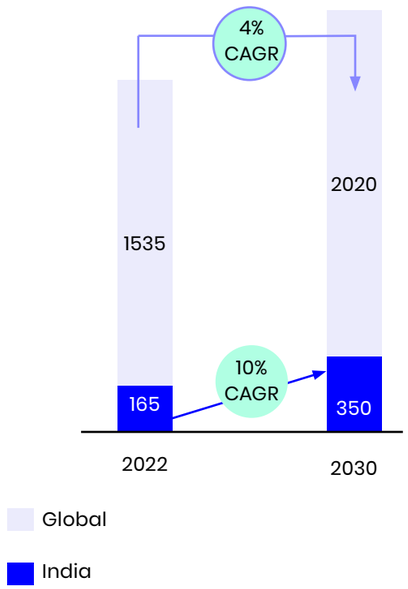
Post-consumer waste:
3.94 million tonnes

This number is only expected to grow, due to production growth and consumption increase

Pre-consumer:
India has a long history of textile production, and the market is expected to double by 2030.

Post-consumer:
The key factors driving increasing textile waste in India are - growing population, consumption trends and fast fashion

PROJECTED TEXTILE & APPAREL MARKET SIZE (USD BILLION)



Source: FICCI, Wazir Advisors

India has the largest population in the world at **1.43 billion people,** driving textile production and consumption

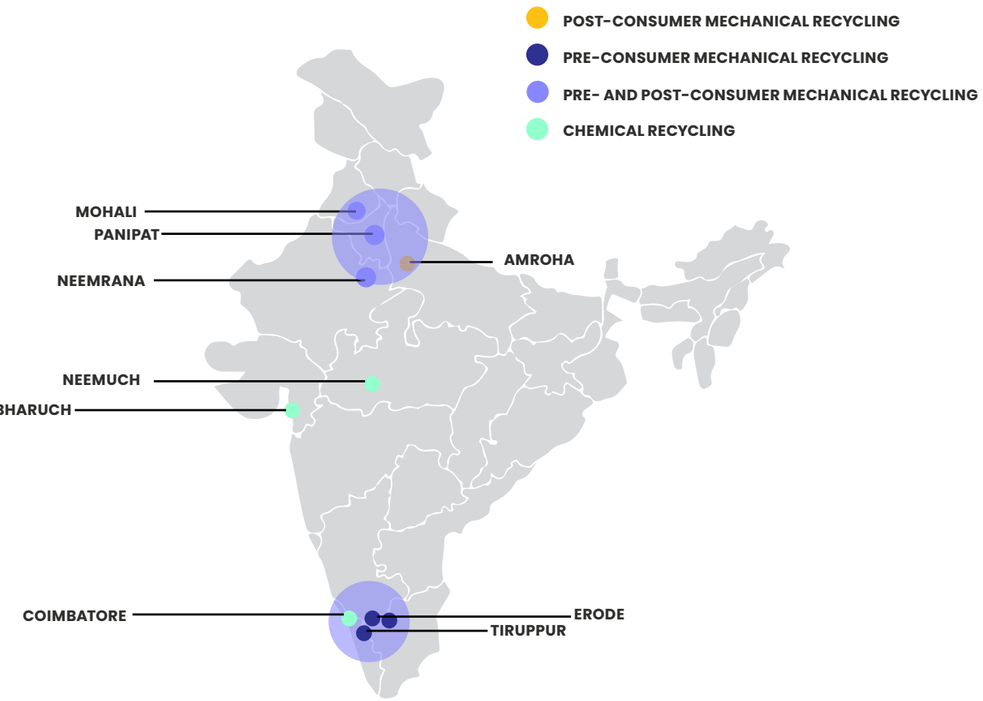
Per capita expenditure on apparel rose to **USD 80 in 2023**, from USD 49 in 2018, growing at a CAGR of 10%

Fast fashion trends are leading to more frequent discards - on an average, a garment is used for 2-3 years in urban India and 4-5 years in rural India

> **5 to 6 years ago, the collection heap would barely contain 8-10 items of clothing in a day. Now, of the 2 tonnes of waste that comes into the centre every day, 10% are just clothes.**
>
> – MANSOOR, OPERATOR AT A DRY WASTE COLLECTION CENTER (DWCC) IN BANGALORE

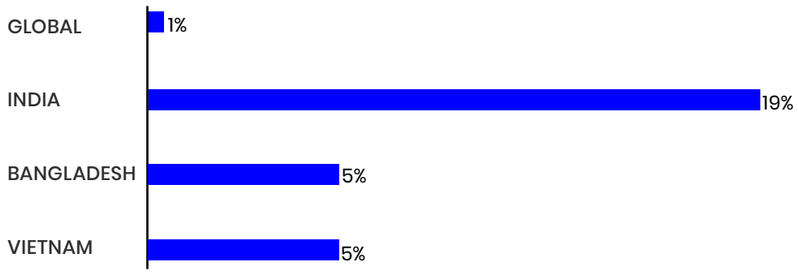
India has traditionally been a recycling hub, resulting in a relatively high share of locally recycled textile waste

Recyclers are mainly concentrated in Tiruppur-Coimbatore-Erode & Panipat Amroha-Mohali



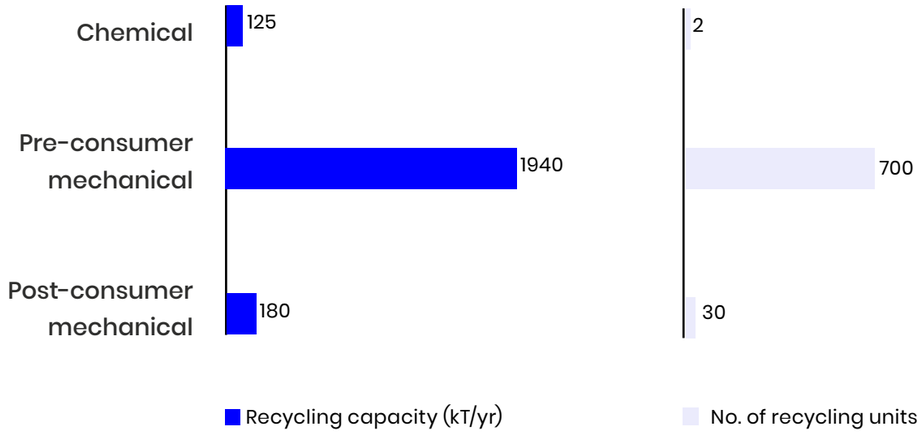
Compared to other leading textile producers, a significant share is recycled locally in India

% TEXTILE WASTE RECYCLED LOCALLY WITHIN COUNTRY/REGION



However, it largely consists of lower grade mechanical recycling solutions for cottonrich pre-consumer waste and imported post-consumer waste

The recycling system largely consists of mechanical recyclers, focused on pre-consumer materials



Preferred feedstock for recycling are pre-consumer cotton-rich waste and imported used garments

Cotton-rich preconsumer waste

Polyester and blend-ed fabric

Imported used garments and mutilated rags

Domestically used garments

Also, recycling capacities have not been able to keep pace with the rate of growth of the textile and apparel market in India

Recycling market is expected to grow with 3.4% while the textile production is expected to increase with 10%

The India textile recycling market	The Indian textile and apparel market
Rs 2529 crores in 2022	Rs 65,57,39 crores in 2021
Rs 3073 crores in 2028 (expected)	Rs 1,55,73,71 crores in 2026 (expected)
Expected CAGR3.4% from 2023 to v2028	Expected CAGR 10% from 2019-20 to 2025-26

Source: IMARCGroup

Source: India Brand Equity Foundation, Statista

> **We limit polyester as an input to our recycling machines to <10% to avoid serious fire risks**
>
> - MECHANICAL RECYCLER

The share of textile waste being landfilled and downcycled are much higher in domestic post-consumer textile waste compared to pre-consumer textile waste

DECREASE VALUE REALIZATION, LESS SUSTAINABLE

	SHARE OF WASTE REUSED*	SHARE OF WASTE RECYCLED INTO FIBRE	SHARE OF WASTE DOWNCYCLED	SHARE OF WASTE LANDFILLED & INCINERATED
45% **Pre-consumer waste** (3265 KTons)	16%	46%	37%	1%
55% **Post-consumer Domestic waste** (3944 KTons)	~35-50%	~2-4%	~5 -10%	~55-70%

Lack of scientific landfilling & disposal further compound this problem.

*donations, resale, upcycling, household repurposing

Indian landfills receiving textile waste are characterized by towering heaps of mixed waste, including non-biodegradable textiles

Textile waste is the 3rd largest source of municipal solid waste in India

Landfilling 25 kilo tonnes of solid waste requires 1 ha land

Waste is dumped in informal sites –under bridges, in lakes, etc. without scientific treatment

Landfills in cities like Mumbai and Delhi are overwhelmed by mixed waste, including textiles. These landfills are not designed to handle biodegradable or synthetic textiles separately, leading to both **methane emissions and microplastic pollution**

Leaching of Toxic Chemicals: Dyes and treatments commonly used in textiles are highly polluting. When discarded garments are exposed to rain, harmful chemicals seep into the soil and groundwater, polluting natural resources

Land Scarcity Issues: Rapid urbanization in India amplifies the challenges of finding space for landfills. Textile waste adds to the pressure, filling landfills faster and reducing available land for other uses

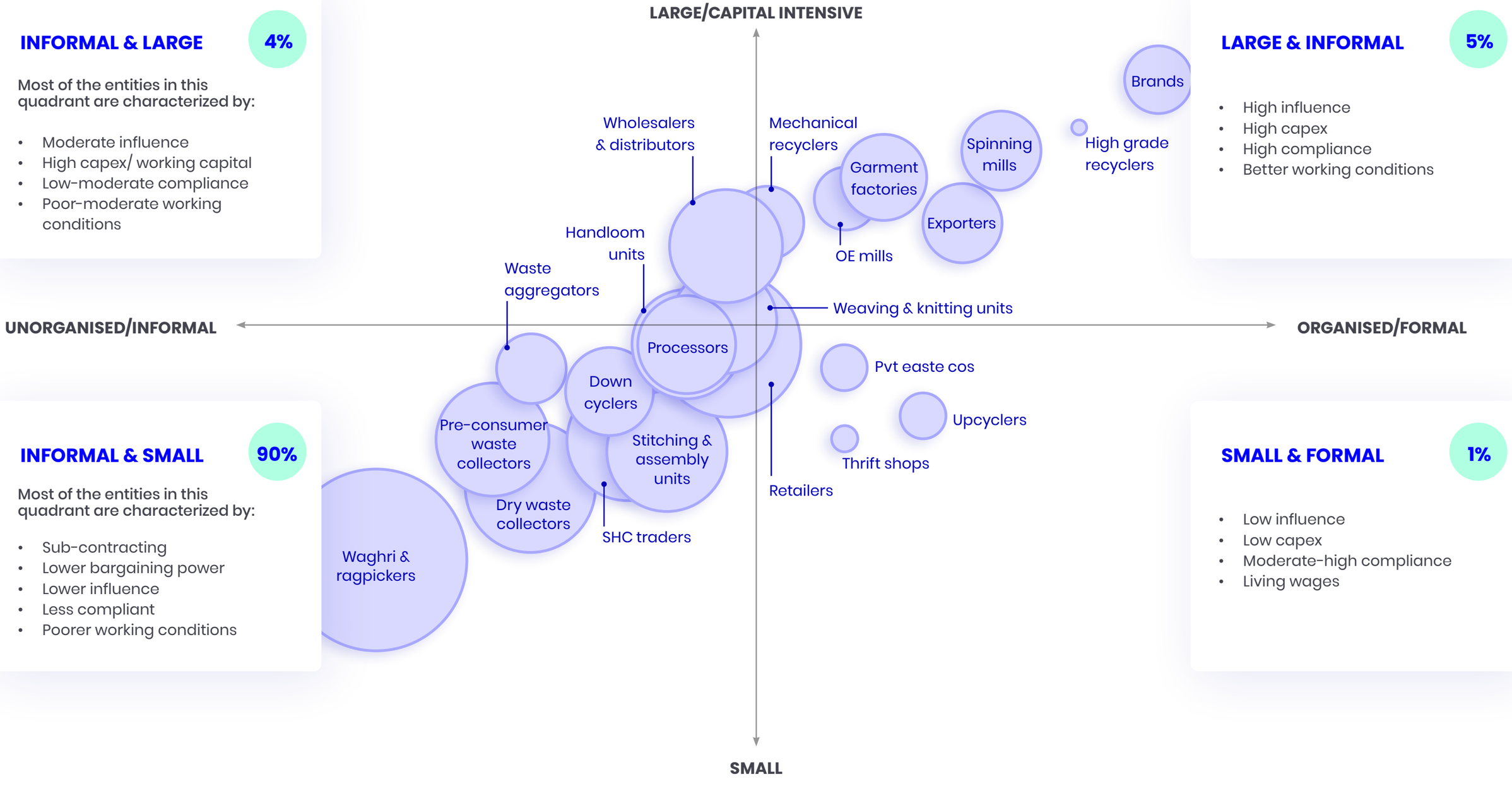
90% of the textile industry and textile waste ecosystem consists of small, unregulated and informal entities with limited resources and influence

INFORMAL & LARGE

4%

Most of the entities in this quadrant are characterized by:

- Moderate influence
- High capex/ working capital
- Low-moderate compliance
- Poor-moderate working conditions



LARGE & INFORMAL

5%

- High influence
- High capex
- High compliance
- Better working conditions

INFORMAL & SMALL

90%

Most of the entities in this quadrant are characterized by:

- Sub-contracting
- Lower bargaining power
- Lower influence
- Less compliant
- Poorer working conditions

SMALL & FORMAL

1%

- Low influence
- Low capex
- Moderate-high compliance
- Living wages

NOTE: The chart includes both Pre-consumer and Post-consumer stakeholders

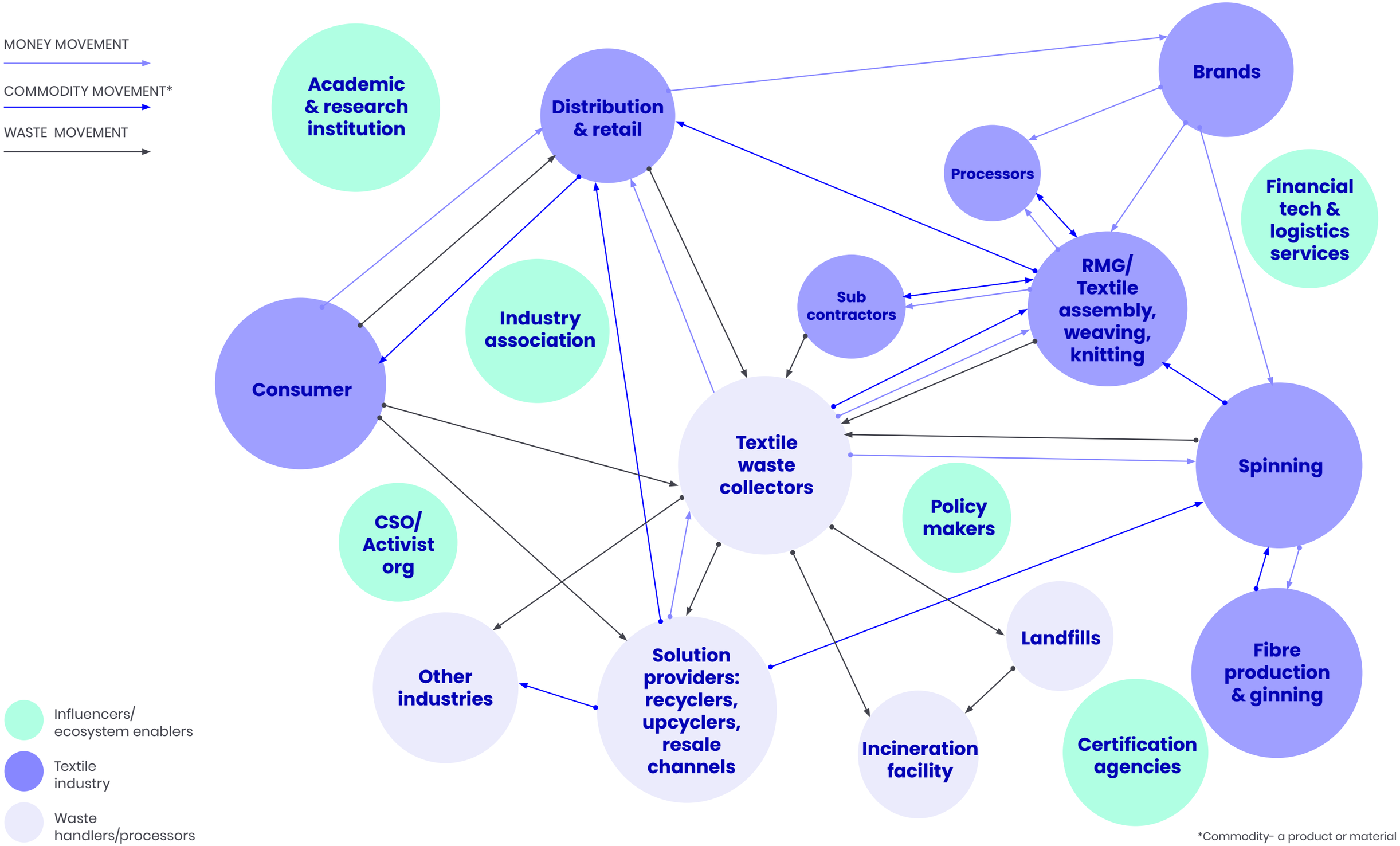
“

Through all layers of subcontracting of labour it is hard for brands and bigger factories to hold accountability for the social issues in the supply chain

”

ANONYMOUS, WASTE AGGREGATOR TIRUPUR

The textile waste ecosystem in India is mostly decentralized, fragmented and informal and involves diverse stakeholders operating at varying scales

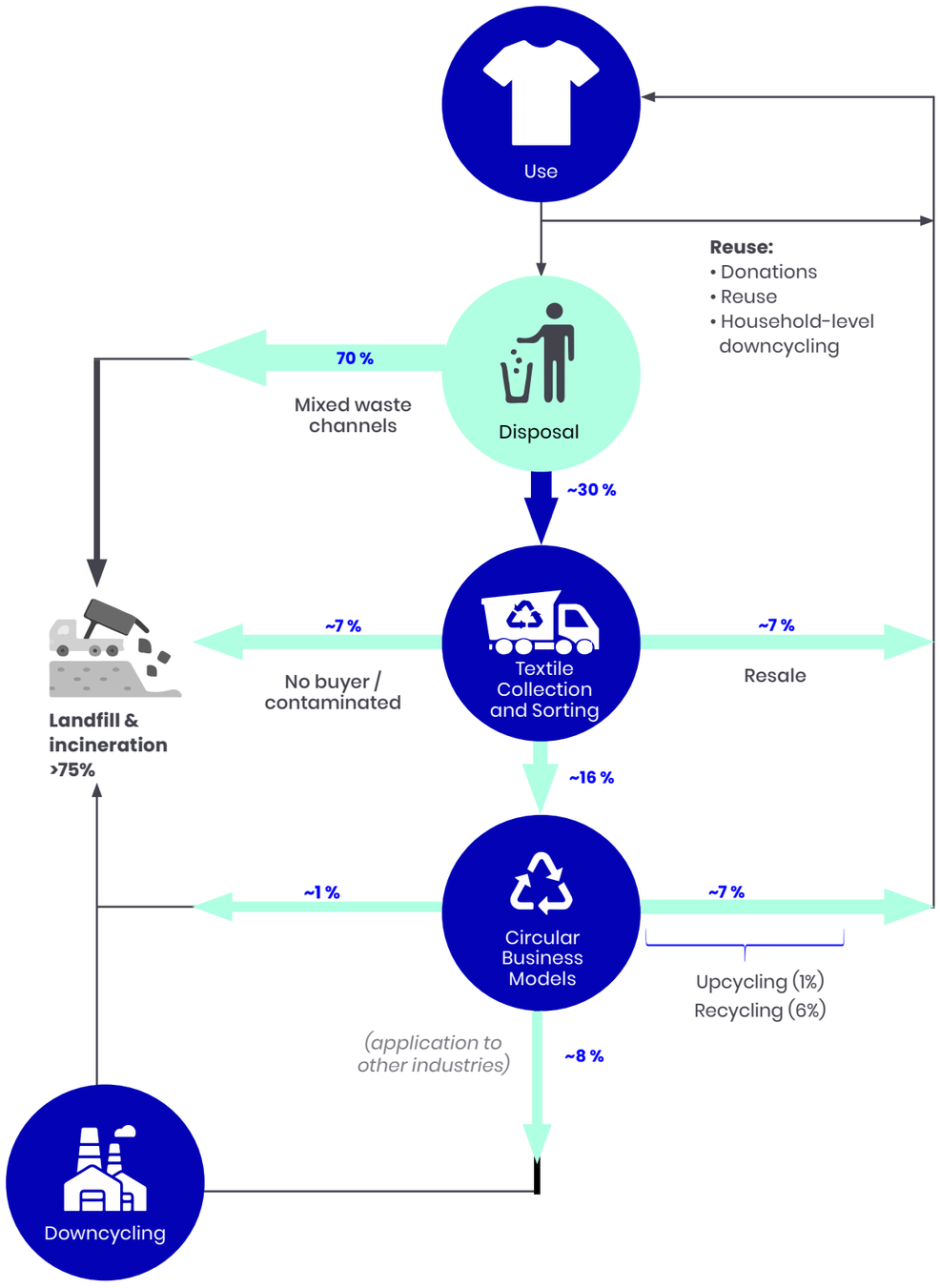


*Commodity- a product or material

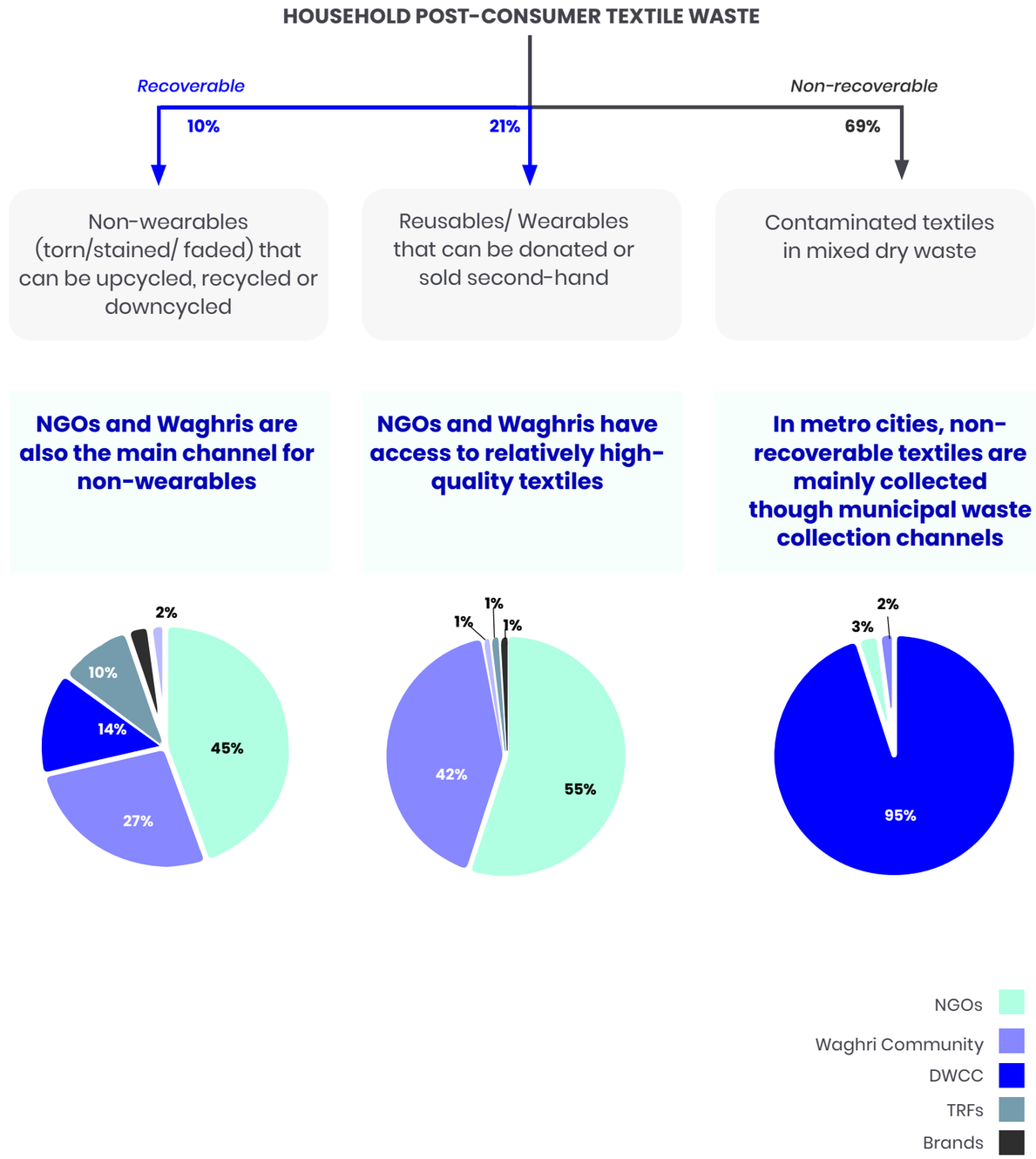
04.

Mapping post-consumer waste flows in an urban context

In a large city like Bangalore, over 75% of the urban household textile waste ends up being landfilled and incinerated while only ~14% enters high value circular value chains



The majority of the textile waste in a metro city like Bangalore is non-recoverable and collected through municipal waste collection channels, NGOs and Waghris are the main channel for recoverable textiles

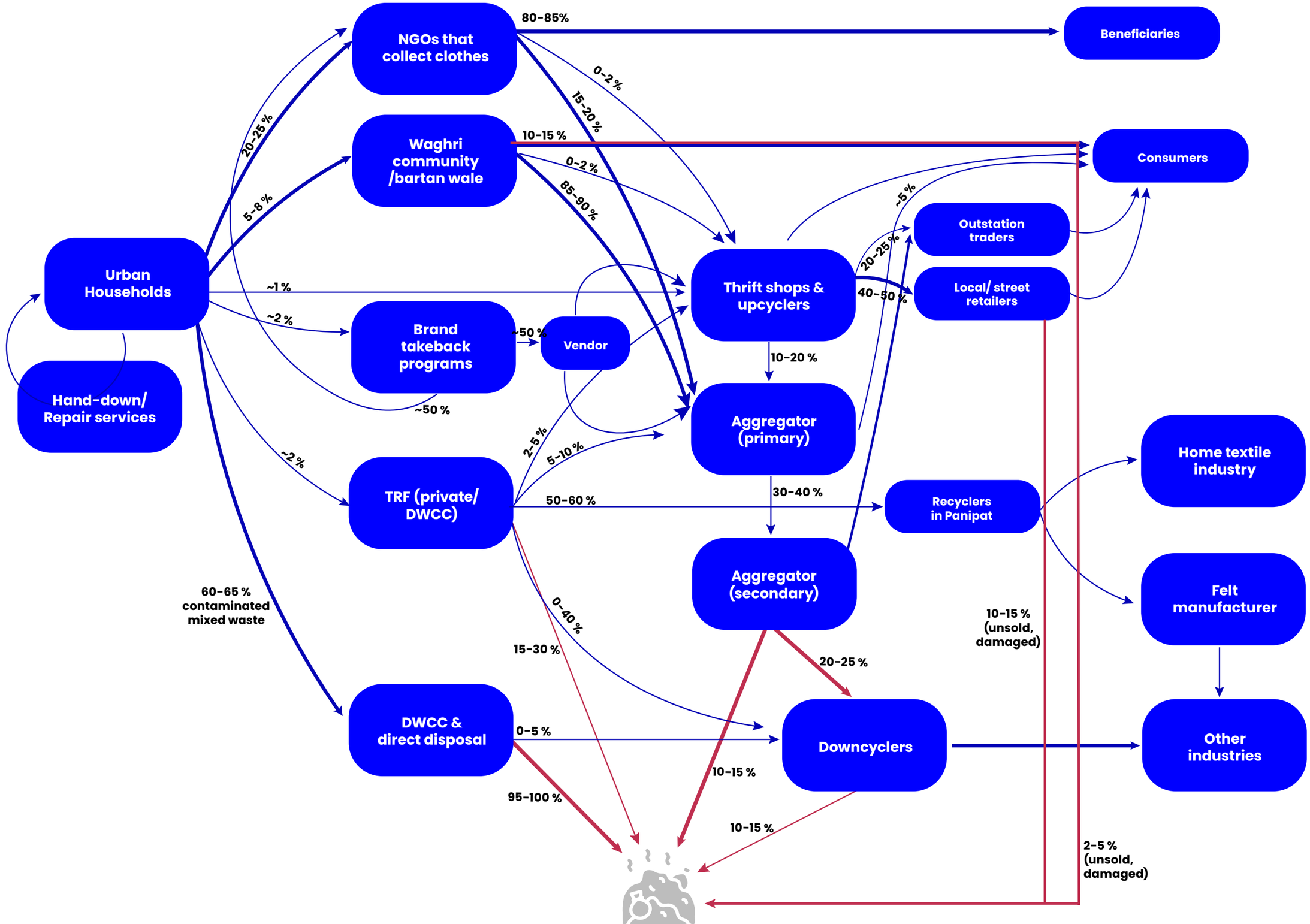


NGOs and Waghris are also the main channel for non-wearables

NGOs and Waghris have access to relatively high-quality textiles

In metro cities, non-recoverable textiles are mainly collected though municipal waste collection channels

Even from the higher-quality channels, textiles eventually reach landfill if no suitable consumer is found and when aggregators fail to



So... what exactly is happening at each stage of the value chain, that limited domestic textiles discards enter in circular systems?

	HOUSEHOLDS	COLLECTORS	AGGREGATORS	RESALE / REPAIR	UPCYCLERS	(MECHANICAL) RECYCLERS	DOWNCYCLERS
CHARACTERISTICS	• Buy 3-8 times/y • >80% population is high price sensitive • Millennials, Gen Z • adopting thrift • Only a select group prefer repair over disposal • Not willing to pay for waste collection • Very limited awareness of environmental impact	• Door-to-door collection • Majority of the workforce is women • Sorters predominantly unable to read and write, low wages • Highly informal nature, no contracts involved • Unsellable items are resold to aggregators • Market linkages are locally based, no access to bigger players • No use of technology	• Handles ~50-100 tonnes/ month • Semi-formal Collection of discarded clothes and dead stock • Purchasing from bartanwalas, retail shops, NGOs, institutions • Do basic repairs such as stitching, fixing buttons, zips • Discards unsold items in landfill	• Combination of formal (thrift stores, online platforms) and informal (local/street markets) • Activities include: sorting, washing, Ironing, storing and selling • Repair services are rare and can only repair certain types of garments • Currently, adoption of online thrift, and accessibility of local thrift markets remain low	• Mainly formal, creating fair jobs for women • Handles limited volumes (<10 tonnes/ month) • Have very specific requirements for the sorters • Overheads in sorting, design, customization, cataloguing and marketing	• Biggest group are the lowgrade recyclers (~5 tonnes/day), noncompliant and sell locally • Activities include sorting, shredding, bailing and selling to OE spinning mills • Mid-high grade recyclers prefer pre-consumer waste for known composition • Mechanical recycling is predominantly found in two large clusters and remains largely fragmented	• Purposes are wipes, felt, buff wheels, gloves, mats, beds/mattrasses, seats. • Informal nature; not willing to pay costs of compliance & certifications • Poor working conditions; risk of fire while shredding polyester • Input competition from eg. PET bottles
SYSTEM CHALLENGES	• Poor usage patterns: repurposing or downcycling into products that are used within their homes • No consistent and convenient access to a collection system results in disposal along with dry waste • Limited incentives to separate textile waste properly	• Difficulty to find demand for collected items results in downcycling & disposal of unsold items • High costs and low profit margins limit incentives to grow • Contamination and poor quality of collected garments • Lack of dedicated collection and storage infrastructure • Lack of compliance & transparency	• Poor discoverability and limited viable solutions for unsold items results in landfilling • Limited locally available high value solutions • Unknown composition of materials limits optimal end-use • Risk of damaging during rains • Use of dedicated (online) platforms for buyer-seller matching are adding too much to the overheads	• No collective mechanism to recollect (aggregate) all unsold items for circular purposes • Space limitations for stocking unsold items leads to dumping • Transportation overheads	• Difficult to scale due to limited customers • No certifications that can help increase sales of upcycled products	• Compliance is an additional and unaffordable cost • Buyers don't ask for compliance, neither regulations • Working conditions affect health & safety • Lack of traceability when using post-consumer waste for yarns results in low demand by compliant (international) buyers • Challenging to be competitive with virgin prices	• Compliance is an additional and unaffordable cost • Limited know-how and investment capabilities to improve operations Ref. Annex

"Indians take the life out of textiles within their households

"Contamination is a big challenge for us, about 45% of the received garments are rejected

"We store the unsold stock in anticipation of buyers. If it gets wet or if we run out of space, we are forced to dump it

"I buy on credit from aggregators and I have to repay the amount by Monday after sales in the Sunday markets

"We are bootstrapped and our procurement capacity depends on sales orders

"A sweater can contain a blend of cotton, cashmere, acrylic, nylon & spandex. None of the fibers can be recycled in the same pipeline

"Climate change is reducing winter days, leading to lower demand for felt for making jackets, & blankets

STAKEHOLDER PERSONA:
NGO

Poornam Ecovision, Pune

FOUNDED: 2012
EMPLOYEES: ~20-25 WITH CONTRACT
LOCATION: SINHGAD ROAD, PUNE
COMPANY TYPE: 80G CERTIFIED NGO

WORK DETAILS

- Activities: waste collection, public awareness, consultancy, product designing and manufacturing. Organize training for SHGs.
- ~ 2-3 drives conducted per month. Collection is between 50-1000 kg with an average of 300 per month.
- Sales of upcycled products happens mainly through events
- Workplace: Admin and logistics office, a big, ventilated, clean, hot,terrace-converted room with metal sheet roof for Paripoornam (upcycling)
- Revenue sources: sale of upcycled products, sale of waste
- Funding: CSR – Thermax Foundation, Persistent Foundation, KPIT,Cummins, HSBC etc.

TOP CHALLENGES

- Heavily contaminated clothes at times; unpleasant to work with
- Storage limitations
- Upcycler employees are likely to switch to a higher-paying or closer job
- Small scale due to limited demand and/or standardization possibilities

FUTURE PROSPECTS

Expect the Paripoornam program (upcycling unit of Poornam) to be financially self-sufficient by the end of 2026

STAKEHOLDER PERSONA:
Sorter in Dry Waste Collection Center

Meet Pramila from Bangalore

AGE: 54
GENDER: FEMALE
MONTHLY INCOME: RS 8000-10000
EDUCATION: 4TH GRADE
FAMILY MEMBERS: HUSBAND, SON, DAUGHTER-IN-LAW
DIGITAL LITERACY: VERY LIMITED

WORK DETAILS

- Timings: 8 am to 5 pm
- Transport to work: Walk
- Nature of work: sorting mixed dry waste and sometimes textiles
- Working conditions: Unhygienic, badly ridden with insects and stench

TOP CHALLENGES

- The pitiable work conditions: foul smell, unhygienic surroundings, insects & flies
- Very few holidays; was working full-time through COVID

MOTIVATIONS AND BEHAVIOURS

Does not want the children in her community continue the same job ever. Determined for change in her work but helpless.

JOB/WORK PROSPECTS

Will continue working here but in search of a better job. There are multiple health hazards at her workplace but she doesn't have a choice

STAKEHOLDER PERSONA:
Waghri / Boharin (textile collector)

Meet Meena from Kolhapur

AGE: 42
GENDER: FEMALE
MONTHLY INCOME: RS 10,000-12,000
EDUCATION: 8TH GRADE
FAMILY MEMBERS: THREE CHILDREN, HUSBAND, FATHER IN-LAW
DIGITAL LITERACY: CAN OPERATE A SMARTPHONE

A typical day

5 AM *Prepares breakfast and lunch, gets ready for the day*

6 AM *On market days like Sunday, setting up the stall and tending to customers. Going for collection on other days*

10 AM *Sorting and grading of collected clothes*

1 PM *Has lunch, brought from home*

1.30 PM *Grading/ sorting of clothes, going to Sheela tai to sell her stock to her*

4 PM *Laundry of some of the collection*

5 PM *Returns home to rest and prepare dinner, watches TV*

7 PM *Prapares dinner, feeds family, does preparations for the next day*

WORK DETAILS

- Timings: 6 am to 4:30 pm
- Transport to work: walking, rickshaw / tempo to carry material
- Nature of work: collecting , sorting and selling old clothes and textiles
- Working conditions: Walking long distances carrying load of utensils and clothes, visiting housing colonies and crowded bazaar areas

TOP CHALLENGES

Young generation does not find the job dignified. Poor access to housing societies and dignity in Mumbai, being solved for by BRC

MOTIVATIONS AND BEHAVIOURS

Enterprising, hardworking, is proficient at her business. Is satisfied with her earnings and financially stable.

JOB/WORK PROSPECTS

Will continue working the same way with/out support of any organisations. Has alternate income streams like selling decoration materials around festivals, fruits etc.

STAKEHOLDER PERSONA:
Upcycling Worker

Meet Savita Jadhav from Pune

Age: 34
Gender: Female
Monthly income: Rs 7500 - 11000
Education: 12th grade
Family: husband, two young children, in-laws
Digital literacy: can operate a smartphone

WORK DETAILS

- Timings: 9:30 am to 5:30 pm
- Transport to work: bus and walk
- Nature of work: sorting old clothes, cutting and half-stitching them into upcycled products
- Working conditions: a big, ventilated, clean, hot, terrace-converted room with metal sheet roof. Heaps of un/sorted clothes and sewing machines around

TOP CHALLENGES

- Distance from work, travel time of an hour one-way.
- Heavily contaminated clothes at times; unpleasant to work with
- Sending her kids to school, cooking and cleaning before work.

MOTIVATIONS AND BEHAVIOURS

Shy, diffident, gels well with her coworkers. Is average at the work she does. Religiously inclined. She likes the work but is open to other work opportunities closer to her place.

JOB/WORK PROSPECTS

She might be promoted to supervise other women, based on her performance. She might discontinue her job because she found one closer to her place or that pays better.

The system is not ready yet to implement and scale all type of innovations in India; larger investments in technologies will only get traction when there is assurance of offtake

LOCAL GLOBAL

Collection

Solutions that solve the problems of high overheads- collection and storage

Eco Dhaga, Mudlerft, Saahas Zero Waste, Sympany

Solutions that solve the problems of off take and the gaps between demand and supply

indiamart, Queen of Raw

Solutions fo traceability

satma, Reverse Resources

Solutions that have steady access to quality supply

Solutions that play a role in play a role in awareness within households

BTR Global Back To Roots

Sorting

Solutions that can optimize sorting by composition

KOSHA., Matoha

Solutions for demand supply mismatch

Solutions for traceability

Reverse Resources, Reverse Resources

Solutions for discoverability

KOSHA., ecotrace

Reuse

Solutions that allow customers to buy and sell second- hand items online

A-CAIN, Vinted

Solutions that work around the stigmas of second hand

BTR Global Back To Roots

Solutions that solve for the poor market infrastructure

toosed, Kiabza

Solutions for the poor access to regular supply and demand

Kiabza, Re love, Vestiaire Collective, THREDUP

Recycling

Solutions for 100% cotton and cotton dominant feedstock

CIRCULOSE

Solutions for 100% Polyester and polyester dominant

syre

Solutions for blends

irc

Solutions for elastane and contamination

RE:LASTANE, PICVISA, HKRITA

Downcycling

Solutions for mixed materials

Retl, THE GOOD FELT, KLEIDERLY.

Incineration /Landfill

Solutions to save costs

BURNING

Solutions for incineration

WASTE TO ENERGY INCINERATION

Mixed channel landfilling

India Adapts Innovations, Yet Scaling Remains a Challenge

- Very few gaps have been identified; however, most innovations still face limited scalability.
- The primary reason for this limited scale is the lack of demand on the buyer side.
- To enable wider adoption of these innovations, it is essential to increase the demand for recycled products.

Some innovations are available globally but not in India

- Large-scale recycling solutions (R&D stage) require early-stage investments and subsidies, which are limited in countries like India.
- To enter the Indian market, these innovations must demonstrate proven profitability, a viable business model, and effective operations before scaling

Please note: This is not an exhaustive but a landscape to highlight the gaps in innovation. A more detailed overview is given in the appendix

05.

Root causes and leverage points for systemic change

The post-consumer textile value chain has limited integration into circular systems due to 6 key challenges across the value chain

HOUSEHOLDS

COLLECTORS

AGGREGATORS

CIRCULAR BUSINESSES

BUYERS

2 In the existing collection system, the stakeholder struggle with unit economics and 2 quality

2 (Informal) collection partners are not linked to recycling value chains.

Segregated textile waste flows through informal channels; lack of linkages with off-takers prevents results in down-cycling and landfilling.

5 Lack of innovation limit the value potential of post consumer waste

4 Brands are not driving the system by creating a high demand; they are limited by compliance standards

3 Existing high value solutions barely use post-consumer waste due to quality & consistent volume barriers

1 Key stakeholders lack the motivation, incentives and infrastructure to ensure responsible use and disposal of textiles

5 Limited recycling solutions for the increasing polyester and blends results in downcycling and landfilling.

6 Lack of policy and regulations to incentivize the stakeholders across the full supply chain

1

Key stakeholders lack the motivation and incentives to ensure responsible use and disposal of textiles

Households & institutions

- They lack **access to convenient channels** for responsible disposal of textile waste.
- There **is poor awareness** about the severity andconsequences of the textile waste crisis.
- **High cost of repair services** coupled with the low cost of new garments makes discarding the preferred option for urban consumers.

Brands & manufacturers

- Without strong **policies like EPR**, brands and manufacturers lack the accountability and motivation to invest in takeback programs.
- **Lack of traceability** in the waste supply chain as well as lack of offtake further inhibits brands from implementing takeback & disposal programs.

Waste collectors

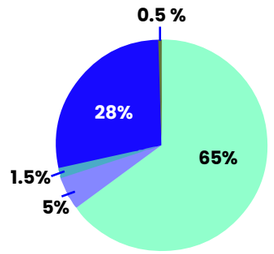
- Lack of **economic incentives** to collect, segregate and dispose textile waste in a responsible manner.
- Local scrap dealers only deal with plastic, paper,cardboard and metals and are **not aware** of buyers & value of textile waste.

LACK OF ECONOMIC INCENTIVES FOR WASTE COLLECTORS: COST & PRICE REALIZATION PER CATEGORY (INR/KG)

2

The (limited) existing collection stakeholders for textiles struggle with unit economics, quality and creating good working conditions

% SHARE OF COLLECTION VOLUME



Municipal dry waste collection is the dominant channel for disposing household textile waste due to convenient access, high penetration and daily collection rounds....

....but the channel struggles with the quality, unit economics, storage infra, value realization and working conditions.

	Quality of waste	Access for consumer	Frequency of collection	Penetration /Reach	Unit cost of collection	Storage infra	Value realization	Working conditions
Municipal dry waste collection	Low	High	High	High	Avg-High	Poor-Avg	Low	Poor
Waghri & similar communities	High	High	Low	Medium	High	Poor	Medium	Poor
Collection drives by circular biz	High	Medium	Low	Low	Avg	Good	High	Good
Donations to charity	Medium	Low	Medium	Medium	Low	Avg	Medium	Avg
Brand takeback program	Medium	Low	High	Low-Medium	Avg-High	Good	Low	Good

Source: Stakeholder & expert consultations

While other collection channels struggle with scale, access, storage and also value realization:

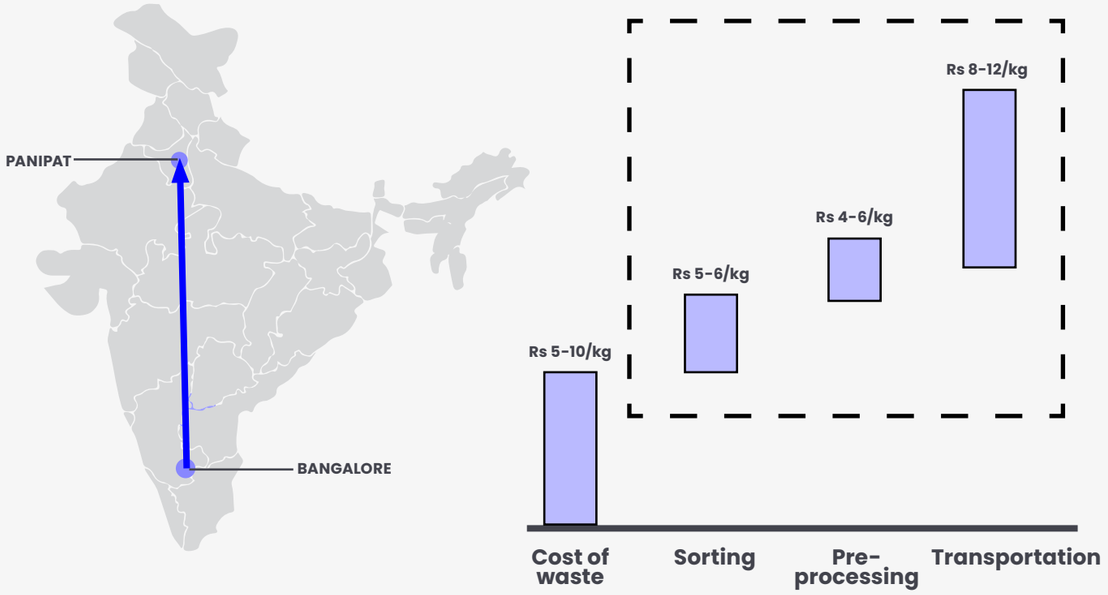
> Extended storage of textile waste in the same facility as mixed dry waste exposes it to contamination by rats, moisture & stench.
>
> -DWCC OPERATOR IN BANGALORE

> Access restrictions in gated communities, urbanization, closure of second-hand markets, low demand for utensils, etc. affect the livelihood of Waghri community.
>
> -SOCIAL ENTERPRISE IN MUMBAI

> We haven't invested in takeback programs since there is no transparency in the disposal supply chain & we can't be sure where the waste is ending up.
>
> -FASHION BRAND IN MUMBAI

2 Unit economics are a struggle due to limited access to existing channels + high transportation costs to reach these channels

The overheads of Rs 17-24/kg in sorting, pre-processing & transportation till Panipat makes selling to recyclers unviable compared to selling to local downcyclers



There is no standardization of prices and recyclers aim to minimize their procurement costs

RECYCLERS:

Unsorted waste:
Rs 4-5/kg

100% white cotton:
Rs 40-50/kg

100% solid cotton:
Rs 30-40/kg

Denim with > 98% cotton:
Rs 30-40/kg

UPCYCLERS:

Denim:
Rs 10-50/kg

Garments:
Rs 20-50/pc

DOWNCYCLERS:

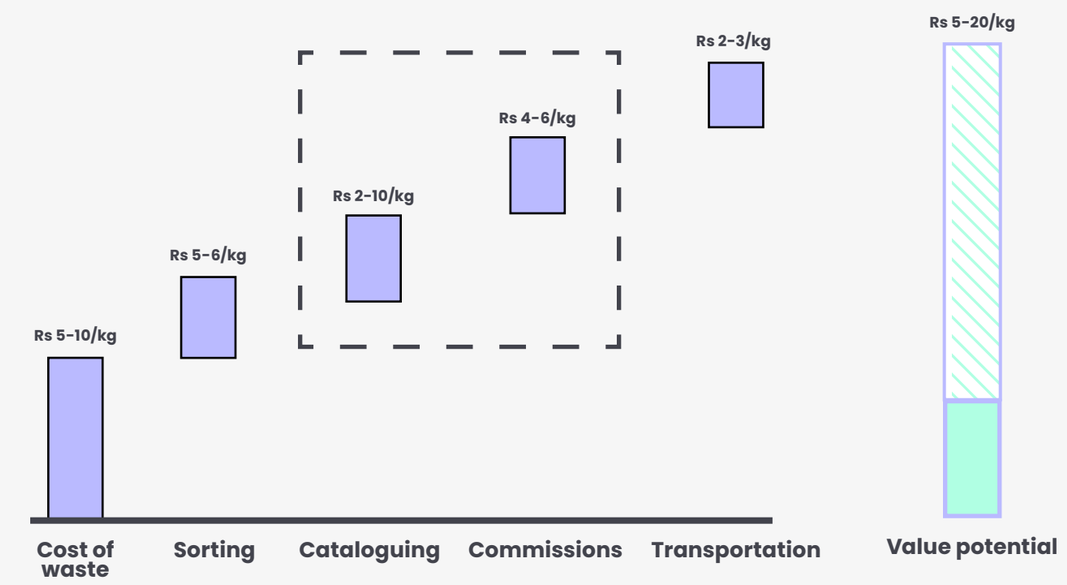
Cotton-rich waste:
Rs 15-18/kg

Polyester:
Rs 3-5/kg

Denim:
Rs 8-10/kg

2 The low value and margin potential of post-consumer textile waste coupled with tax and compliance liabilities limit the adoption of formal discovery platforms and marketplaces

Low value potential and high costs of cataloguing and listing fragmented non-homogenous waste makes it unviable for waste collectors and aggregators to list their inventories on digital platforms



Online listing requires fulfilling certain regulatory requirements and exposes the unorganized actors to tax liabilities

Online marketplaces require sellers to have Goods and Service Tax (GST) registrations and other licenses like Shop & Establishment, Fire Safety, etc.

Many aggregators and some of the recyclers and downcyclers have poor working conditions which are not compliant to fire safety and health norms

GST and income tax liabilities would eat into already thin sales margins

3 Existing high value circular solutions barely use post-consumer waste due to quality and (consistent) volume barriers

		TATTERED	FADED/ OVERWASHED	CONTAMINATION	NON-BRANDED	MINOR TEAR & DEFECTS	UNKNOWN COMPOSITION	MINIMUM VOLUMES
RESALE	ONLINE RESALE PLATFORMS	✗	✗	✗	Limited	✗	✓	✓
	THRIFT STORE	✗	✗	✗	Limited	✗	✓	✓
	SECOND-HAND MARKETS	✗	✓	✗	✓	✓	✓	✗
	UPCYCLING	✗	✗	✗	✓	✓	✓	✗
	RECYCLING INTO YARN	✗	✗	✗	Non-compliance is the issue here	✓	✗	✗
	DOWNCYCLING INTO OTHER PRODUCTS	✓	✓	✗	✓	✓	✓	✗

Quality constraints

Quantity constraints

> Gen Z and millennials are **driving the growth** of thrift in metros, while the older generation has concerns around hygiene & quality
>
> – THRIFT STORE IN BANGALORE

> In order to process a batch of 20 tonnes of **textile waste of a particular colour,** we have to procure & sort through 300 tonnes of post-consumer waste
>
> – RECYCLER IN PANIPAT

> Due to **lack of consistent** quality in sourcing postconsumer waste, we are now procuring pre-consumerwaste at a higher price
>
> – UPCYCLER IN KOLKATA

3 Although recyclers and upcyclers are slowly showing more interest in sourcing post-consumer textile waste, aggregators and collectors face several challenges in catering to their requirements

Low & mid grade mechanical recyclers in Panipat & upcyclers are slowly opening up to using domestic post-consumer textile waste as their feedstock

- Recyclers in Panipat have a combined capacity of recycling 500 tonnes/day & largely use imported post-consumer textile waste sourced from importers and waste collectors in Kandla and Panipat
- The recycled yarn is coarser of lower counts and is mostly used for home textiles
- Based on pilots by ecosystem enablers, some mid-high grade recyclers are showing interest in select post-consumer textile waste streams:
  - 100% cotton Whites
  - 100% cotton pastel solids
  - Denim with more than 98% cotton
  - Wool and acryllic
- Upcycler preferences:
  - Larger cut panels
  - Fabric with designs and embroidery
  - Denim

Post-consumer textile waste aggregators are either unaware or unable/unwilling to cater to recycler requirements, while upcycler requirements tend to be irregular and niche

- Aggregators are mainly focused on rewearables for resale
- The overheads in aggregating non-homogenous household textile waste, sorting on the basis of colour & composition, removing disruptors & transporting to Panipat is not viable
- Storage of sorted stock requires more space & aggregating a truck load of sorted stock would require more time, thus locking up space & working capital
- Most upcyclers have niche demand and do not offtake on a regular basis
- Selling unsold stock & any non-rewearables to downcyclers locally would yield better profit margins & improve cashflow
- Sorting technologies like Matoha and Picvisa are not commercially viable and cannot be deployed at scale

4 Brands hold the catalitic key to kickstarting post-consumer waste uptake

IF.. Brands start to demand post-c fabrics

Then the demand for sorted post-c waste increase

Then the sorting business model will become viable

Then sorters find incentives to scale

Then sorters will be able to scale their operations resulting in higher quantities of recycled output

Then recyclers will increase their post-c yarn volumes

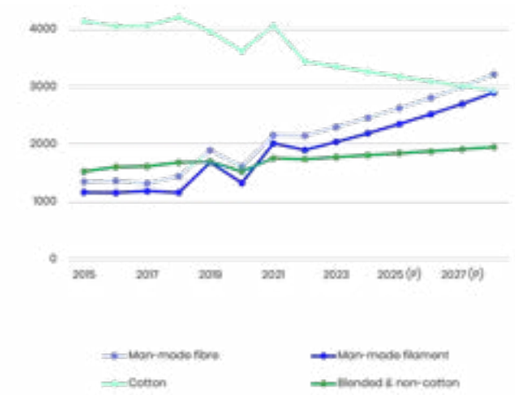
AND THE WHOLE SYSTEM IS CAPABLE OF INVESTING FOR IMPROVEMENTS

But they struggle to demand fabrics with post-consumer content: the transparency and traceability gap

- Consumers and circular businesses do not know the source of post-consumer waste especially due to the lack of organized collection systems
- Products specs cannot be of the same details as with raw materials or preconsumer materials
- Recycling of post-consumer material often results in non-compliant recycled output resulting in apprehension
- Some traceability-based solutions exist but only provide tracking the first use of the garment and are removed or dissolved at the pre-processing or recycling stages.
- Low value realization does not justify the incremental investment in traceability solutions
    - Good quality RFID tags or DNA tagging that can withstand 200 washescosts around Rs 30/ pc
    - Additional costs of deploying the RFID trackers and developing and managing the software

5 Lack of product and tech innovations is another limiting factor in value realization of post -consumer waste; this is mainly caused by high R&D costs and limited incentives

Poly is increasing, while solutions are limited & yet to be implemented at scale



TRENDS IN INDIA'S YARN PRODUCTION

Key barriers are competition from existing alternatives, time and cost involved in R&D

Application	Sustainable Substitutes
Furniture	Recycled wood, Recycled plastics
Tiles	Ceramics, Recycled Plastics
Consumer lifestyle products	Recycled plastic, plant-based biodegradable fibres (banana, are-canut, hemp, etc.)
Thermal insulation	Recycled wool
Acoustic insulation	Recycled PET, foam, wool

- R&D and prototyping new products can involve considerable time and resources
- Consumer products tend to be more premium but their demand depends on the prevailing fashion trends while B2B applications have lower value realization and are cost-sensitive

In the absence of recycling solutions, polyester & blended non-wearable textile waste are mostly downcycled

Downcycling- Wipes
Cotton-rich blends have good absorption and can be used as wipes

Downcycling-Felt
100% polyester and poly-cotton blends are used for making felt for industrial and automobile applications

Downcycling- Bedding
Shredded waste is used for stuffing mattresses and pillows

6 Lack of policy and regulations to incentivize the stakeholders across the full supply chain

Example: EU and India comparison

India's system for textile waste disposal and recycling is still developing, relying heavily on informal networks and emerging policy measures. The European Union, while not without its own challenges, is further ahead, with a more structured and enforceable approach supported by advanced legislation and infrastructure.

ASPECT	EU	INDIA
Legislative Framework	Advanced, with binding regulations for textile waste collection and recycling.	Evolving, with draft policies and partial regulation.
EPR	Widely implemented, legally binding in many countries.	Early stages, voluntary frameworks under consideration.
Subsidies	Comprehensive funding programs for innovation and infrastructure.	Focused on technology upgrades and limited state-level initiatives.
Waste Management	Sophisticated systems for separate collection, reuse, and recycling.	Largely informal, with limited segregation and formal recycling.
Circular Economy	Strong emphasis on product lifecycle sustainability and circularity.	Growing focus but hindered by infrastructural and policy gaps.

POLICY GAPS ON CIRCULARITY

1. Lack of Comprehensive Circular Economy Legislation

No comprehensive policy framework like the EU's Circular Economy Action Plan, with fragmented, sector-specific regulations.

2. Weak Implementation & Enforcem.ent

Poor compliance with existing policies and limited monitoring of circular initiatives' effectiveness.

3. Limited EPR Coverage

EPR frameworks mainly focus on plastics and electronics, excluding textiles and other sectors.

4. Inadequate Incentives

Minimal financial support for circular practices, with policies favoring linear production over circular models.

5. Data & Measurement Gaps

No standardized metrics or indicators to measure resource efficiency or track circular economy progress.

POLICY GAPS ON INCLUSION

1. Lack of Policies Addressing Social Standards in the Informal Sector

No regulations ensuring basic protections, such as formal contracts, social security, and safety measures, for informal workers in recycling and waste management

2. Absence of Gender and Child Labor Protections

Policies fail to address gender disparities in wages and exploitation, or regulate child labor risks in informal recycling, especially in low-income communities.

3. Inadequate Skill Development Policies

No formal policies or programs to reskill informal workers or integrate them into the formal circular economy, leaving workers excluded from better opportunities.

4. Limited Policy Engagement with Informal Workers

Circular economy policies neglect the critical role of informal workers in the recycling system and exclude marginalized groups from policy-making processes.

5. No Ethical Labor Standards in Circular Production

Policies promoting circular production fail to address ethical labor practices, such as fair wages, safe working conditions, and compliance with global labor standards in recycling and upcycled manufacturing.

WAY FORWARD: CIRCULARITY

- Develop an integrated circular economy policy.
- Strengthen enforcement mechanisms and expand EPR across more sectors.
- Offer financial incentives and subsidies for circular business models.
- Invest in waste management and recycling infrastructure.
- Promote education and awareness campaigns on the benefits of circularity.

WAY FORWARD: SOCIAL ASPECTS

- **Formalizing the informal sector** by integrating waste pickers and informal workers into formal systems with legal protections, fair wages, and access to social security.
- **Establishing occupational safety standards** for all workers in waste management and recycling processes.
- **Promoting gender equity** through targeted policies addressing wage gaps and discrimination in recycling roles.
- **Creating reskilling initiative**s to prepare workers for emerging roles in a circular economy.
- **Mandating ethical labor practices** in circular supply chains, ensuring compliance with fair trade and global labor standards.

Key leverage points for system interventions: Opportunity areas for system change in Indian textile waste management

	HOUSEHOLDS	COLLECTORS	AGGREGATORS	CIRCULAR BUSINESSES	BUYERS
PATTERNS RULES, PRACTICES, DOCTRINE, TACTICS, TECHNIQUES AND PROCEDURES	Overconsumption	Limited storage space coupled with delays in offtake lead to dumping	Lack of compliancy and transparency		Use of polyester and blends are rising
	70% Disposal in mixed waste channel	Storage constraints & extended storage without offtake leads to dumping		Competition from conventional & sustainable alternatives	Low and non-consistent off-take of post-c materials
	"Indians take the life out of the garment"	Overheads in pre-processing	Non-homogenous and fragmented nature	Unwillingness to sort on basis of colour due to labour, space and time constraints	Quality of textiles are declining due to fast fashion
	Improve Access to repair and/or collection system	Lack of robust textile waste collection systems	Low volumes per unit, unable to sell to larger players	No scaled circular applications & innovations for polyester & blends	Limited deposit & takeback schemes by brands and retailers
STRUCTURES ORGANIZATIONS, LAWS, AUTHORITY, RELATIONSHIPS	Mixt waste is most convenient discard structure offered	Municipal dry waste centers have not included textiles as a separate stream	Lack of access of (in)formal players to existing recyclers	Lack of product categories and supporting policies for recycled materials	Brands & textile industry have a lot of influence
	No regulations, rewards pen-alties to ensure segregation at source	Bartanwala-aggregator channel is not fully leveraged	Informal nature of collectors and aggregators make discovery challenging	No local recycling hubs to lower transportation costs	Lack of EPR
				Low, niche, trend-dependent & seasonal demand for upcy-cled products	Brands & manufacturers chase growth
MENTAL MODELS BELIEFS, TRADITIONS, ASSUMPTIONS, VALUES	Low value attributed to waste-based products			Quality of domestic waste is lower than quality of imported waste	Low value attributed to waste-based products
	Throw vs Repair mindset				
	Unconscious consumption and disposal			Quality of (post-c) recycled materials is not good enough	Branded and new are more aspirational
	New is more trendy than Recycled / reused				

HIGHER LEVERAGE AND HIGH IMPACT — LOWER LEVERAGE AND LOW IMPACT

Largest (environmental) system change impact can be made at household level; however, if there are no off-takers the collected garments need to be disposed all together.

Therefore, it is needed to work on the demand side and matching demand & supply before increasing volumes along the value chain.

This requires adoption of domestic waste by existing circular solutions, filling solutions gaps, ensure collectors can meet requirements both with quality and quantity, and create an increased demand for recycled products through supporting policies and subsidies.

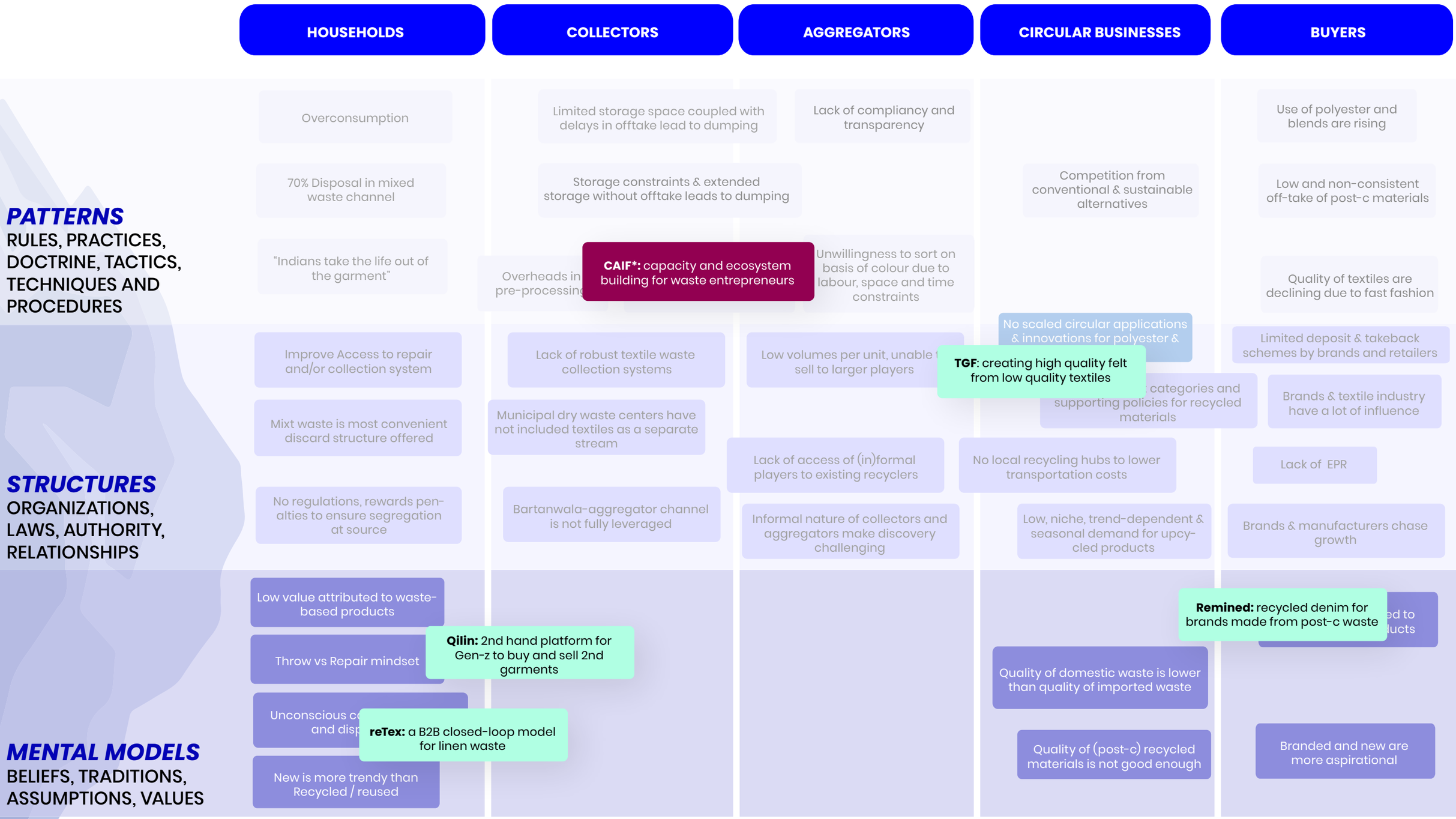
All of this will only work if unit economics work for all players involved, either through positive business models or structural subsidies and support.

“Victory comes from finding opportunities in problems”

06.

Current system interventions we are working on

Enviu's current interventions in development



THE GOOD FELT

Made from Recovered post-consumer Textiles

Completely Circular

Endless Applications

Dedicated to transforming poor quality and post-consumer mixed textile waste into premium, non-woven felt sheets.

THE MODEL

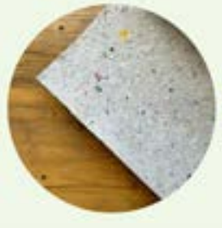
TGF takes off low quality post-consumer waste from local waste entrepreneurs. The textile waste is converted into into high quality non-woven felt sheets, suitable for multiple applications like fashion accessories, acoustics, sound proofing panels.

www.thegoodfelt.com

thegoodfelt

hello@thegoodfelt.com

Old clothes rejected by recyclers.



Converted into Felt Sheets

Turned into unique products.

APPLICATIONS

Fashion accesssories | Acoustic Panels | Packaging and more

IMPACT 2023-2024

Waste Diverted - 3 tonnes

Jobs Provided; Direct - 3, Indirect - 7

reTEX

Made from Recovered Textiles

Extended Life

Multiple Applications

A venture solving for the post institutional waste, committed to sustainable solutions that maximizes the value of the (hotel linen) waste.

THE MODEL

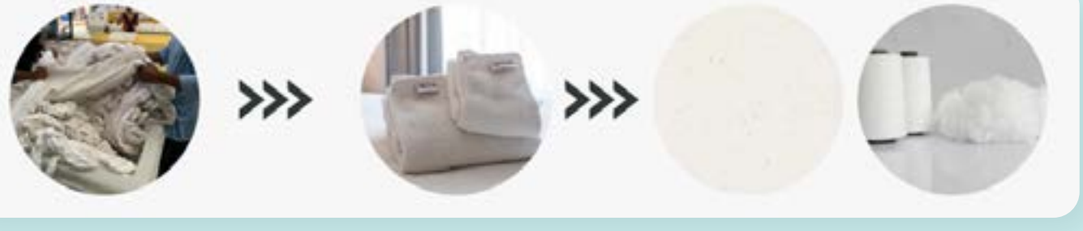
At Retex, we are committed to sustainable solutions through a two-fold approach that maximizes the value of hotel linen waste, current focus.

1. Recycling Feedstock
2. Upcycled Products

Reweave.enviu.org

Reweave.enviu

tharun@enviu.org



End of life discards collected like Uniform, Table cloth, bedsheets, towels etc.

Recycling Feedstock

Recycle and make products like yarn, paper, ropes, home textiles etc.

IMPACT 2023-2024

Waste Diverted - 15 tonnes

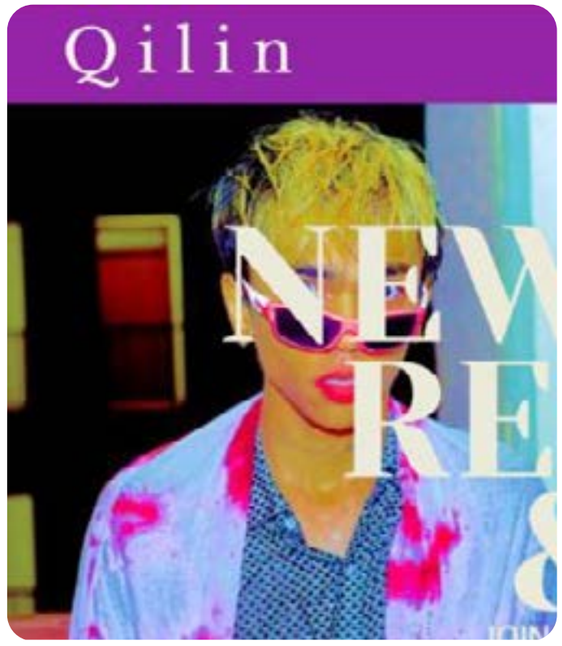
Jobs Provided:Direct – 6, Indirect - 5

QILIN

Extended Life

Reduced need for new production

Top customer: Millennials & Gen Z



A venture preventing wearables ending up in landfills, directly connecting buyers and sellers of pre-loved clothing and enlarging their life

THE MODEL

A digital platform which connects buyers and sellers of 2nd-hand clothing. We offer buyer protection, product visibility, platform advertising, and delivery subscriptions, which will also serve as our revenue streams.

Reweave.enviu.org

Reweave.enviu

anna@enviu.org

Seller uploads picture and details about their clothes, and posts it on the platform

Buyer searches for preloved items, chats with seller, and closes the deal with secure payment

Seller ships the agreed upon item. Buyer confirms correct receival

Once confirmed, seller receives payment and both leave reviews

IMPACT 2023-2024

n/a (in concept stage)

n/a (in concept stage)

Re-Mined

Made from postconsumer denim

Textile to textile circularity

Reverse value chain

Alternative materials

The venture focuses on circular Denim business model and aims to utilize Pre and Post-consumer Denim waste that are downcycled, landfilled and incinerated in India

THE MODEL

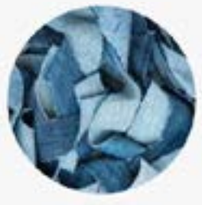
Post consumer denim is used to make recycled yarn and fabric which is sold to apparel manufacturers, nominated by Brands, Fabric exporters, Designer labels and Retail stores. The venture will ensure transparency in the supply chain and meeting customer demands for the fabric characteristics .

Reweave.enviu.org

Reweave.enviu

ramjith@enviu.org

Collection of discarded denim, sorting, disruptor removal by waste entrepreneurs



Shredded feedstock sent for processing into fiber

Post consumer denim fiber is blended with virgin cotton fibers and Agro waste fibers to denim mills

New Denim fabrics are produced using recycled yarn and sold to brands

IMPACT 2023-2024

n/a (in concept stage)

n/a (in concept stage)

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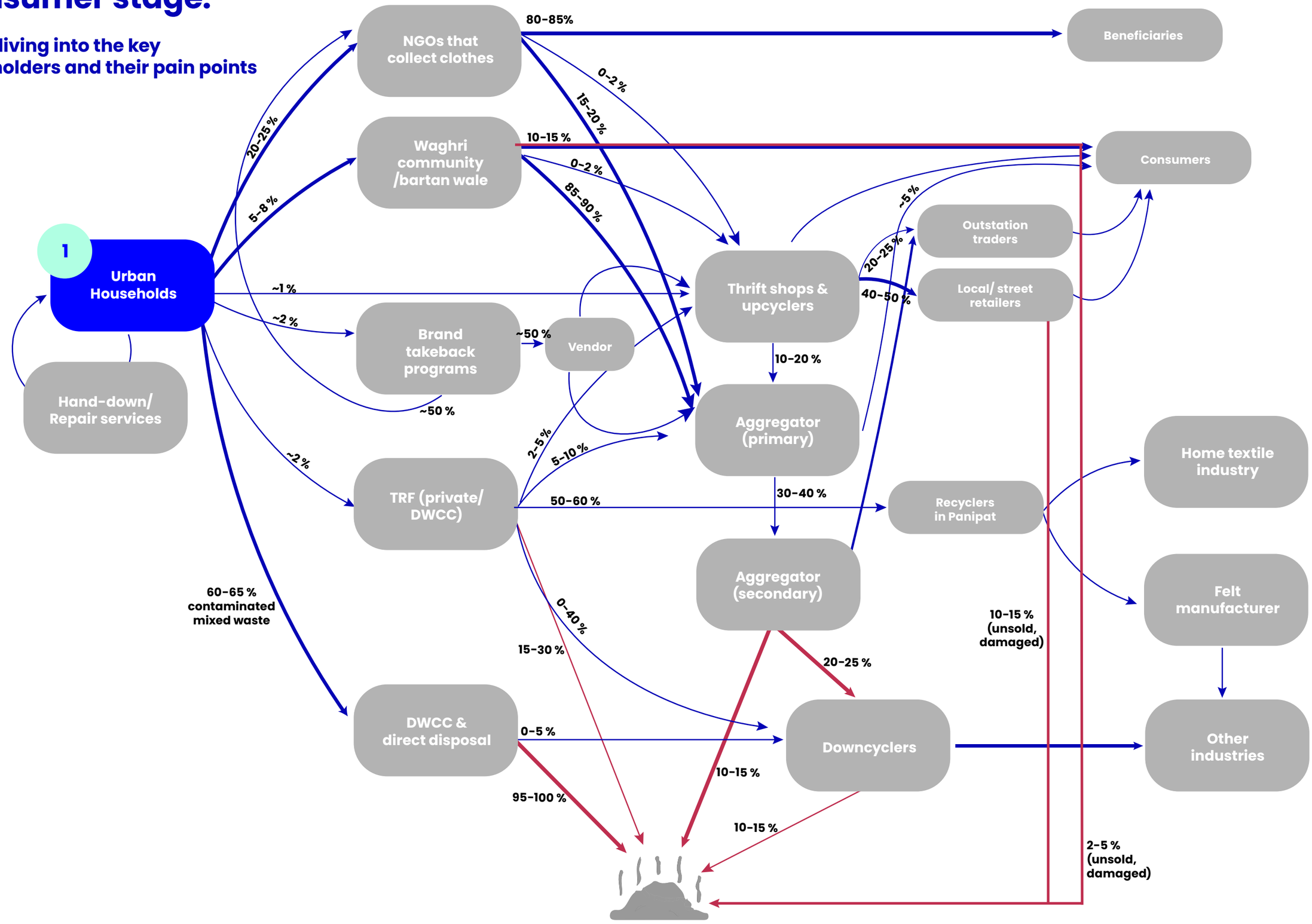
Annex

Detailed Stakeholder mapping

Deep diving into the key stakeholders and their pain points

Consumer stage:

Deep diving into the key stakeholders and their pain points



1 Most interesting segment to influence are the middle income and aspirers because of size and repurpose / disposal behavior

Purchase & usage characteristics (scope: urban)

	High income (> 3 mn INR)	Middle income (0.5-3 mn INR)	Aspirers (0.125-0.5 mn INR)	Low income (< 0.125 mn INR)
Size of the segment	• 3 %	• **30 %**	• **52 %**	• 15 %
Characteristics	• Stay in gated communities, premium localities	• Stay in flats, houses in mid-premium areas • Price sensitive	• Stay in flats, houses in low-mid income areas • Highly price sensitive	• Stay in slums and low-income neighbourhoods • Water scarcity is a more critical issue than dirty clothes
Purchase trends	• Buy >6 times/yr • Buy global brands from malls, brand retail outlets, e-commerce, boutiques • Millenials, Gen Z adopting thrift and sustainability	• Buy 3-8 times/yr • Buy domestic and some global brands from malls, brand outlets & e-commerce • Millenials, Gen Z adopting thrift, sustainability	• Buy 3-6 times/yr • Buy domestic brands, non-branded clothes on sale in malls, local retailers & SHC markets	• Buy 3-8 times a year from SHC markets • Buy new, unbranded clothes forfestivals & occasions 1-2/yr • Labourers buy low quality, stained clothes for work
Repair & maintenance behavior	• Prefer discard over repair • May pay to repair expensive clothes • Pay for ironing & dry cleaning	• Older people may repair on their own • Selective dry cleaning • Wash & iron clothes on their own	• Mostly do slight repairs on their own • Manual washing • Nobody bothers to read wash & care instructions on clothing labels	• May make slight repairs on their own • Manual washing
Disposal channels	• Hand-me-downs (to helps) • NGOs • Brand takeback programs (youth) • Swap events (youth) • Collection drives by TRF, upcyclers, thrift shops • DWCC (stained, torn)	• Hand-me-downs (within family, relatives, to helps) • Repurposing in household • NGOs • Brand takeback programs • Collection drives by TRF, upcyclers, thrift shops, Bartanwala • Swap events (youth) • DWCC (stained, torn)	• Repurposing in household • Hand-me-downs (within family) • Bartanwala • TRF (where operational) • Mixed disposal through DWCC • Direct disposal • Burning	
Key insights	• Can pay for convenience (decluttering, collection systems) • High apathy, indifference regarding	• Will not pay for waste collection • Can be incentivized to discard waste	• Will not pay for waste collection • Needs incentives to discard textile waste	

Purchase & usage trends spotted

Fast fashion is driven by youth in high & mid-income segments;

Affordable Access to Global Trends: Fast fashion brands offer trendy and stylish clothing at low prices, making them highly appealing to younger consumers in urban and semi-urban areas who want to emulate global fashion without high costs.

Digital Influence and Social Media: Platforms like Instagram and TikTok promote fast fashion through influencers and targeted advertising, encouraging frequent wardrobe updates to stay relevant in a highly visual and social culture.Rapid Urbanization and

Disposable Income: Increasing urbanization and a growing middle-class youth segment with disposable income fuel the demand for convenient, affordable, and aspirational fashion choices.

Repair is on the decline due to cheap fashion

Historically, repairs have been outsourced to local artisans and tradespeople, given the affordability of labor.

With fast fashion offering low-cost replacements, repairing clothing has become less economically attractive

Additionally, the long-standing reliance on outsourcing repairs has left many individuals without the necessary time or skills to repair items themselves

Thrift is gaining popularity among youth; mainly driven by cost, trends and climate consciousness

India's 2nd-hand fashion market is expected to grow at a CAGR of 11% between 2021 and 2031

Rising Environmental Awareness: Gen Z & Millennials are more environmentally conscious

Affordability: Higher-end brands and luxury products are more affordable on the 2ndhand market

However, not everyone is onboarded due to Limited trusted opportunities and hygiene issues

1 Disposal Insights

System challenges

Poor usage patterns: Most individuals repurpose or downcycle old clothes into products that are used within their homes and pass on rewearables to younger siblings and/ or domestic help. Downcycled products result in contamination and landfilling after use.

Lack of segregation at source: Lack of regulations and public awareness on segregation leads to the disposal of both reusable and unusable textile waste along with mixed dry waste

Lack of an established collection system: Consumers do not have consistent access to collection systems. The ones that are existing are irregular and/or inconvenient. They would be helped with a 'one-stop-shop' for all their textiles, including lower quality items.

System Opportunities

Dedicated textile waste disposal & collection systems like collection bins, on-demand collection, decluttering services

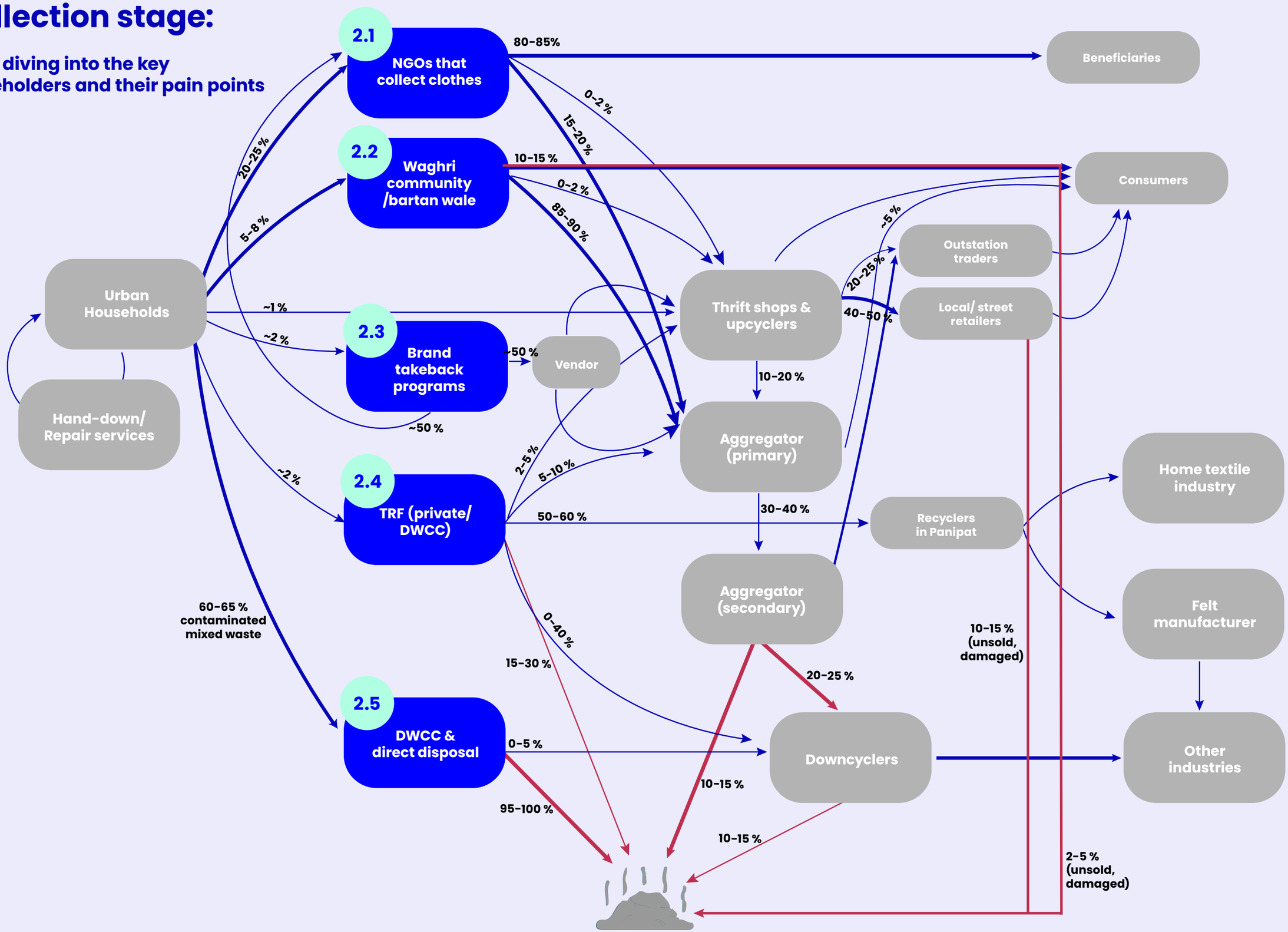
Regulations, rewards & penalties to ensure segregation of textile waste at source

Repair, deposit & takeback schemes by brands and retailers

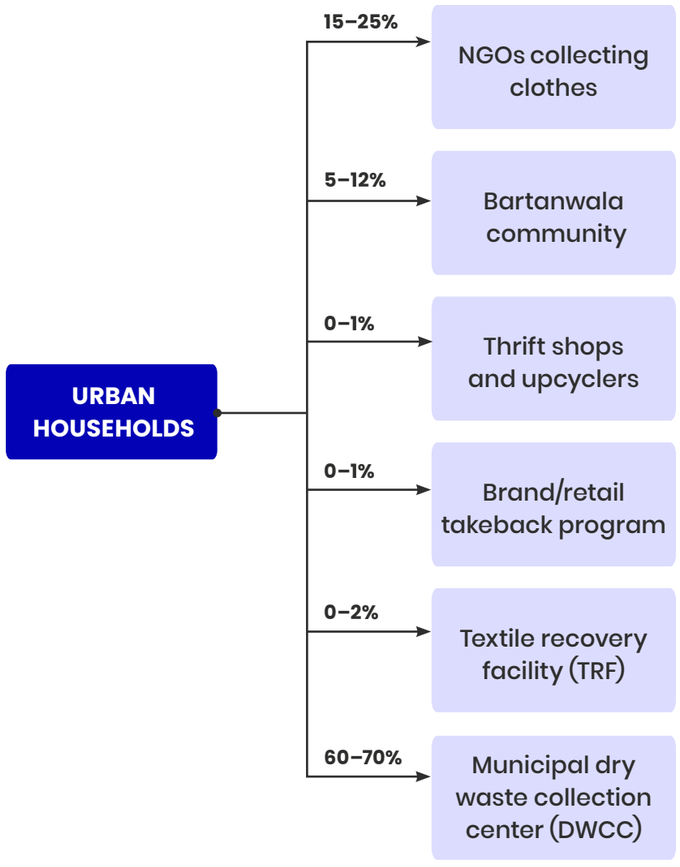
Awareness and behavior change campaigns for households

Collection stage:

Deep diving into the key stakeholders and their pain points



2 Largest textile waste volume flows through municipal DWWC, which is the least circular. Most channels struggle with finding circular models and are working with vulnerable stakeholders



	% TO LANDFILL	% TO CIRCULAR MODELS	TRENDS	QUALITY OF DISCARDS	VULNERABLE STAKEHOLDERS	SIZE OF THE WASTE STREAM	EASE OF SCALING AND IMPLEMENTATION
NGOs collecting clothes	2%	3%	↗	Good/mixed	Low	Low to medium	Medium
Bartanwala community	15%	20%	↘	Good/mixed	High	Medium	Medium
Thrift shops and upcyclers	<1%	2–5%	↗	Good	Low	Very low	Medium
Brand/retail takeback program	4%	6%	↘	Good/mixed	Low	Low	Medium–high
Textile recovery facility (TRF)	20–30%	20–40%	↗	Mixed	High	Low to medium	Medium–high
Municipal dry waste collection center (DWCC)	>95%	0–5%	↗	Poor	High	Very high	Low–medium

2.1 NGOs collecting clothes for donation: storage space and the mismatch in demand and supply are key pain points for large and small NGO's

Large Indian NGO operating across multiple cities

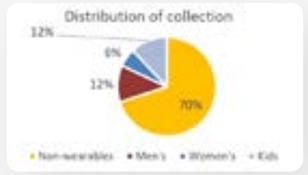
Handles 3-4 tonnes per city per month; (India: ~5,000-8,000 tonnes/yr)

OPERATING MODEL:

Collection & QC through drives, dropoffs, institutional partnerships → Aggregation at city level & sorting for donation, upcycling → Processing (washing, repairing, packing upcycling) → Donations to beneficiaries & sale of upcycled products

PAIN POINTS
- High cost of collection, storage & labour
- Storage space limitations during peak period
- Contamination & poor quality
- Mismatch in demand & supply
- 70% is non-wearable
- Donor apathy

NEEDS
- Relevant (socially acceptable) garments for rural population
- Grants for operations
- Ensuring dignity for staff & beneficiaries
- Ensuring flow of collection in future



MOST PROBLEMATIC WASTE STREAMS
- Wearables:
  - Over-sized
  - Fashionable
- Non-wearables
  - Tattered
  - Worn out/ faded
  - Contaminated

"People donate what they have used and not what others need"

Small NGO operating at city-level

Handles 0.3–1 ton per city per month

OPERATING MODEL:

Collection through dropoffs, pick-ups and drives → Aggregation & storage in NGO office → Clothes are donated to beneficiary NGOs

PAIN POINTS
- Cost of collection, storage & operations
- Storage space limitations
- Mismatch in demand and supply
- Surplus stock: eg: sarees

NEEDS
- Funds for operations
- Recognition

MOST PROBLEMATIC WASTE STREAMS
- Undergarments
- Non-wearables
  - Polyester
  - Contaminated

2.2 Bartanwala - there are several nuances across bartanwalas in different cities and castes with regard to gender roles, types of waste collected, repair, sales channels, etc.

Waghri woman collector & retailer in Mumbais

Handles ~100-150 kg per week | no schooling | 45yr | headload | barter & cash | clothes

OPERATING MODEL:

Door-to-door collection rounds & purchase/ barter → Sorting into grade A,B and C & storage at home → Sale in SHC markets in Mumbai → Sale/ disposal of grade C, unsold items

PAIN POINTS
- Poor access to gated communities
- Storage space limitations
- Sub-optimal collection rounds
- Households want to dispose torn clothes too
- 8-10% is grade C, which is sold as chindi, for low prices (Rs 3-10/kg)
- Closure of SHC markets
- Inconvenient market timings

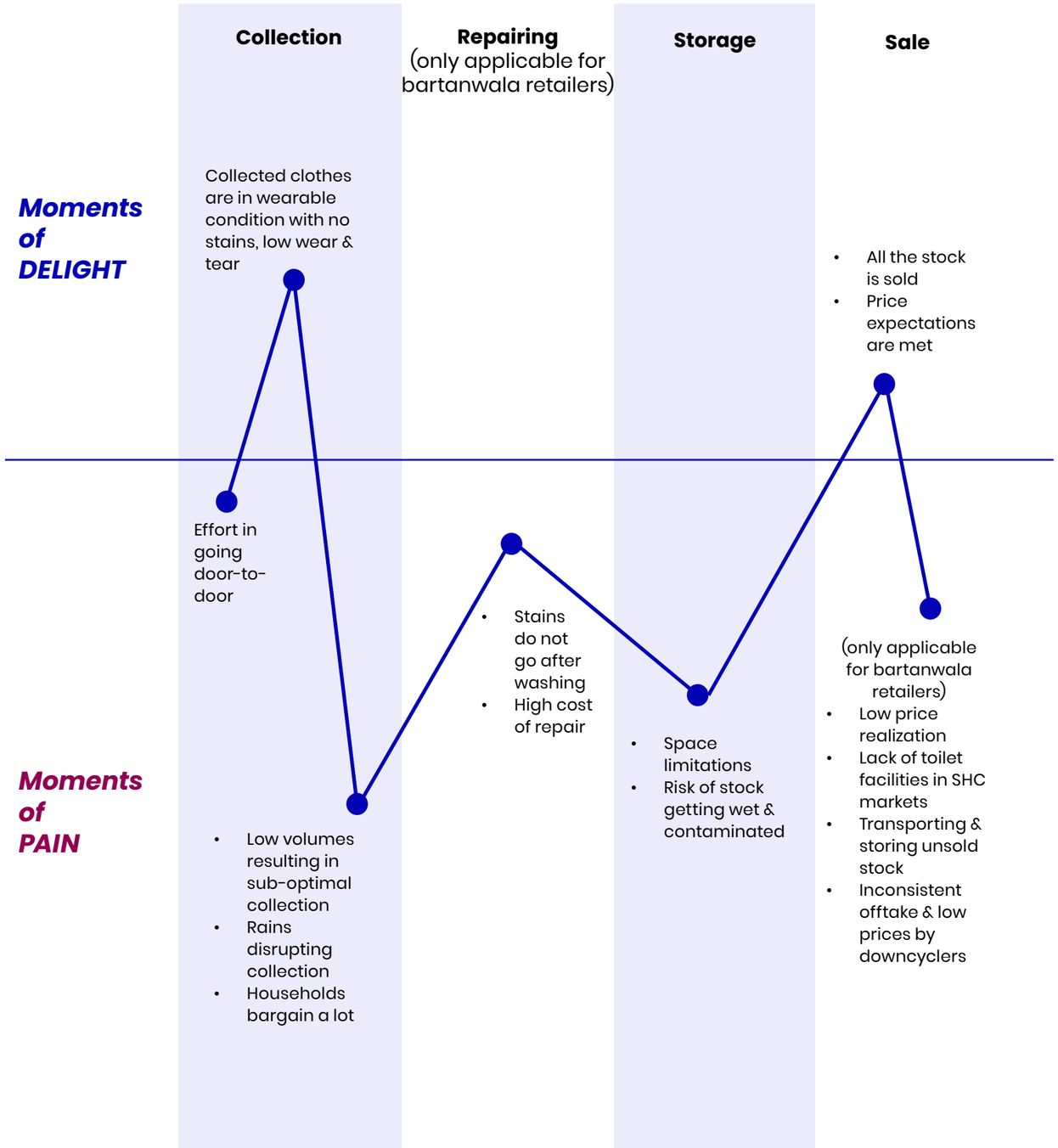
NEEDS
- Relevant (socially SHC markets with adequate infrastructure
- Access to higher quality clothes
- Storage space
- Working capital*
- Dignity

MOST PROBLEMATIC WASTE STREAMS
- Wearables:
  - Over-sized
  - Fashionable
- Non-wearables
  - Tattered
  - Worn out/ faded
  - Contaminated

"I do not collect bedsheets, dresses or torn clothes"

"I only sell to my maalik (owner) who gives me utensils on credit"

2.2 Bartanwala | High cost of repair and limited storage space are constant moments of pain



2.3 Takeback programs global retailers | Brand image and customer engagement are key drivers for global brands while their key pain points are costs and lack of transparency

Global fast fashion brand & retailer with takeback program working with vendor

OPERATING MODEL:

Customers drop off old clothes in retail stores & are issued with vouchers → Collected clothes across stores are aggregated at vendor's go-down → Vendor sorts the clothes and routes them to appropriate circular end uses

PAIN POINTS
- High cost of collection
- Storage space in retail stores
- Lack of transparency
- Probable leakages to landfills

NEEDS
- Good brand image
- Repeat sales
- Customer engagement
- Transparency
- Adhering to EPR

MOST PROBLEMATIC WASTE STREAMS
- Undergarments
- Low quality unbranded clothes
- Non-wearables
  - Polyester
  - Stained
  - Contaminated
  - Highly worn out

Global fast fashion brand & retailer with takeback program working with NGO

OPERATING MODEL:

Collection through dropoffs, pick-ups and drives → Aggregation & storage in NGO office → Clothes are donated to beneficiary NGOs

PAIN POINTS
- Storage space in retail stores
- Lack of transparency
- Probable leakages to landfills

Takeback is not critical – the brand intends to stop the program

NEEDS
- Good brand image
- Repeat sales
- Customer engagement

2.3 Takeback program Indian brand | In the absence of EPR, most Indian brands do not have takeback programs

Indian fashion retailer with takeback program

OPERATING MODEL:

Customers drop off old clothes in retail stores & are issued with vouchers → Collected clothes across stores are donated to NGOs → NGOs distribute the clothes to their beneficiaries; unusable clothes are sold/ disposed

PAIN POINTS
- Cost of collection
- Leakages to landfills

NEEDS
- Good brand image
- Repeat sales
- Customer engagement
- Convenience

MOST PROBLEMATIC WASTE STREAMS
- Undergarments
- Non-wearables

2.4 Textile Recovery Facilities | to avoid disposal and incineration, discovering buyers for all types of waste streams and adequate storage space is critical

TRF run by DWCC operator, Bangalore

Handles ~2-3 MT per month | semi-formal | small godown | 35y | belongs to waste-picker community | Income: 40-50,000 per month

OPERATING MODEL:

Routine & dedicated collection → Sorting & Storage → Pre-processing & aggregation → Sale & disposal

PAIN POINTS
- Restrictions on use of municipal premises for TRF
- Inadequate storage infrastructure
- Contamination on extended storage
- Time & space required to aggregate sorted feedstock for recyclers
- Delays in payment from buyers
- Lack of segregation at households

NEEDS
- Regular offtake of all streams
- Dignity
- Storage Infrastructure
- Local recycling options

MOST PROBLEMATIC WASTE STREAMS
- Undergarments
- Non-wearables
  - Tattered
  - Worn out/ faded
  - Contaminated
  - Polyester, Elastene, blends
  - Unknown composition

> “Extended storage of textile waste in the same facility as mixed dry waste leads to contamination by rats, moisture & stench.”

2.4

TRF run by private waste management company, Bangalore

Handles 10-15 MT per month | formal | Diversified: thrift, upcycling | also involved in other waste streams

OPERATING MODEL:

Posters & collection form → Collection drive, pickups → Weighing, & sorting → Processing & storage → Sale & disposal

PAIN POINTS
- High cost of sorting
- Low profit margins in post consumer textile waste

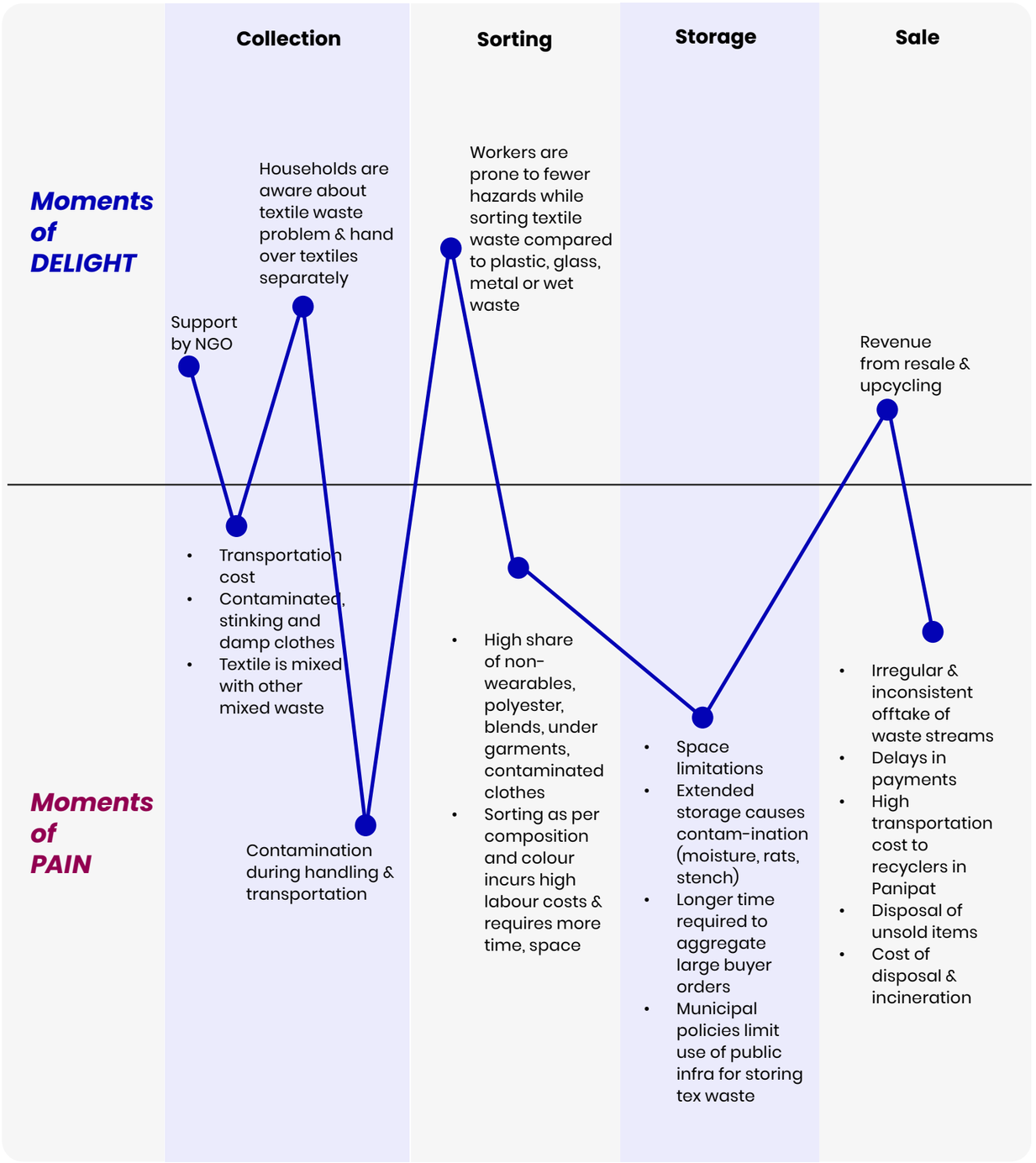
NEEDS
- Regular offtake from buyers
- Buyers for all waste streams

MOST PROBLEMATIC WASTE STREAMS
- Undergarments
- Non-wearables
  - Polyester
  - Contaminated
  - Stinky

DOMINANT WASTE STREAMS
- Sarees
- T-shirts
- Shirts
- Jeans
- Trousers
- Dhotis/ lungi

2.4

Textile Recovery Facilities | the inconsistent nature of the collection can cause it to be a moment of delight OR pain, similarly for sales, while sorting and storage are structural moments of pain



2.5 DWCC | Contamination due to lack of segregation and poor working conditions are the key issues of DWCC

DWCC operator, Bangalore

Handles ~5-6 MT per month of contaminated mixed textile waste | semiformal | ~45yr | Basic schooling | Income: Rs 40-50k per month

OPERATING MODEL:

Routine mixed dry waste collection → Sorting out textile waste & Storage → Waste pickers scavenge through pile → Disposal

PAIN POINTS

- Restrictions on use of Restrictions on use of municipal premises for TRF
- Inadequate storage infrastructure
- Contamination on extended storage
- Delays in payment from buyers
- Lack of segregation at households
- Contamination due to mixed waste collection

NEEDS

- Regular offtake of all streams
- Regular offtake of all streams
- Dignity
- Storage Infrastructure

"I need a regular offtake of 500 kgs to 1 ton per month in order to collect & sort textile waste. Right now, there is very inconsistent demand for textile waste to bother about"

Woman Sorter in DWCC

Sorts 100 kg per day | daily wage | hails from waste picker community | sorts other waste streams too | 54 yrs | earns Rs 8-10k per month

OPERATING MODEL:

Household choresr → Sorting based on parameters → Paid daily/ weekly → Paid daily/ weekly

PAIN POINTS

- Poor and unhygienic working conditions
- Risk of injuries and health hazards
- Low wages
- Lack of fixed contract

NEEDS

- Dignity
- Safe & hygienic working conditions

MOST PROBLEMATIC WASTE STREAMS

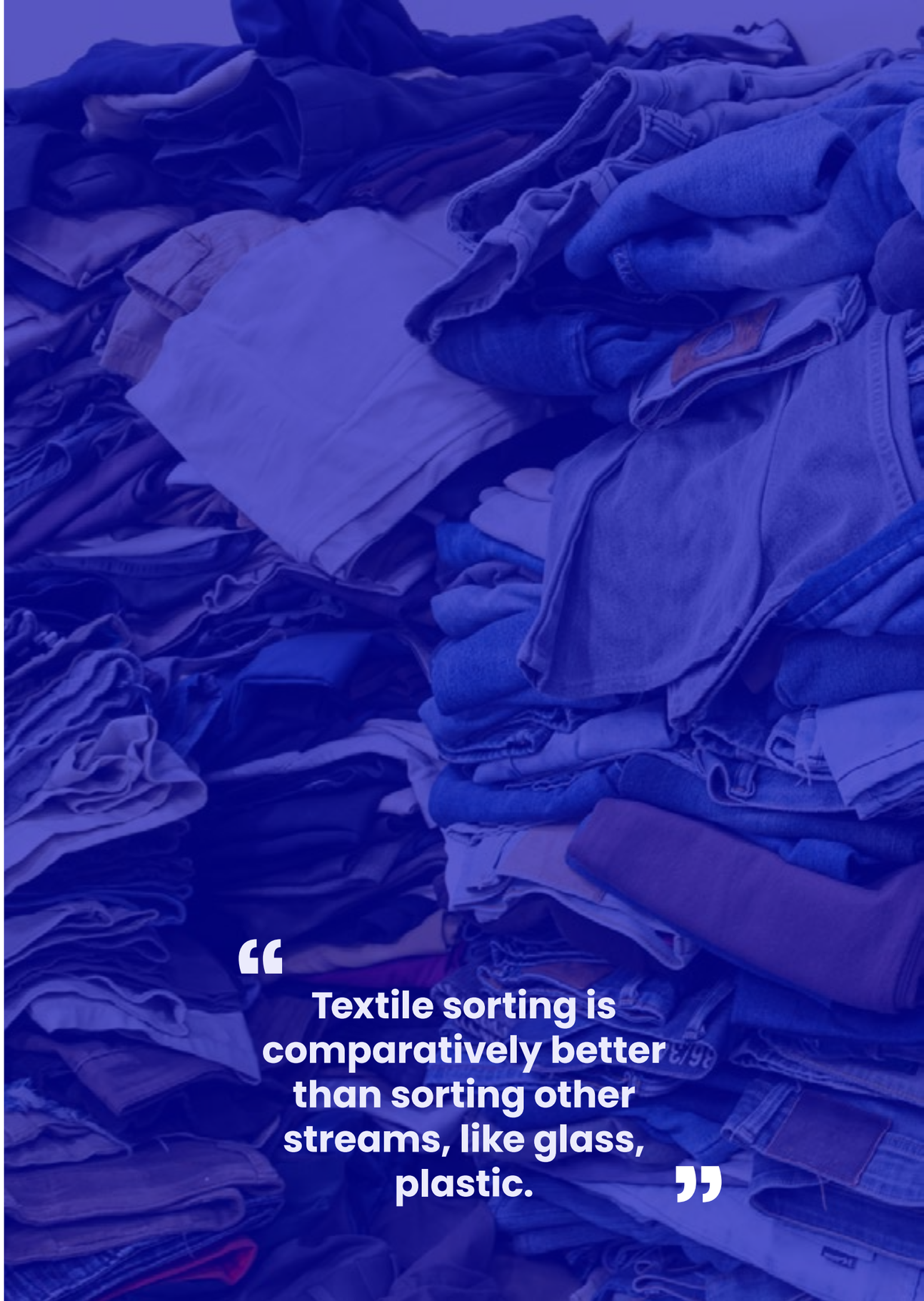
- Undergarments/ unhygienic clothes
- Contaminated waste
- Glass pieces & articles with sharp edges

"Textile sorting is comparatively better than sorting other streams like glass, plastic"

Collection - Issue- Innovation mapping

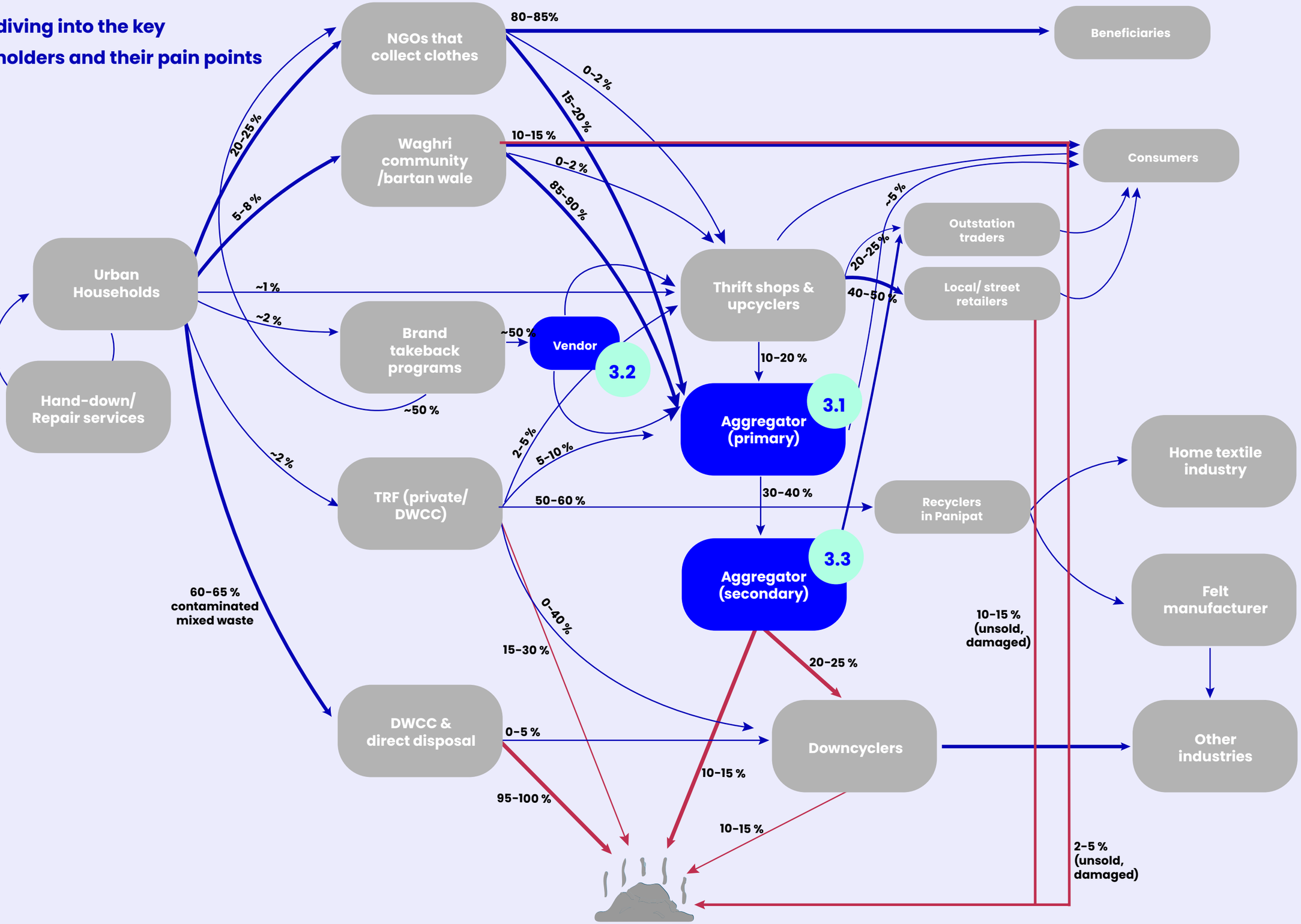
The return on investments are too low to allow for tech interventions

KEY CHALLENGES	EXISTING INNOVATIONS	LIMITATIONS, CONSTRAINTS & GAPS IN INNOVATIONS
Access to quality supply	India: BRC, Share At Doorstep Global: Kiosks, Deposit schemes (pilots)	Success depends on incentivizing households; Downstream leakages possible in BRC, SADS model; Ensuring zero contamination at source
Collection overheads	India: BRC (predictability, cost), SADS (predictability, cost), EcoDhaga (paid decluttering services), Bombay Closet Cleanse (paid appointments) Global: Kiosks, Deposit schemes (pilots)	Worn out or damaged textiles can still end up being disposed
Storage constraints	India: Saahas Zero Waste (storage + diversification) Global: Africa Collect Textile, Uptex (storage + diversification)	Low viability - high cost overheads & low price realization, dependent on local off-takers
Prone to contamination	India: Saahas Zero Waste (storage + sorting) Global: Africa Collect Textile, Uptex (storage + sorting)(storage + diversification)	Low viability – high storage and sorting overheads
Demand supply mismatch	India: Recykal (plastics), Indiamart (product agnostic) Global: Queen of Raw	GST, quality assurance, catering to specific buyer requirements
Irregular offtake	-	
Market access & buyer discovery	India: Recykal (plastics), Indiamart (product agnostic) Global: Queen of Raw,	GST, quality assurance
Offtake of specific streams	India: The Good Felt, Reti Ecotech (pilots)	Competition from conventional & other sustainable alternatives, limited demand potential, scaling
Lack of transparency	India: InfiniteX, EcoTrace, SatmaCE	Cost-benefit, low buy-in from brands, not fully robust (eg: at end of life, RFID or QR code can be cut off)



Collection stage:

Deep diving into the key stakeholders and their pain points



3.1 Primary aggregators- consistent offtake from buyers, adequate storage infrastructure and working capital are critical for operations

Primary aggregator (no repair) in Shampura, Bangalore

Handles 50-100 MT per month | semi-formal | no schooling | no online presence | 2nd gen family business since 40 years | 5-6 workers | 40-70 sq mtr godown

OPERATING MODEL:

Giving advance to Bartanwalas locally & in other cities → Purchasing from bartanwalas, retail shops, NGOs, instn → Sorting, (basic repairing)* & storage → Sale to street vendors (on credit), out-station traders & sec aggregators

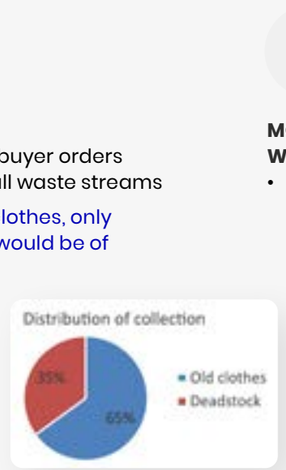
PAIN POINTS
- Inconsistent offtake
- Storage space limitations
- Risk of default
- Low quality collection

"Our kids don't want to continue in this line. They prefer to work on computers"

NEEDS
- Consistent buyer orders
- Buyers for all waste streams

"Out of 25,000 clothes, only 200-500 (1-2%) would be of high quality"

"We have a network of 150 bartanwalas in Kerala"



MOST PROBLEMATIC WASTE STREAMS
- Non-wearables
  - Tattered
  - Worn out/ faded
  - Contaminated
  - Heavy stains
  - Polyester

Primary aggregator (does repair) in KR Market, Bangalore

Handles 80-100 MT per month | semi-formal | regd on online platforms | 2nd gen family business since 40+ years | 8-9 workers | 2 godowns

PAIN POINTS
- Inconsistent offtake
- Storage space limitations
- Labour availability
- Colour/ specific sorting
- Low price realization for non-wearable polyester

"We can supply up to 10 MT of low quality waste/ month"

NEEDS
- Consistent buyer orders
- Buyers for all waste streams

"We do basic repairs such as stitching, fixing buttons, zips & it costs us Rs 5-15/pc"

Storage & sorting are key value propositions for buyers for engaging with aggregators

3.2 Secondary and diversified aggregators | fast discovering buyers for all types of waste streams and adequate storage infrastructure is critical to avoid disposal and incineration

Takeback program vendor & Processor, Panipat

Handles ~5-6 MT per month from 3-4 brands | formal | Diversified: garneting, garment mfg, upcycling, pre-consumer waste collection | capacity: 1500 MT/month

OPERATING MODEL:

Collecting from brand/ retailer warehouse/ stores → Aggregation, Sorting & Storage → Refurbishing, Garneting, upcycling inhouse → Sale to yarn manufacturers, brands, traders, downcyclers

PAIN POINTS
- Unknown composition of non-wearables limits optimal end use & value realization
- Lack of standard sizes across brands makes resale and upcycling challenging
- Inability to provide wide range of choices in resale, upcycling
- Poor quality of domestic post consumer waste vs imported

NEEDS
- Consistent offtake from brands

"As service providers, we need to provide solutions for all the waste streams. We can't tell brands that we will only take cotton or denim"

END USE OF COLLECTED WASTE

MOST PROBLEMATIC WASTE STREAMS
- Undergarments
- Non-wearables
  - Tattered
  - Worn out/ faded
  - Contaminated
  - Polyester, Elastene, blends
  - Unknown composition
  - Stretch, skinny fit

3.3 SHC aggregator (secondary) in Bangalore

Handles 40-60 MT per month | semi-formal | registered on online platforms | 150-200 sq mtr godown

PAIN POINTS
- Risk of damage during rains
- Factories do not pay for stock for incineration (only bear transport)
- Cost incurred in disposal

"We store the unsold stock in anticipation of buyers. If it gets wet or if we run out of space, we are forced to dump it"

NEEDS
- Regular offtake from buyers

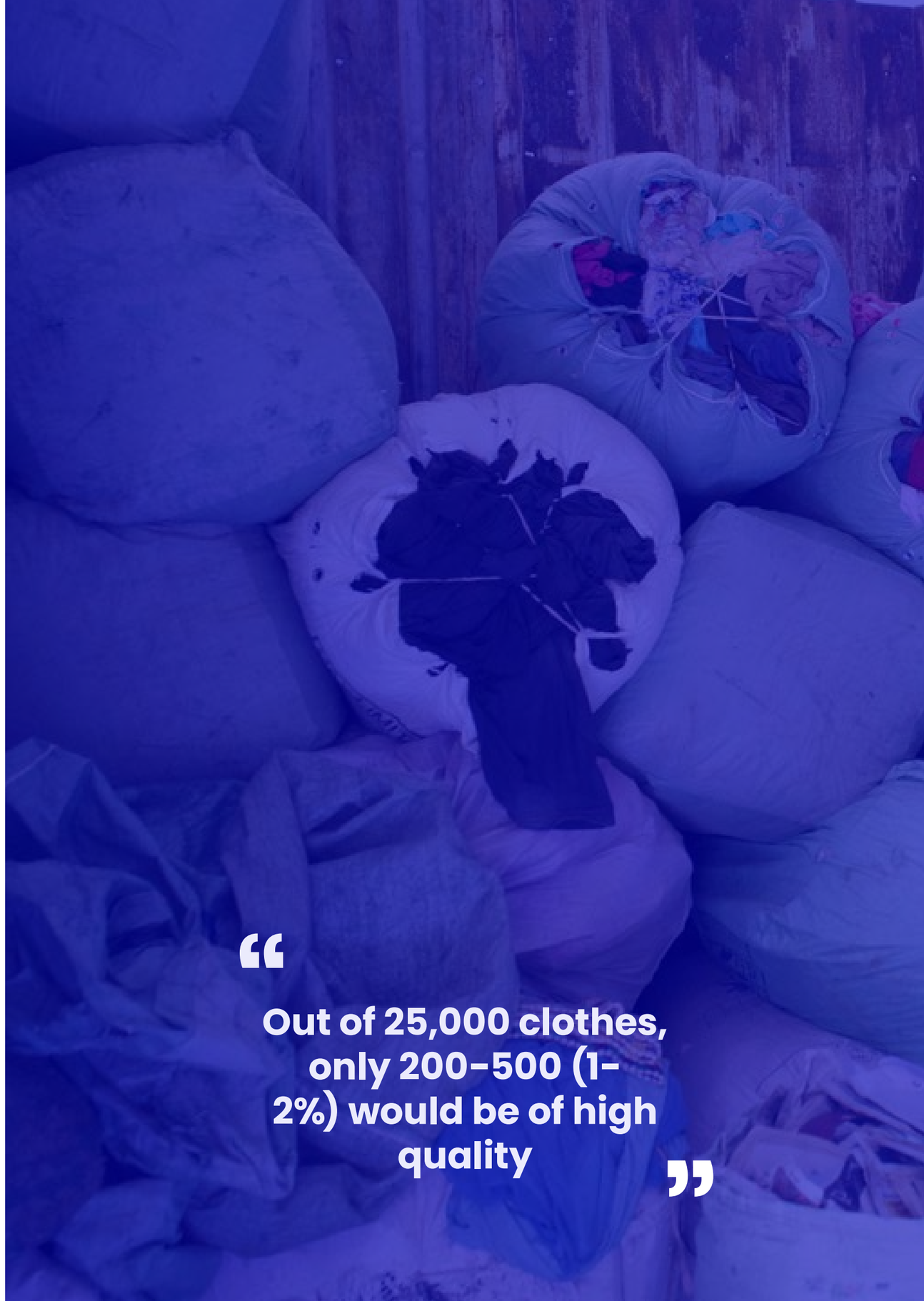
MOST PROBLEMATIC WASTE STREAMS
- Undergarments
- Non-wearables
  - Polyester
  - Contaminated
  - Stinky

DOMINANT WASTE STREAMS
- Sarees
- T-shirts
- Shirts
- Jeans
- Trousers
- Dhotis/ lungi

3 Aggregation – Innovation mapping & gaps

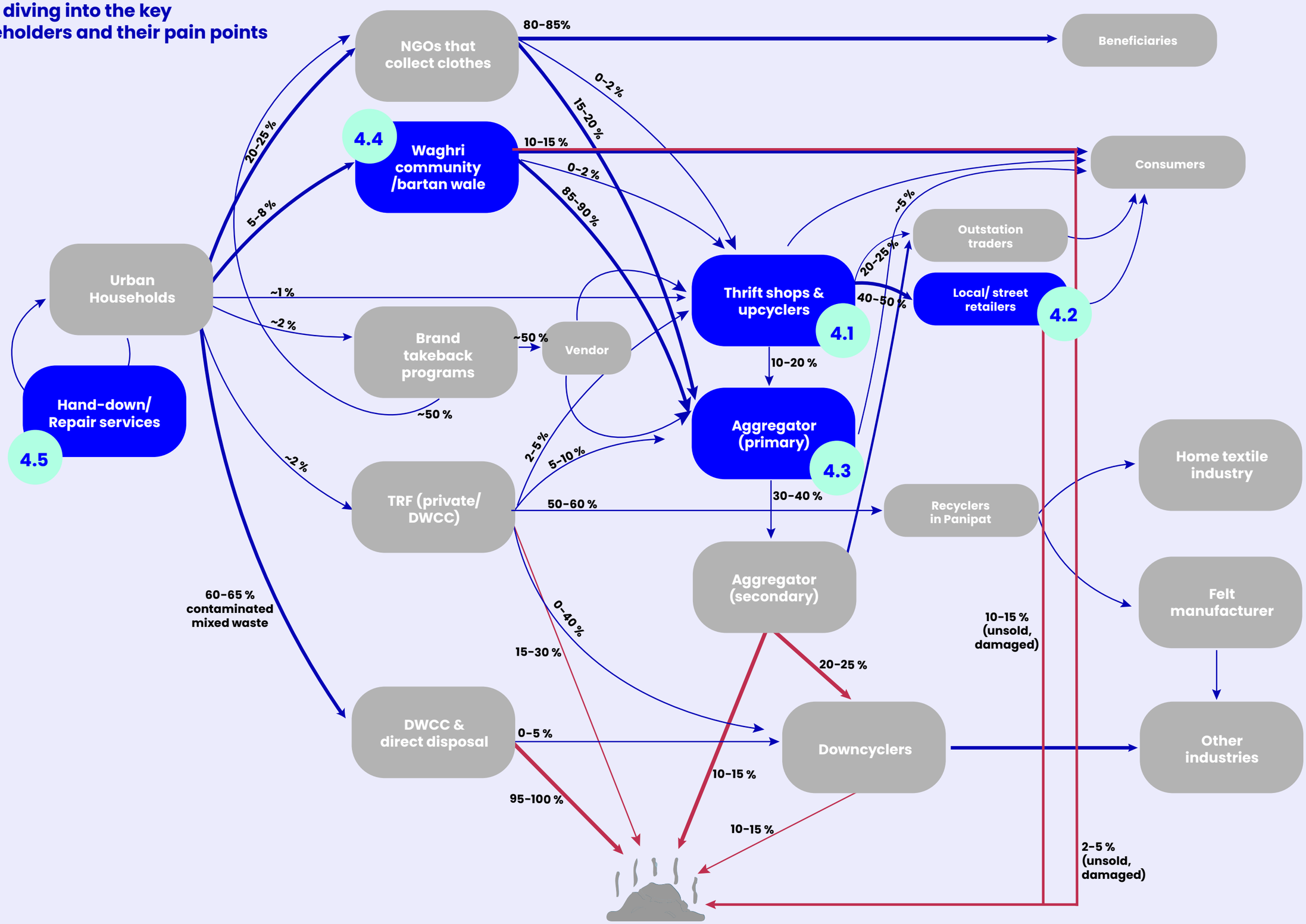
Aggregators work locally and without tech solutions; most solutions have limited viability for post-consumer waste due to low margins in the value chain

KEY CHALLENGES	EXISTING INNOVATIONS	LIMITATIONS, CONSTRAINTS & GAPS IN INNOVATIONS
Lack of standardized sorting guidelines	Local: TWMM	Adoption, specific buyer requirements
Unknown composition limits optimal end use	Global: Matoha (composition identification) Local: Kosha InfiniteX, Ecotrace (tracability)	Cost-benefit, not fully robust and not enough offtake
Storage constraints – space & infrastructure	Local: MuddleArt (pre consumer), informal coops of Amroha (cooperation) Global: Uptex (pre consumer), Sympany	Low viability for post-consumer waste
Demand-supply mismatch & info asymmetry	Local: Indiamart (product agnostic), Recykal (plastics) Global: Queen of Raw	Nothing in textiles yet, Cost of onboarding, need for physical inspection
Offtake of specific-streams	Local: TGF, Geotextile pilots, Reti Ecotech Global: Fabrick, Kleiderly	Functional attributes not being met; competition with substitutes
Low value realization for non wearable polyester	TGF, Reti Ecotech, Kleiderly	Viability, Competing against conventional and other sustainable alternatives, not solving buyer's pain point
Lack of transparency	InfiniteX, Ecotrace, Reverse Resources, SatmaCE	Low buy-in from brands, cost-benefit, not fully robust



Resale & repair:

Deep diving into the key stakeholders and their pain points



4.1 Thrift shops handle limited volumes due to relatively small sales volumes

Thrift shop & upcycler, Bangalore

Handles ~300-500 kg per year | formal | Diversified: thrift, upcycling, collection | 5-6 employees

OPERATING MODEL:

Giving advance to Bartanwalas locally & in other cities → Purchasing from bartanwalas, retail shops, NGOs, instn → Sorting, (basic repairing)* & storage → Sale to street vendors (on credit), out-station traders & sec aggregators

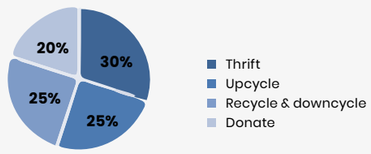
PAINT POINTS
- Design overheads in upcycling
- Lack of options for buyers in thrift, upcycling (in terms of size, design)
- Space constraints to aggregate and store clothes for recycling, downcycling & donations
- Lack of transparency and traceability in downcycling
- Lack of volumes to optimize cost of transportation to Panipat

"Women are our main customers"

NEEDS
- Branded, non-contaminated
- Timely offtake by recyclers
- Transparency & traceability

"We offer paid decluttering services where we collect old clothes from homes/ apartment complexes"

MOST PROBLEMATIC WASTE STREAMS
- Undergarments
- Non-branded clothes
- Non-wearables
- Tattered
- Worn out/ faded
- Contaminated



END USE OF COLLECTED WASTE

Instagram-based thrift store

Handles 150-600 pcs per month | semi-formal | full-time

OPERATING MODEL:

Acquire select SHC based on store aesthetic → Repairing & washing → Photographing & posting on Instagram → Responding to inquiries; sale, packaging, shipment

PAINT POINTS
- Handling rapid, high influx of inquiries
- Product must fit store aesthetic, search available stock for select items
- Accurately reporting state of product for transparency
- Preconceived notions/stigma around second-hand clothing
- Only one item/size available

NEEDS
- Discard options for clothes not getting sold

"We mainly focus on women's fashion"

4.2 Local street retailers are characterized by relatively large volumes and low sales prices; working capital is a painpoint

Local street vendor, Bangalore

Sells 500-600 sarees per month | informal | Employs family labour (wife) | Has bank account but does not use UPI for payments | Income: INR 40-50k/ month

CURRENT OPERATING MODEL:

Purchase from primary aggregators → Sorting & fall cutting → Ironing, packaging & storing → Sale in roadside markets

PAINT POINTS
- Space limitations for stocking unsold items
- Transportation overheads
- Low price realization

"I buy on credit from aggregators and I have to repay the amount by Monday after sales in the Sunday markets"

NEEDS
- Working capital
- Good price realization
- Independence as an entrepreneur

"I have paid money to collect these sarees. So I will not dispose them. I will store them till I have the capacity or else I will sell them at a discount"

MOST PROBLEMATIC WASTE STREAMS
- Torn sarees
- Stained sarees

"I sell 100-200 sarees on Sundays"

4.3 Aggregator & retailer, Bangalore

Handles 5-8 MT per month | semi-formal | listed on online platforms | 4 sq mtr store | Employs family labour (son) | Does basic repair

CURRENT OPERATING MODEL:

Purchase from shops, bartanwala → Sorting & basic repair → B2B and B2C Sales → Storage & clearance sale

PAINT POINTS
- Risk of damage on extended storage (fading, creasing)
- Space limitations to store unsold stock
- Low quality of wearable clothes in the mixed lot
- Forced to buy entire mixed lot
- Working capital*

NEEDS
- Regular offtake from buyers
- Timely payments

"Even stained clothes are not disposed. We sell those at Rs 10-15/pc to street retailers who wash, dye & then sell it to workers at Rs 50-100/pc"

MOST PROBLEMATIC WASTE STREAMS
- Undergarments
- Non-wearables
- Stained & contaminated
- Irrepairable

DOMINANT WASTE STREAMS
- Sarees
- T-shirts
- Shirts
- Jeans
- Trousers
- Dhotis/ lungi

4.4 Bartanwala resale mainly happens at large scale markets; their value realization is highly dependent on the quality of the collected clothes

Waghri woman collector & retailer in Delhi

Handles ~100-150 kg per week | no schooling | 35yr | retails in Raghubir Nagar market daily

CURRENT OPERATING MODEL:

Door-to-door collection rounds & purchase/ barter → **Sorting into grade A,B and C & storage at home** → **Sale in Raghubir Nagar market** → **Disposal or clearance of unsold items**

PAINT POINTS
- Poor access to gated communities
- Sub-optimal collection rounds
- Households want to dispose torn clothes too
- Poor market infrastructure
- Digital payments
- Seasonal fluctuations

NEEDS
- SHC markets with adequate infrastructure
- Access to good quality clothes
- Dignity
- Better future for children

MOST PROBLEMATIC WASTE STREAMS
- Wearables:
  - Over-sized
  - Fashionable
- Non-wearables
  - Tattered
  - Worn out/ faded
  - Contaminated

Boharin collector & retailer in Kolhapur (tier 2 city)

Sells ~300-400 sarees per week | no schooling | 45yr | retails in Sunday market | engages in sale of fruits, diyas to supplement income

CURRENT OPERATING MODEL:

Gets utensils on credit for bartering → **Collection rounds & purchase/ barter** → **Sale to customers in Sunday market** → **Sale of unsold sarees to upcycler**

PAINT POINTS
- Storage space limitations
- Sub-optimal collection rounds
- Collection & sales are affected during rains
- Seasonal variations in demand & supply

"Some colours – black, chocolate, grey don't have demand & sell at a discount in Kolhapur"

NEEDS
- Good quality supply
- Dignity
- Good price realization

MOST PROBLEMATIC WASTE STREAMS
- Wearables:
  - Over-sized
  - Specific Colours
  - Fashionable
- Non-wearables
  - Tattered
  - Worn out/ faded
  - Contaminated

DOMINANT WASTE STREAMS
- Sarees
- Dupatta
- Bedsheets

"Orphanages and small boarding schools place advance orders"

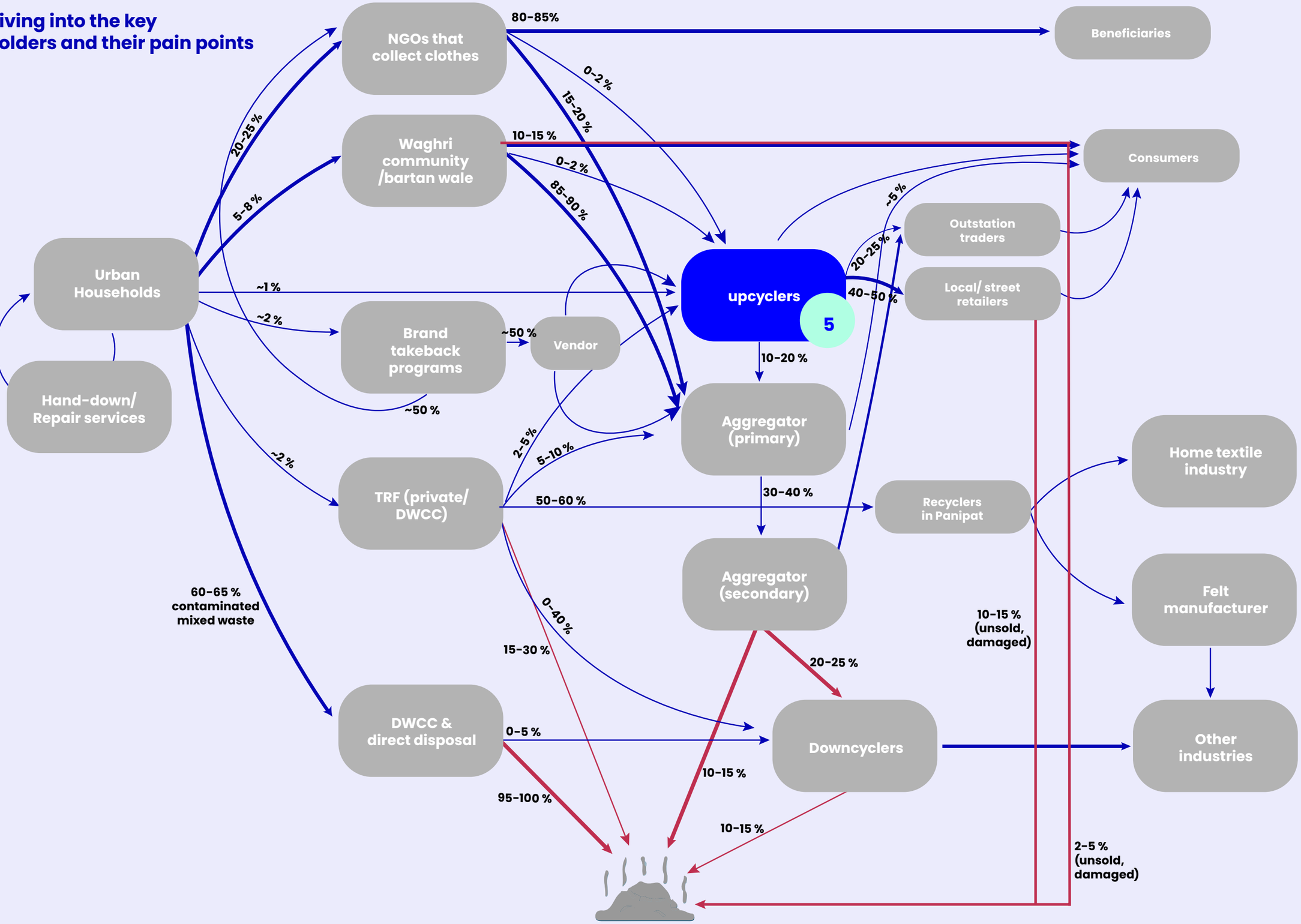
3 Resale and Repair – Innovation mapping & gaps

Solutions exist, but nothing is at scale due to underdeveloped demand side

Key challenges	Existing innovations	Key features of innovations	Limitations, constraints & gaps in innovations
Space constraints	Local: A-Gain Global: Vinted	Peer-to-peer platform to buy and sell secondhand clothes	Small scale, Lack of adoption by customers
Lack of options for buyers	Local: Kiabza Global: ThredUp, Vestaire Collection	A C2B2C service that allows buyers to get commission on each garment sold through their website	Supply and demand volumes did not match- leaving large unsold inventories and resulting in high logistical costs
Lack of transparency	Local: ReLove	A resale feature for brands to allow customers to resell their brands' items for credit and cash, thereby increasing customer retention for small, slow fashion brands in India.	Number of brands opting for this platform still remains low
Stigma around second hand	Local: Ecodhaga, ReStore, BTR (back to roots)	Both use their second hand to talk about the stigma around wearing preloved and making thrifting accessible and affordable at lower prices.	Since affordability is at the center of their operations, their margins remain low, which hinder scaling and expansion
Poor access to rewearables	Local: Bombay Recycling Concern	They work with collection through the Waghri communities who help collect and bridge the gap of poor access	They still struggle to have fixed marketplaces for selling collected used clothes.
Poor market infrastructure	Local: TooUsed	Builds the idea of 'Mindful Redistribution' and ensures that all material is diverted, into a variety of industries from resale to recycling	
Fluctuating and seasonal supply and demand	Local: Waste Management Shops – Saa-has Zero Waste and Green-worms	Setup local swaps and resale pop-ups to ensure seasonal items if not sold, are sent to other industries like recycling and downcycling since operations are inhouse	Resale infrastructure still is not established, making reusable material end up in recycling/ downcycling

Upcycling stage:

Deep diving into the key stakeholders and their pain points



5 Upcycling is a manual and customized process with high overheads; inconsistent outputs limit large scale sales through bigger stores and brands

Garment to Garment Upcycler, Panipat

Upcycles & refurbishes 5-10 MT per month | formal | Diversified: garneting, garment mfg, upcycling, pre-consumer waste collection

CURRENT OPERATING MODEL:

Collecting from brand/ retailer warehouse/ stores → **Aggregation, Sorting & Storage** → **Refurbishing & upcycling** → **Sales to retailers, brands & D2C**

PAINT POINTS
- Unknown composition may limit the life of upcycled product
- Lack of standard sizes across brands makes resale and upcycling challenging
- Inability to provide wide range of choices in resale, upcycling
- Poor quality of domestic post consumer waste vs imported
- Overheads in upcycling each garment

NEEDS
- Offtake from brands
- Consumer Demand for upcycled garments
- Access to branded & better quality discards

MOST PROBLEMATIC WASTE STREAMS
- Worn out
- Contaminated & stained
- Polyester, Elastene, blends
- Unknown composition
- Stretch, skinny fit

Accessories upcycler, Mumbai

Handles 200-250 kg per month | Formal | Registered on online platforms

CURRENT OPERATING MODEL:

Sourcing pre and post consumer denim waste → **Sorting and washing** → **Customised cutting based on product** → **Retailing the products online**

PAINT POINTS
- Sorting and customization are the most time consuming
- There are no certification for upcycled products
- Influencing consumers to buy the upcycled products

NEEDS
- Regular sales orders
- Bigger sizes of denim are preferred
- Certification for upcycling*

"We are bootstrapped and our procurement capacity depends on sales orders"

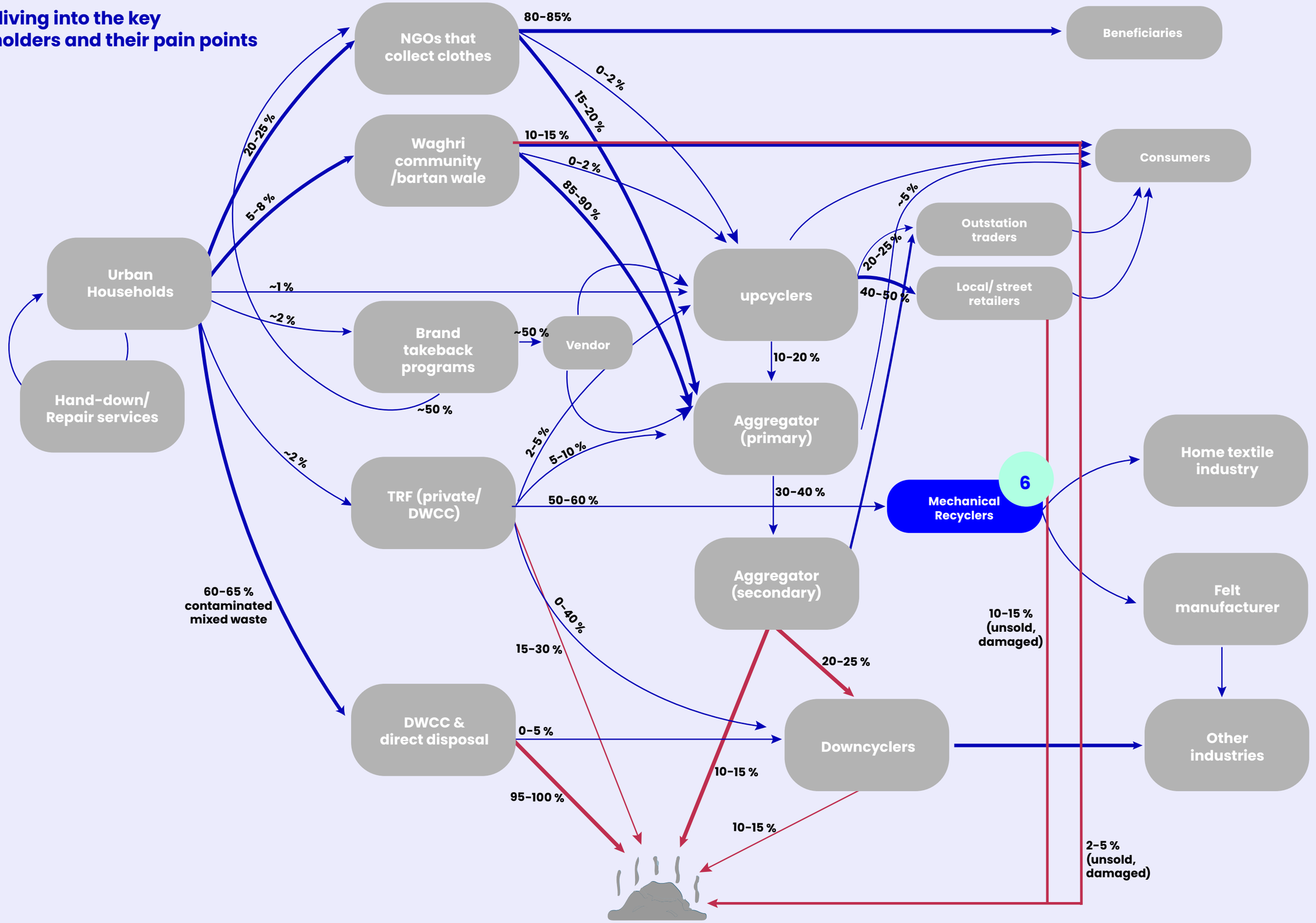
MOST PROBLEMATIC WASTE STREAMS
- Denim with lycra, elastane
- Short patches
- Uneven fading
- Contamination
- Stains that can't be removed

PREFERRED WASTE STREAMS
- Denim
- Felt

> "Some colours – black, chocolate, grey don't have demand & sell at a discount in Kolhapur"

Recycling stage:

Deep diving into the key stakeholders and their pain points



Low & mid grade recyclers work with high volumes, are informal and struggle with fluctuations in demand because of the lack of formal contracts

6.1 Aggregator & Garneter, Amroha

Shreds ~5-6 MT per day | informal

CURRENT OPERATING MODEL:

Aggregating tex waste → **Sorting based on colour** → **Shredding into fibre** → **Baling & sales to OE spinning mills**

PAINT POINTS
- Risk of fire while shredding polyester, disruptors, cotton
- Cost of removing disruptors
- Cost & overheads of compliance
- Religious bias
- Fluctuations in demand & price of recycled fibre

NEEDS
- Consistent orders & offtake
- Machinery utilization
- Capex subsidies
- Recognition

"We need to inspect the stock in person; photos and catalogues will not work"

MOST PROBLEMATIC WASTE STREAMS
- Undergarments
- Tattered
- Worn out/ faded
- Contaminated
- Polyester, Elastene, blends
- Prints, stripes, fancy

"We don't have good infrastructure – roads, schools, hospitals, etc.

Garneter & OE spinning mill, Panipat

Capacity of 300 MT per day | formal

CURRENT OPERATING MODEL:

Sourcing pre and post consumer denim waste → **Sorting and washing** → **Customised cutting based on product** → **Retailing the products online**

PAINT POINTS
- Unknown composition
- Stench and contamination
- Denim which has <98% cotton is not suitable for dyeing
- Fluctuating demand and prices
- Quality of domestic waste is lower than imported
- Import duty on cotton waste
- Cost of removing disruptors
- Cost of certifications

"To recycle 20 MT of colour-sorted waste, we have to procure 300 MT unsorted post consumer waste"

NEEDS
- Regular offtake from buyers
- Capex subsidies
- Orders from brands
- Recognition

"A sweater can contain a blend of cotton, cashmere, acrylic, nylon & spandex. None of the fibers can be recycled in the same pipeline"

PROBLEMATIC WASTE STREAMS
- Undergarments
- Denim <98% cotton
- Polyester, elastane
- Blends
- Prints, stripes, fancy
- Faded/ worn-out

"The recycling industry is driven by the demand for low priced clothes for the mass market"

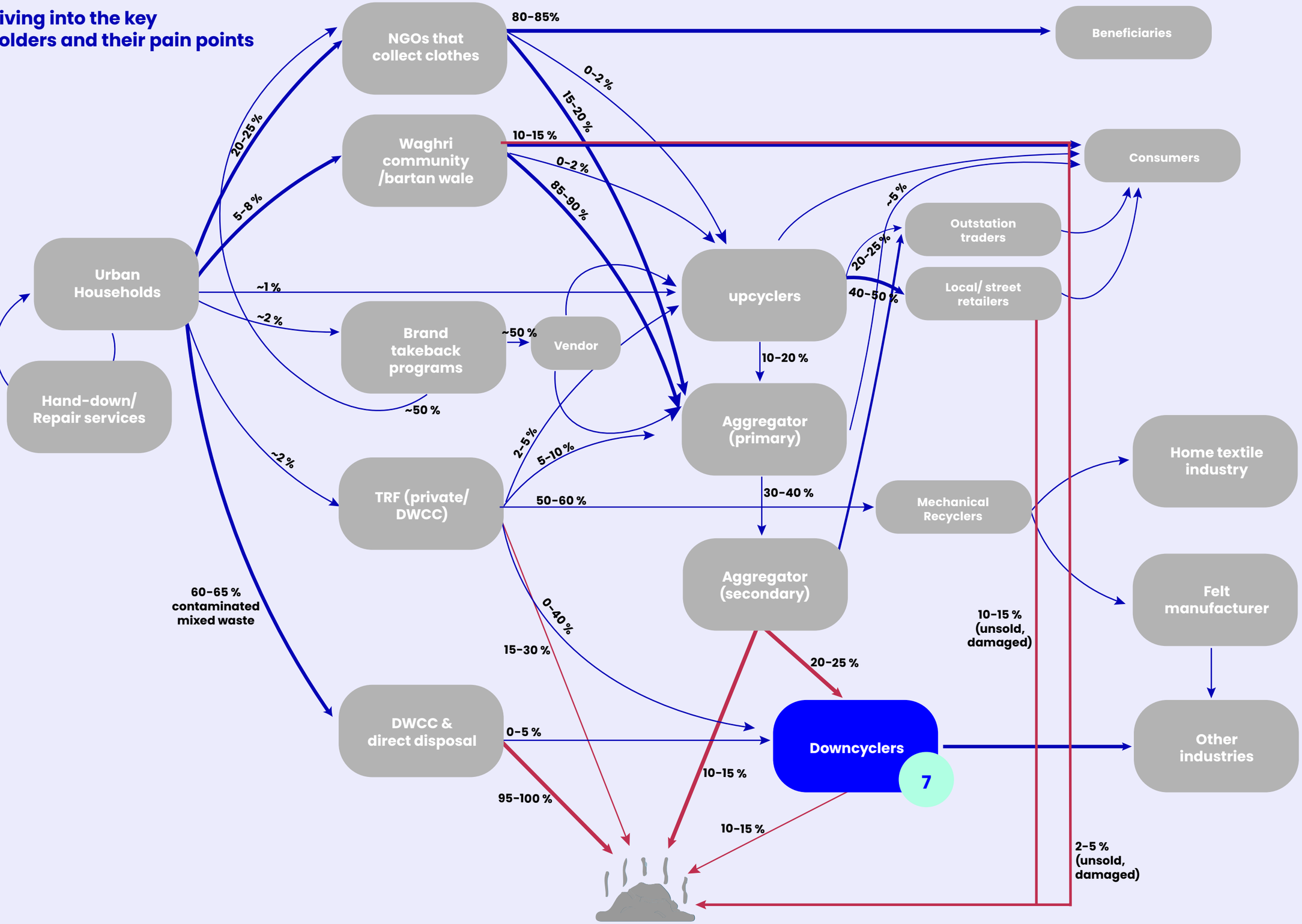
6 Recycling – Innovation mapping & gaps

Recycling is for limited materials predominantly cotton rich materials, and still lack large scale adoption (even globally)

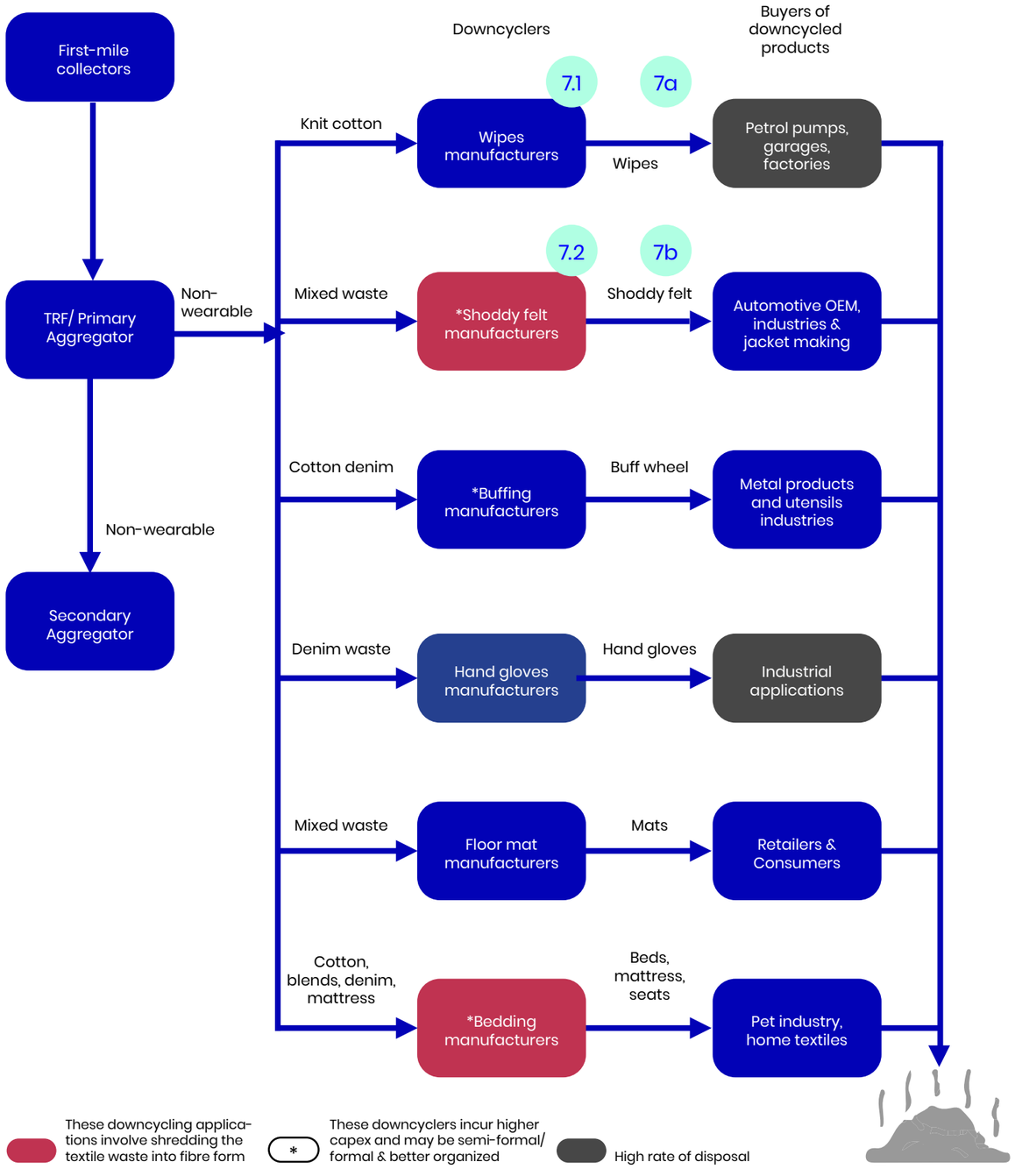
KEY CHALLENGES	EXISTING INNOVATIONS	KEY FEATURES OF INNOVATIONS	LIMITATIONS, CONSTRAINTS & GAPS IN INNOVATIONS
Only require 100% cotton-white and light colors	Global: Circulose (previously Renewcell) Local: Usha Yarns, Vardhaman	Their output is a 'dissolving pulp' that can be used to make viscose, lyocell, modal, acetate, and other types of man-made cellulosic fibers	Lack of offtake even with full scale plant
Recycling of blends	Global: CirC	Their pioneering technology returns polycotton waste back to the raw materials from which it was made	Cannot solve the problem of elastane
Polyester textile-to-textile recycling	Global: Syre (previously Premirr Plastics), CuRe	Pioneering textile-to-textile recycling solution that provides circular polyester with quality on par with virgin polyester but with superior sustainability performance	
Elastane present	Global: Re:lastane	The process involves a mild chemical process that only targets the garment's polyester fiber, and breaks them down into monomers and collects them, that leaves the elastane thread intact and recyclable	
Lack of Traceability	Global: Reverse Resources Local: Reverse Resources	A SaaS platform to digitise, connect and scale global textile-to-textile recycling	
Unknown composition of feedstock	Local: Mechanical Recyclers- Kakkar Spinning Mills	Mechanical recycling that produce a range of Open End Spun Yarn for the home textile market	Fiber strength is lowered with their methods, so potential to recycle again is low
High cost of collection, sorting and pre-processing of post-consumer wastedemand	Local: Kosha Global: Matoha	Using NIR to enable sorting of textiles efficiently without a huge investment into infrastructure	Cannot identify elastane
	Global: Picvisa	Using Artificial Intelligence and NIR to enable fully- automated sorting of textiles efficiently without a huge investment into infrastructure	Cannot identify elastane and multi layered garments, and is very energy intensive

Downcycling stage:

Deep diving into the key stakeholders and their pain points



7 Downcycling – a crowded pace with multiple key stakeholders, mostly (semi)-informal with national customers



UTILITY & PROPERTIES :

- Oil absorption
- Cleaning machinery

Applications:	Estimated Annual Consumption (MT)			
Fuel stations	64,600 x #stations	52 x weeks	2 kg/week	= 6,718
Mechanics, garages & service centers	25,000 x #centres	300 x days	1 kg/day	= 7,500
Factories	200,000 x #factories	300 x days	1 kg/day	= 60,000

7.1 Wipes downcycler and trader, Bangalore

Sells 2-3 MT of wipes & handles 20-30 MT of waste per month | semi-formal | regd on online platforms | 45 yrs | 5-6 workers based on orders (incl family)

CURRENT OPERATING MODEL:

Sourcing tex waste → **Sorting based on end-use** → **Cutting into wipes** → **Packing & sales**

PAINT POINTS

- Poor availability of labour due to high demand from local nurseries
- Lack of regular orders especially for polyester, blends
- Low share of high value waste streams can lead to low price realization
- They have to buy mixed lot and cannot choose specific waste streams
- Limitations in storage space

"Unsold sarees are sold to grape farmers in north Bangalore at Rs 28/pc"

NEEDS

- Consistent orders & offtake
- Timely availability of labour
- Good price realization

"To cater to specific buyer requirements –eg: white cotton waste, I have to procure 5-10 times of the order volume and I end up stocking a lot of other waste streams"

DOMINANT WASTE STREAMS

- Polyester: 60-70%
- Non-wearables: 80-90%
- Undergarments
- Knit cotton: 10-15%
- Wearables: 10-20%
- Denim: 10%
- Blankets, bed sheets, towels: 5%

7.1 Wipes downcylers are ….. Availability of labour, regularity of buyer orders, inventory turnover and the type of waste streams in the procured lot determine the moments of delight & pain for a wipes downcycler

	Sourcing	Storage	Processing	Sale
Moments of DELIGHT	• Availability of reliable suppliers (aggregators in Kerala and bartanwale in Bangalore) • High share of wearables, knit cotton, denim, saree			• Consistent offtake waste streams • In-bound enquiries through network platforms • Provision of fulfil customized requirements • Timely cash
Moments of PAIN	• High cost of transportation • Risk of damage due to unseasonal rains during transportation, loading & unloading	• Space limitations • Extended period of storage can lead to deterioration of quality (mould, rats, stench, creases) • Risk of stock getting wet & disposed, resulting in losses	• Erratic electricity supply will result in delays in using cutting machine • Poor availability of labour and competition from local	• Irregular offtake of urgent fulfilment requests order requirements • Delays

Shoddy Felt

UTILITY & PROPERTIES :
- Thermal insulation
- Acoustic insulation
- Oil absorption
- Shock absorption

7.2 Shoddy mill, Amroha

Shreds ~5-6 MT per day | informal/ semi-formal

CURRENT OPERATING MODEL:

Sourcing & sorting → Shredding into fibre → Carding & layering → Needle punching → Packing &Sales

PAINT POINTS
- Risk of fire while shredding polyester, disruptors, cotton
- Cost & overheads of compliance
- Religious bias
- Declining demand for shoddy
- Competition from Chinese shoddy mills
- Cost of removing disruptors

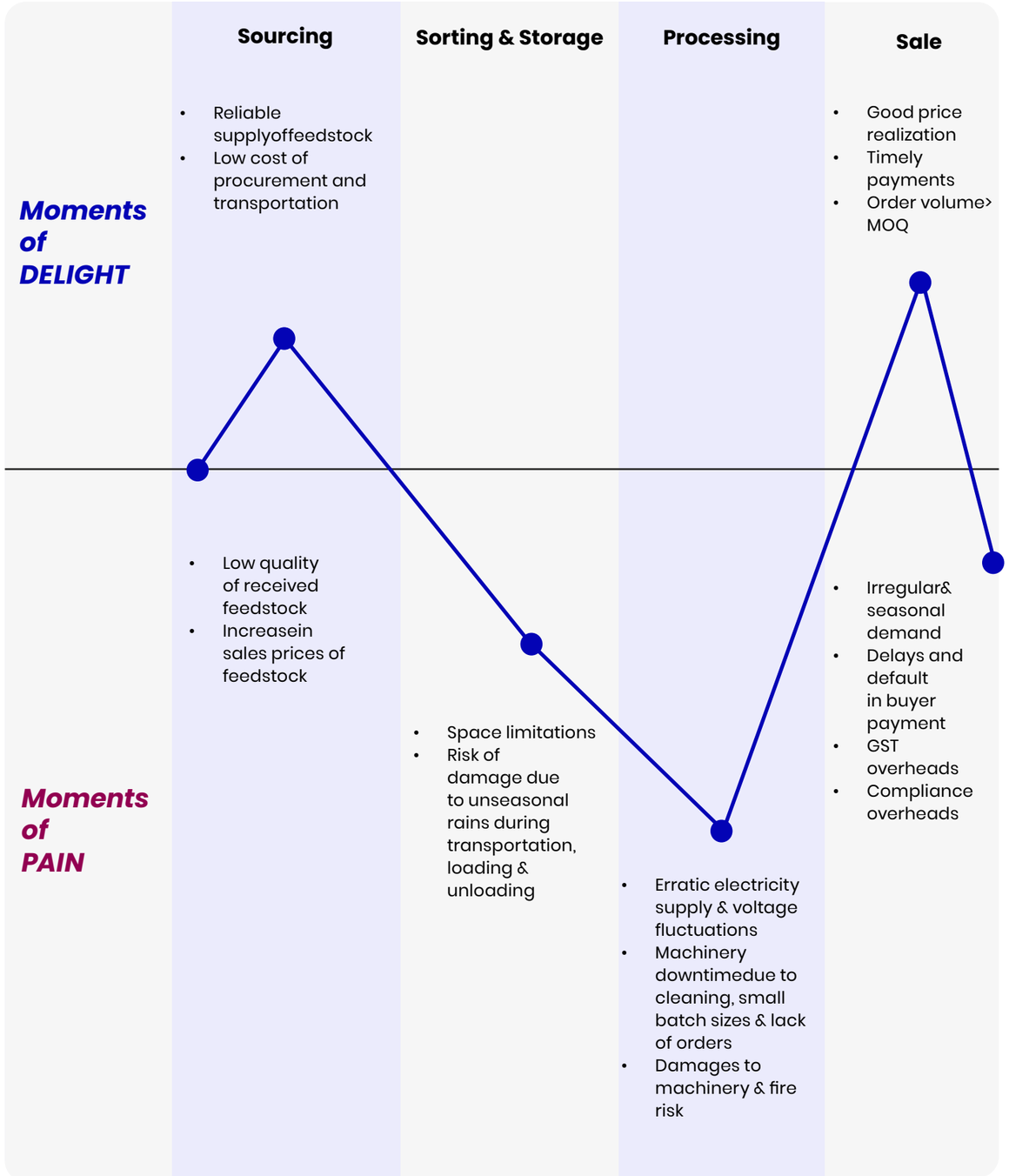
NEEDS
- Consistent orders & offtake
- Machinery utilization
- Capex subsidies
- Recognition by Govt
- Preventing fire risks & damage to machinery

"Climate change is reducing winter days, leading to lower demand for felt for making jackets, & blankets"

DOMINANT WASTE STREAMS
- Polyester and blends
- Undergarments
- Contaminated
- Prints, stripes, fancy

"We don't have good infrastructure –roads, schools, hospitals"

7.2 Regular buyer orders and optimal utilization of machinery determine the moments of delight & pain for shoddy mill owners



7 Downcycling – Innovation mapping & gaps for the formal and organized sector

Solutions exist, but margins are low even at scale

KEY CHALLENGES	EXISTING INNOVATIONS	KEY FEATURES OF INNOVATIONS	LIMITATIONS, CONSTRAINTS & GAPS IN INNOVATIONS
Solutions for mixed materials	Global: IDid Local: The Good Felt	High grade felt making with polyester rich materials	Lack of consistent feedstock at competitive pricing
Solutions for material without pre-processing	Local: The Good Felt; Local Shoddy felt (non-metallic only)	Low grade felt with polyester rich material	Low price margin
Solutions for unidentifiable (composition) material	Local: Reti Ecotech	Bricks made of textile waste of any composition	Slow adoption

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10.Field Research

REWEAVE

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