

Vital lessons from pioneering organisations on the frontline of waste and ocean plastic

LEAVE NO TRACE

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Letter from Joi Danielson, Founder of Vital Ocean



JOI DANIELSON
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This book has been an act of love. It was completed on the sidelines of building and running frontline waste programs at Hasiru Dala, TriCiclos and Project STOP. It's the report we wish had existed when we were starting our organisations. It includes what we've learned in our own endeavours, and what has worked for over 45 successful frontline organisations interviewed in four focal countries—Indonesia, India, Brazil, and Chile.

So often these kinds of reports—including my own past research¹—take a top-down, “what must be true” modelling approach to solving waste management and ocean plastic problems. But this report is bottom-up. We went into the world and asked those that had been successful on the frontlines how they did it. We hope that making the effort to cross the language barrier between English, Portuguese, Spanish, and Bahasa Indonesia will bring new insights into how sister organisations have solved the most important and common waste management challenges and inspire new collaborations between organisations.

Waste is collected on the frontlines. It can only be stopped from going into the ocean on the frontlines. While global leaders gather at international forums to talk about the crisis of ocean plastic, local leaders on the ground are rolling up their sleeves and getting things done. These are the heroes of waste management. Yet, their task is more difficult than it needs to be. In each country, they need to work around different but significant constraints in the waste system that can only be addressed at a policy level outside their control. They struggle to make the economics of waste management work due to the very low margins of recycling and minimal, if any, government or private sector support. They hear about the hundreds of millions of dollars earmarked for ocean plastic and waste solutions yet struggle to access these funds because they're too small, too informal, or don't communicate in a way that international donors need to feel comfortable. There needs to be a better way.

Waste has always been someone else's problem. The very nature of throwing waste “away”, out of sight, out of mind, transfers the responsibility to someone else. Some blame the government for not investing enough into waste management or for poor legislation. Some blame resin producers and consumer goods companies for flooding the market with plastic products (much of which is hard if not impossible to recycle economically). Some blame everyday people for burning garbage or dumping waste directly into the environment when they should know better (yet do not have access to functional waste collection services). When we blame, we transfer the problems to others. But what's needed is the sharing of responsibility across the entire manufacturing-to-waste value chain—by every stakeholder—especially to empower frontline organisations to do their job and scale their impact. This is how true change will happen.

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We thank the many organisations who gave us a glimpse into why their organisations have been so successful. This work is a celebration of all that they have achieved.

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Executive Summary

The world is struggling to answer the question, “How do we stop ocean plastic pollution quickly, permanently, and as cost efficiently as possible?” This paper attempts to provide answers, focusing on waste management strategies in the developing world that will curtail leakage of plastics into the planet’s waterways.

Ultimately, reduction will result from solving the complex root causes that cause waste to be mismanaged—something deeply interwoven with economic, technical, social, and behavioural norms. Solutions need to be culturally appropriate, inclusive, economically sustainable, technically rigorous, and built on a foundation of transparent, reliable governance—which takes time to develop. Yet, we are in an environmental crisis and need to move forward—and scale quickly while not ignoring the fundamental building blocks required for systemic change.

Building long-term, circular waste management systems that are economically sustainable—in environments where funding is not abundant—is challenging. But if the accumulation of plastic waste in the environment is to be curtailed, it must happen.

Waste management is an integrated system. If only one part of the value chain is addressed, then remaining constraints create bottlenecks in other parts of the chain. Many committed and capable organisations have made only incremental progress in reducing ocean plastic because they focus on only a single aspect of the waste system. But when constraints throughout the waste system are resolved simultaneously and the economics can be solved, long-term marine debris reduction is possible. Cleaner, healthier, and more modern cities—including the creation of thousands of green jobs—are also achievable. Few waste organisations have managed to do this successfully—and fewer still at scale. We wanted to learn from those that had.

Our aim for this research was to unlock how some of the most successful waste organisations around the world have solved the toughest challenges facing poorly funded waste management systems. The universal, complex issues they faced include:

1. Behaviour change at scale
2. Waste picker inclusion
3. Affordable waste collection
4. Recycling plastics economically
5. Processing organics without a loss

This report includes a chapter on how to solve each of these five universal waste management challenges. Case studies are used to illustrate how different organisations have tackled these issues in different environments. The conclusion includes recommendations to government and the private sector that come from the frontline of waste management. If implemented, these recommendations would remove systematic challenges that are faced by all organisations and materially improve waste systems country wide. The appendix includes short descriptive profiles and business canvases of the report’s most prominently featured organisations so others can learn different waste business model designs.

This process took us to four nations in the world that are arguably leaders in solving these common, yet significant, challenges: India, Indonesia, Brazil, and Chile. Leaders of more than 45 best-practice organisations were interviewed. A range of languages, belief systems, and geographic realities separate the organizations featured in this report, but their stories and business models are broadly applicable to any waste funding-constrained area of the world. We hope that the effort to cross the language barriers of English, Portuguese, Spanish, and Bahasa Indonesia will bring shared recognition across cultures regarding how to solve these universally difficult, but solvable, challenges.

KEY FINDINGS

1. BEHAVIOUR CHANGE AT SCALE

Waste management literature is littered with failed behaviour change case studies. So much so that the general consensus is that models which rely on community behaviour change—like waste separation at source—will fail. It is assumed that it is just too difficult to get people to care enough to sort their waste. But the focal organisations have shown that behaviour change is not only possible, but also does not require years to accomplish. This chapter outlines the tools,

tactics, and campaigns that organisations have used to transform how their communities think about—and take responsibility for—their waste practices.

- **Behaviour change is as much a science as it is an art.** With distinct steps, behaviour change can be broken down, learned, and applied by anyone for consistent results to address a broad range of waste and ocean plastic actions that need not take years.
- **If we want to change behaviour,** we must first understand the belief systems that guide it and then develop alternative belief structures.
- **To get behaviour change to “stick,”** communicating “why” change is necessary is crucial. Reasoning has to be clearly shared and change made structurally easy, with both positive and negative incentives that organically reinforce the transformation over the long-term.
- **To build a new habit,** introduce “triggers” like a sound or smell that precedes an activity and a “reward” for completing that activity (cue → routine (habit) → reward). Each time the brain encounters the trigger, it knows what activity should come next (with a reward to follow).
- **Eight influencing strategies have been found to be particularly potent** in changing community behaviour. They are (1) inspiration/appeal to values, (2) logic, (3) role modelling, (4) relationships, (5) authority, (6) consulting, (7) social pressure, and (8) community pride.
- Campaigns **combine overlapping and mutually supportive behaviour change strategies** and communication elements to inspire and train communities.

2. WASTE PICKER INCLUSION

This chapter delves into understanding waste pickers—who they are, and why they need to be protected, and the strategies that organisations have successfully used to earn their trust, inspire governments to change, and build economically viable business models that secure their livelihoods through participation across the entire waste value chain—from waste collection to safe disposal.

- Celebrated municipal waste efforts—such as single-use plastic bans, clean-city programs, and supporting tech-enabled waste start-

ups—lead to cleaner, more modern cities. But they also reduce the amount of material for waste pickers to collect and earn an income from. However, **it does not need to be a choice between supporting waste pickers and professionalising a city’s waste system.**

- In every best practice example, **government legislation has been a vital component in improving conditions for waste pickers.** They can attain a healthier, safer, and more secure future—but rarely on their own.
- **Different types of organisations serve different waste picker needs.** Social justice and policy organisations build trust, community, and advocate for their rights. Livelihood organisations create long-term entrepreneurial opportunities, while waste enterprises can blend waste picker and other workforces.
- India and Brazil, arguably the two countries that have best supported waste pickers, **followed similar steps to move waste pickers from subsistence living to greater opportunity.** These countries (1) built solidarity among waste pickers, (2) mobilised them to fight collectively for recognition and economic opportunity, (3) granted them legitimacy through occupational ID cards and work rights, and (4) built entrepreneurship opportunities that allowed them to formally participate at multiple points in the waste value chain.
- **Waste pickers are deeply entrepreneurial,** hardworking, independent, and skilled at identifying valuable waste—their livelihoods depend on it. But as a result, it can be challenging to incorporate them into the formal waste system. They generally earn more than minimum wage or earnings found in comparable low-skilled professions (e.g., domestic work, manual labour, fishing, farming) and prefer to work independently with flexible schedules (rather than reporting to a manager with fixed timelines and deliverables).
- **Three waste picker inclusion models have been found by focal organisations to be particularly effective.** These are (1) waste picker livelihood organisations that create entrepreneurial opportunities, (2) waste picker cooperatives, and (3) blended workforces that combine flexible pay-for-performance and salary-based operational work.

3. AFFORDABLE WASTE COLLECTION

Waste collection is the foundation of the entire waste management system and most important lever for keeping plastics out of the environment. This chapter broadens the definition of waste collection, presenting the strengths and weaknesses of nine diverse collection models. It also distils lessons learned from the field to build economically viable waste collection systems that can withstand the test of time and keep waste out of the environment, including strategies to increase revenue through multiple income streams and reduce costs with improved operational efficiency and worker productivity.

- The value created from processing waste is usually not enough to cover the full cost of waste systems, especially collection (which almost always runs at a net cost, especially when high-value recyclables are removed by waste pickers and residents). **This gap between cost and value dissuades potential waste collection investors and entrepreneurs from dedicating time and resources; and creates a powerful disincentive for city governments to collect a community's waste** - the more they collect, the more expensive their fuel, vehicle maintenance and worker salaries, and the shorter their landfill life.
- Each organisation, government and private sector institution investing in or designing a waste collection system needs to consider **whether their collection model catalyses an exemplary waste system model of the future or supports less-than-perfect collection models that utilise the shortest path between collection and recovery**, including decisions on which materials will be collected, whether waste will be collected from all households and businesses or a sub-set, and whether waste pickers will be supported and if so how.
- From an environmental and social point of view, **the best collection systems ensure all non-organic waste is collected from all households and businesses**, in a way that creates the waste system a region wants long term and thoughtfully includes waste pickers in the transition.
- **Waste collection can take many forms** from traditional charge-for-service models such as government or community-run collection, private hauler and social enterprise for-profit collection, micro-entrepreneurial haulers, and waste picker cooperatives; secondary collection by buying already collected waste from waste pickers, junkshops or waste banks and collection models where residents donate their valuable recyclable

waste through recyclable collection points and/or waste picker entrepreneur programs.

- **Each collection model has trade-offs.** Some are less capital intensive and generate greater entrepreneurial opportunities—but are harder to ensure quality service delivery. Others are fast and efficient at collecting recyclable waste—but leave out the rest of the non-organic stream and may perpetuate less than ideal social and environmental norms. Others are capital intensive and entail managing large work forces and vehicle fleets—but have ultimate control over every aspect of the waste system
- Innovative organisations are optimising their operations to be as low cost as possible and developing multiple, new revenue streams to cover expenses.

4. RECYCLING PLASTICS ECONOMICALLY

Recycling gives value to waste, transforming it into useful materials and products, rather than ending its useful life in a landfill or worse, in the environment. In most rapidly developing economies, recycling of high-value materials can be profitable without subsidies (albeit with low margins). However, only a small fraction of what can be recycled, actually is. Most waste plastics do not have enough value to justify the “collect-sort-transport-clean-recycle” process, making recycling in its current incarnation unlikely to be scalable or sustainable for most types of disposed plastic. This chapter however, explores strategies organisations have used to tackle common yet difficult plastic recycling challenges that have resulted in economically sustainable waste businesses.

- **Virtually all kinds of plastic are technically recyclable**, however, few are economically feasible to recycle especially in rapidly developing economies where **2/3rds or more of the plastic composition is “low value” flexible plastics** like multi-layer single use sachets
- Local organisations have found innovative ways to build viable recycling businesses by **creating new markets for waste materials, by vertically integrating along the value chain to capture greater margins, by partnering with other organisations with different core competencies to create stronger product offerings, by marketing and setting up traceable supply chains for “materials**

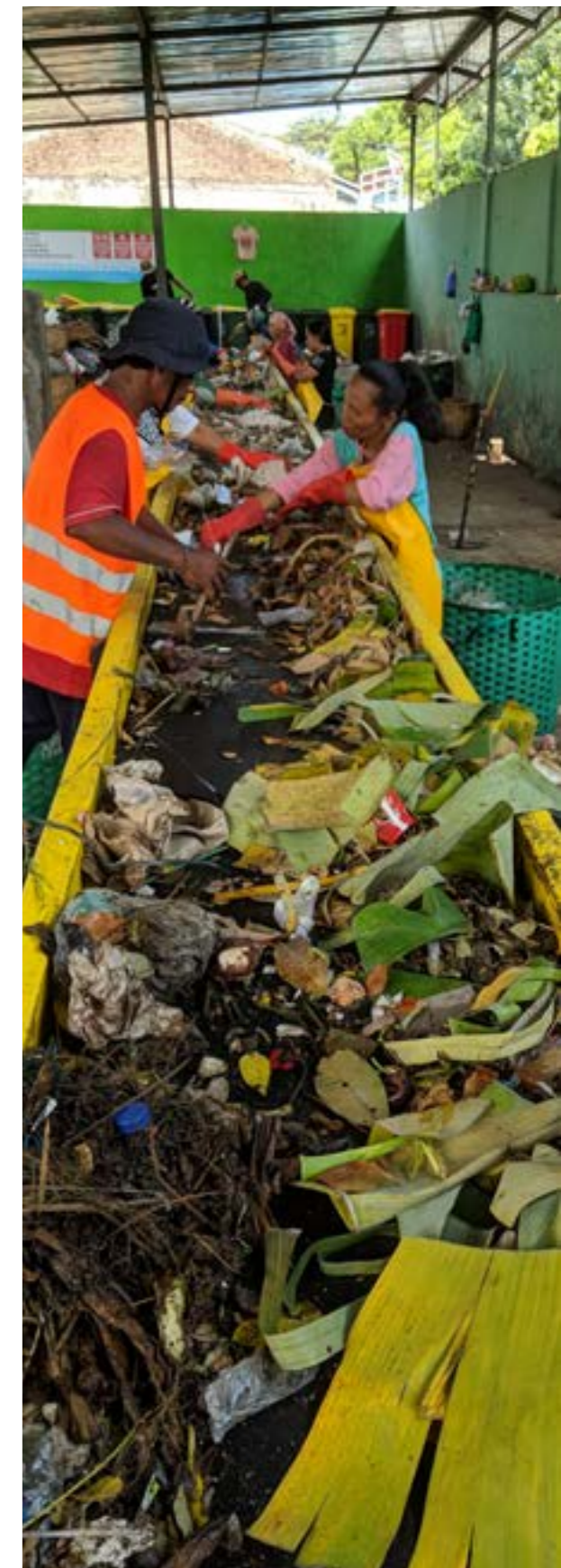
of purpose” - ocean-bound and/or social, Fairtrade plastics that sell for a premium and by developing or adopting new technologies that enable recycling of normally hard-to-recycle materials. Still these businesses generally focus on the highest value plastics, **leaving a gap of economically viable recycling options for the lowest value plastics.**

- Innovative recycling organisations also employ several strategies to reduce recycling costs in their operations including establishing centralised recyclable collection points so materials are brought to them and by building win-win partnerships with both large waste producers and with logistics providers to support the transport of materials to recycling hubs.

5. PROCESSING ORGANICS WITHOUT A LOSS

Organic waste is moist and heavy, making it a greater burden for waste collectors, both financially and technically. Once organic waste reaches a landfill, it releases harmful, fast-acting methane greenhouse gas—contributing to a country's greenhouse gas (GHG) balance. When organic waste is not separated, it contaminates recyclable non-organic waste and thereby reduces its value by up to two-thirds. Additionally, it costs more to produce products like compost from such waste than the market will pay for it. Some organisations, however, have found ways to process organics into valuable resources that cover costs while also feeding the food chain, enriching the soil and plants, and/or providing low cost energy.

- One of the most important actions national governments and municipalities can take to reduce waste system costs is to **incentivise communities to manage their own organic waste.**
- **Organic waste is rarely profitable for communities without financial support.**
- To derive profit from organic waste, **choose a processing approach that creates a product with local market demand** such as compost, fertiliser, animal feed, biogas, charcoal briquettes, or natural pesticides.
- **The ideal processing systems are simple and modular**, enabling the testing of various configurations and processes before larger investments are made.
- **Five strategies have been found that create as much value from organic waste as possible.** These are (1) quality guarantees, (2) subscription fees, (3) vertical integration of operations, (4) GHG mitigation schemes, and (5) government





and private sector buying agreements.

- **Focal organisations employed four tactics to reduce operating costs**, including (1) household and community self-run processing, (2) bartering for land, (3) building and buying equipment locally, and (4) engaging student and volunteer labour.

6. RECOMMENDATIONS TO GOVERNMENT AND THE PRIVATE SECTOR FROM THE FRONT LINE

While some organisations manage to successfully break through the five most difficult universal constraints explored above, national governments and the private sector have the power to quickly and holistically solve the most difficult problems that face low-funded waste systems. They can remove these systemic constraints once and for all, fundamentally altering how waste systems and the incentives that drive them work, while building the foundation for broad entrepreneurial investment. This will make it easier for all frontline organisations to succeed, regardless of their location or how innovative their leaders are.

The ingenuity of local grassroots programs is impressive. This is part of what needs to be shared with the world. But if these small-scale successes cannot connect with large-scale markets then their success is ultimately limited. When plugged into larger regional and national markets, their collected waste gains value, which makes it more economically feasible to collect, sort, and process.

The recommendations below are systemic investment and regulatory policies that have proven to have the most significant impact on improving a nation's waste system—which ultimately equates to how much plastic leaks into the environment. They come from listening to those on the frontline—voices rarely brought to the policy-debate table—but are those with perhaps the most knowledge about what it truly takes to fix waste systems on the ground.

GREATER FUNDING LEVELS

Where investment is needed most

- **Waste collection:** Adequately fund collection and safe landfill disposal systems at USD\$40–

70 per tonne of waste collected.

- **Organics processing:** Support clean development mechanisms (CDM) and voluntary carbon credits to catalyse industrial-scale organics processing and make progress on emission reduction targets.
- **Recycling hubs:** Invest in regional waste treatment “hubs” (and upgrade existing informal recycling hubs) and efficient transportation “spokes”—with new hubs located in strategic recycling deserts, potentially through special economic zones such as recycling parks.
- **Logistics infrastructure:** Support transportation by truck and ship so recyclable materials travel further at lower cost, thereby requiring fewer recycling hubs.
- **Microfinancing:** Develop cooperative funding entities that can provide low-interest capitalisation to waste pickers and junkshops.
- **Moonshot seed financing:** Invest in technology of the future to create a paradigm shift in recycling systems and material design especially for lower value plastics.

Sources of investment

- **Indirect fee collection:** Build national or regional indirect charge systems for household and business payment of waste collection services.
- **Extended producer responsibility (EPR):** Share the responsibility of end-of-life product costs while incentivising product recyclability and greater demand for recyclable feedstock.
- **Impact, philanthropic, and multi-donor trust fund investment:** Access funding dedicated to reducing ocean plastics and broader waste management solutions.

GAME CHANGING POLICY RECOMMENDATIONS AND OTHER SUPPORT

ORGANICS

- National mandates to separate organic and non-organic waste material by households and businesses.
- Require large organic waste generators (e.g., restaurants, hotels, dormitories, residential complexes) to do on-site organics processing.
- Certify the safety and quality of organic

products in order to build market confidence.

- Create a fair market for organic waste processing by giving composters access to subsidies similar to fertiliser manufacturers or remove/lower subsidies to create a fairer playing field.
- Subsidise the nascent organic-processing industry and assist it to develop market share.

WASTE COLLECTION

- Incentivise local communities to manage their own organic waste to keep it out of the waste stream.
- Centralise non-organic waste collection responsibility at the municipal level (or higher) and process waste at a local decentralised level to avoid it going to landfill.
- Support collection programs in small- and medium-sized cities and rural areas, where waste collection levels are generally the lowest.

WASTE PICKER INCLUSION (AND RECYCLING)

- Recognise waste picking as an officially sanctioned occupation within national labour categories and provide occupational identification cards to empower the formal right to access, collect, and sell waste.
- Create a legal body within the national government to aid waste pickers in garnering greater legal rights and welfare.
- Give waste picker cooperatives the right to fulfil municipal waste collection contracts and take-back services to meet EPR requirements.

RECYCLING

- Reduce or eliminate recycling industry value added tax (VAT) when buying materials from waste pickers.
- Design products for end-of-use recyclability.
- Build economically viable scalable organisations by incubating organisations that work to curtail waste and ocean plastics.

Supporting and building effective waste collection, recycling, and organic waste systems will lead to greater amounts of plastics being collected, processed, and not dumped into the world's oceans. This report is an effort to examine and share already proven solutions to build resilient waste programs from 45 organisations on the frontlines.

1 Behaviour Change at Scale

Few other topics are more feared or misunderstood by waste professionals than community behaviour change. Behaviour change refers to any transformation or modification of human behaviour including direct action like motivating residents to sort their waste, pay for waste services or no longer dump waste into the environment. It also refers to broader societal/cultural shifts like elevating the importance of recycling and improving waste picker status.

Waste management is littered with failed behaviour change case studies, so much so that the general consensus is that models which rely on community behaviour change like at source, will fail. Often times it is just too difficult to get people in communities to care enough to sort their waste, but our focal organisations have taught us that behaviour change is as much a science as it is an art. With distinct steps, behaviour change can be broken down, learned, and applied by anyone for consistent results to address a range of waste and ocean plastic actions. In fact, many organisations have used these tools to transform how their communities think about, and take responsibility for their waste practices. These organisations have also taught us that behaviour change need not take years. Entire cities can transform their waste practices in less than a year, given the right campaign reinforcements and leadership support. We hope these tools will inspire more waste management leaders to take bolder steps within their communities and to break through old belief systems, toward an era of more responsible and cleaner waste practices.

CASE STUDIES PROFILED IN THIS CHAPTER

- Cibunut Berwarna, Indonesia
- ecoBali Recycling, Indonesia
- Fundación Basura, Chile
- Hasiru Dala, India
- Indonesia Waste Platform, Indonesia
- La Pintana, Chile
- Magic Eyes campaign, Thailand
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BEHAVIOUR CHANGE AT SCALE

VITAL LESSONS FROM PIONEERING
ORGANISATIONS ON THE FRONTLINE



INTRODUCTION

Behaviour change at scale is not only possible, but easier than people realise when the fundamental building blocks are understood and applied consistently and creatively. This section first explores the science behind how beliefs and habits are formed, and how they ultimately affect our behaviour. It then introduces a four-piece theory of behaviour change, with each piece reinforcing the others to bring about system level change. Next eight influencing techniques to persuade people of any background to think and act differently are introduced. Finally, a few campaign examples will tie pieces together, showcasing how thousands of people can learn to sort their waste in less than a year.

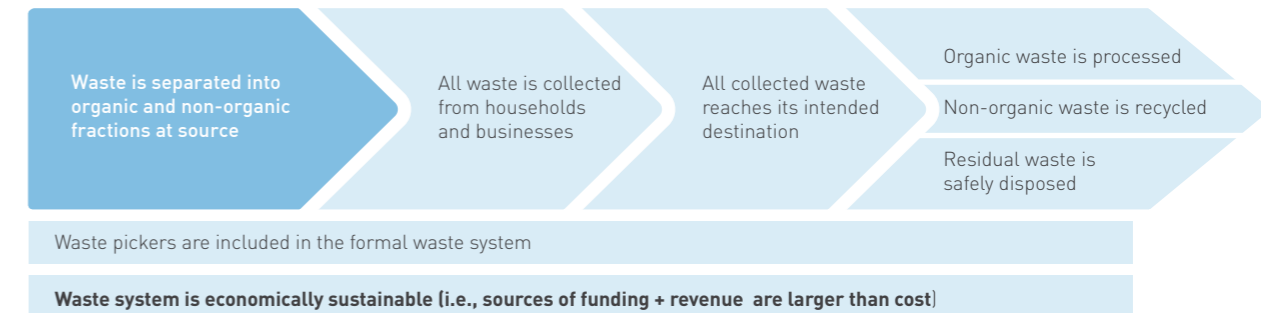
There are two levels of behaviour change explored: changing societal/cultural beliefs, such as elevating the importance of recycling and improving waste picker status, and more direct action such as classifying waste into organic and non-organic fractions (or three-way segregation) or paying for waste services for the first time. As most of the same influencing tactics are used for both, the text illustrates the concepts primarily using household source separation examples.

Case examples from 18 organisations in five countries are profiled throughout the text to illustrate the concepts in real practice. Our four focal countries - India, Brazil, Indonesia and Chile each teach us something new. Indian organisations lead in motivating households to separate their waste into organic and non-organic fractions. They along with Brazil also excel at reducing waste picker stigma and legitimising the value waste pickers bring to society. Indonesia has ingrained the idea that waste has value and has pilot examples of successful household waste minimisation. Chile is growing a culture of conscious environmental awareness and influencing the private sector in progressive ways to develop more recyclable packaging as well as incorporate greater levels of recycling content into their products (explored in other chapters). Together country examples show how the same theory can be used for different types of behaviour change campaigns, or used for comparable behaviour change campaigns but applied in unique country appropriate ways.

Exhibit 1: Focal country waste system comparison

	INDIA	BRAZIL	INDONESIA	CHILE
Household waste collection	Decentralised. Varies by city.	Centralised and done through municipality.	Decentralised. Responsibility of village community.	Centralised and done through municipality.
Waste funding	Varies by city, but generally low	Adequate	Insufficient	Adequate
Waste picker inclusion	High - recyclables + waste collection	High - recyclables	Low	Medium - recyclables
Level of recycling	High	Medium-high	Medium	Medium-low

Exhibit 2: Topic covered in this chapter within the waste value chain



¹ While these best practice principles are true for numerous collection models, they're efficacy will depend on local context

I. THE FORMATION OF BELIEFS AND HABITS

BELIEFS

Our actions are the outward manifestations of our inward beliefs. Therefore, if we want to change behaviour, we first need to understand the inner beliefs guiding this behaviour which are often deeply ingrained from both our youth and the culture in which we live. Beliefs are an incredibly strong presence despite being invisible, forming our identities and how we relate to the world.

Exhibit 3: Beliefs underlie outward behaviour



The behaviour we see

The underlying belief system that leads to the behaviour we see

The behaviour we want to see

- Stop dumping and burning waste
- Sort waste into organic and non-organic fractions

The underlying belief system we want to instil

- Waste matters
- My waste, my responsibility
- Sorting is easy

As a practical example, the outward action of not separating waste can stem from different internal beliefs as illustrated by Project STOP. Indonesian **Project STOP** partners with cities and government to empower local villages² to build low cost, circular waste management systems that collect waste from every household and business and eliminate leakage of plastics into the ocean in highly polluted cities. When they first started operations, they trained two pilot areas of roughly 100 homes each to separate their organic and non-organic household waste. Households were given two bins - one green for organic waste and one yellow for non-organic waste. The newly trained village door-to-door collection workers then used larger yellow and green wheelie bins to collect and keep the sorted waste separate from each household. After making their collection rounds, they store the larger wheelie bins in a temporary storage depot area for pickup and replacement by transfer station workers employed by the village.

Area 1 almost immediately started separating their waste, but stopped after two weeks. Area 2 never really started to separate their waste, except for a small cluster of diligent homes. The STOP team, quite puzzled, held open focus groups with residents of each area. The team discovered that, in the first area, the large yellow and green wheelie bins that local waste collectors used to collect household waste door-to-door were sometimes returned by transfer station workers once emptied with wheelie bins of a single colour (e.g. all yellow wheelie bins and no green yellow bins). Confused, these local door-to-door waste collectors then started mixing the household separated waste into a single bin.

When households saw their separated waste mixed by collectors, they stopped separating because they felt 'there was no point.' Trust was broken between households and the waste collection service taking considerably more effort to re-establish than introducing the behaviour change in the first place. Fixing it took multiple door-to-door visits by behaviour change facilitators to speak with each household to recommit to the promise of keeping organic and non-organic waste separated. A checklist system for transfer station workers was also introduced to make sure the right number and colours of bins were delivered to community depots and they created a temporary wheelie bin marking system in the now rare case that single-coloured bins were delivered.

In the second trial area, the Project STOP team discovered that, although the door-to-door training facilitator was passionate and presented the waste sortation steps accurately, she was ignored because of her age, given the hierarchical culture of the community she spoke to. When the older facilitator from Area 1 presented the same information to these households, the residents were more open to the idea of separating their waste, highlighting the importance of understanding local culture and deeply involving local community members when implementing waste programs.

Those who had consistently separated their waste from the beginning were found to be members of the community's women group who were partners in the STOP program and had chosen the bins, logo, and other operational aspects of the program. Thus, they were highly invested in its success from the start.

CURRENT EXTERNAL ACTION	CURRENT INTERNAL BELIEF
Not separating waste into organic and non-organic fractions	Area 1: There's no point to sort my waste. It's going to get mixed anyway. Area 2: Who is this young girl to think she can tell me what to do?

This case shows how the same action - not separating waste - stemmed from two different belief systems.

The Project STOP team was also surprised to find that the collected waste brought to the transfer station rarely contained any diapers, despite many young children in the community. The team members knew that it was not a question of simply training residents to use the new waste system; they learned there is a religious belief

that if diaper faeces are burned, their child will be harmed. Therefore, mothers in this Indonesian community may separate all of their other waste and put it out for collection, but they will still dump their children's diapers into the river. Changing a belief as strongly as this one, tied to a value as sacred as protecting one's children, was going to be much more difficult. Changing this behaviour is a work in progress for the STOP team. Changing this behaviour is a work-in-progress for the STOP team.

CURRENT EXTERNAL ACTION	CURRENT INTERNAL BELIEF
Throwing all diapers into the river, canal, or ocean	I will harm my baby and be a bad mother if I allow my baby's diaper to be burned. If I throw it into the water, it will be safe from burning.

To support positive change, it is helpful to identify not only the current belief but also the beliefs we want to replace them with - the powerful "whys" behind change. Then we can actively use various influencing techniques to change these beliefs.

WANTED EXTERNAL ACTIONS	NEW INTERNAL BELIEFS
Stop burning and dumping waste	My actions matter My waste practices matter (i.e., there are consequences to my waste practices like where I dump my waste) Waste dumped into the sea harms marine life and the local fishing economy Burning waste harms human health
Sort waste into organic and non-organic fractions	Sorting is easy Sorting my organic waste nourishes life Sorting my non-organic waste gives livelihoods to waste workers Sorting protects waste workers from harm
Pay for waste services	My waste, my responsibility Responsible waste management costs money



Changing beliefs is a gradual process and is often accomplished through campaigns. **Hasiru Dala** and **Swachha Eco Solutions** are organizations in Bengaluru (India) that work both with their municipality and independently to change beliefs by introducing one campaign at a time. They also create customised messages for each type of stakeholder. To achieve their goal of properly sorting waste within their communities, they first focus on training household residents as they are the first point of contact within a household and must buy into the program to go further. Second, team members train their domestic workers and housekeeping staff who manage the daily household waste. Next, they engage the children in the house who become the soldiers of recycling by hitting at the moral heart of their parents and generally enjoying policing the disposal habits of everyone in the house. Children influence their parents to value what they value and fight for their future, reinforcing the original parental training.

Once new beliefs and actions stick, which takes time, the next belief structure and campaign is rolled out. In Bengaluru, for example, in 2009 the **Solid Waste Management Roundtable (SWMRT)** first started to advocate for decentralised waste management, waste collection and processing driven at the community or ward level³ with intermediary neighbourhood facilities set up for non-organic recycling and organic processing rather than waste collection at the municipal level. This was backed by training and live demonstrations, and the government was eventually approached in an effort to institutionalise it. Next in 2010, **Hasiru Dala** members with the SWMRT actively campaigned for the recognition of waste pickers and their right to legally pick-up and sell waste, as well as pushing to have them integrated into the city's waste management system.

It was not until 2012, when the garbage crisis hit the city and the Bulk Generators had to manage their own waste that the government knew change needed to happen. In 2015, the "2 Bin - 1 Bag" experiment⁴ was formally adopted by government. The following year, the SWMRT introduced a campaign on home composting. Through phased campaigns they have changed

how the government runs the city's waste system and inspired hundreds of thousands of households across Bengaluru to separate their waste through home and condominium composting programs.

HABITS

Organisations want to do more than just change behaviours. They want people to form new habits to ensure positive change sticks over time. Scientists have found that when people are learning new skills (like waste classification) their brains are actively involved in the experience, from scanning the environment to making continuous decisions, like what to put where⁵. But as the new skill becomes automatic, brain activity slows down. Movements soon become routine. Consider the complex action of driving a car – what once seemed overwhelming to your senses is now an almost automatic activity. In between these two states of learning and accomplishment is the fairly simple formula of establishing habits:

CUE -> ROUTINE -> REWARD

As a new habit is forming, the brain spends time searching for a trigger. This could be a sound or smell that precedes the activity. Now, your brain knows the next time it encounters this trigger, or "cue", what pattern of activity it should use. The reward at the end simply makes doing the activity worthwhile. So, the secret to forming habits is to find a clear cue and a desirable reward.

Within waste management, there can be a myriad of cues to nudge desirable action. Perhaps it is seeing the green "organics" bin in the kitchen when cooking, watering the plant nourished with waste compost, receiving a WhatsApp reminder that collection service is the next day, hearing the waste collection truck drive onto your street, hearing a specific tune the vehicle plays as it approaches the house, or the consistent holler of a collection worker etc.

The reward is often rooted in our belief systems, and is ideally tied to the "why" behind the behaviour change outreach. For some, the reward is simply getting rid of what is unwanted, while for others it may be following a religious belief

and feeling good about doing the "right thing." For others, the reward could be the integration in being a part of a modern city and/or protecting both the environment and our own health. Still others might want more explicit rewards in the form of monetary payment if for example they believe it's the municipalities job to separate waste rather than themselves or that their waste has a great deal of financial value.

II. THEORY OF BEHAVIOUR CHANGE

There are numerous theories of what makes behaviour change stick. Many of them have similar elements including a powerful "Why?" or story of change that inspires people, training on how to change, and a new process with aligned incentives that make it easier to actually change. Three models that share most of these underlying building blocks are Simon Sinek's "Power of Why" model⁶ which starts with why, then how, and then what; McKinsey & Company's influence model⁷ which starts with role model, fostering understanding and conviction, developing talent and skills, and then reinforcing with formal mechanisms and the Theory of Planned Behaviour⁸ which includes three constructs: attitudes, subjective norms and perceived behavioural control. Our behaviour change elements are the following:

WASTE BEHAVIOUR CHANGE LEVERS

1. Communicate a powerful "why" for change
2. Teach how to change
3. Structurally make it easy to change
4. Align incentives to reinforce the change

1. COMMUNICATE A POWERFUL "WHY"

A compelling "Why" is the fuel behind moving from a temporary, transactional change to one of greater depth and permanence. It is the belief that propels action and the key to the "inspiration" influencing technique. When people understand and believe why the change is important, they then become advocates for change, ultimately sticking with it even when it's not easy. The "Whys" can vary across

organisational programs dramatically, as illustrated by collection programs serving different communities in Indonesia.

Rumah Kompos Padangtegal serves a community in Ubud, the spiritual hub of Bali (Indonesia), with the strong belief that all life is divine. Their "why" is: We must hold God, one another, and the Earth sacred. Good waste management practices go far deeper than ugly, smelly piles of trash. Rather, waste management is a reflection of who we are as human beings. It is about caring for one another by caring for the Earth. Every element of their behaviour change program supports this underlying notion of "why".

Fundación Basura is a Chilean Zero Waste NGO that uses a similar "why": We are nature. If we care for nature, we care for ourselves.

ecoBali Recycling is located in Kuta Utara, Indonesia and serves a broader group of people including many expats, hotels, and businesses. For them, the "why" is: Being a responsible, conscious citizen who wants to do the right thing for the planet by living a zero-waste lifestyle. Their messaging is similar to many waste programs in the U.S. and Europe, where environmental concerns are more endemic.

Project STOP is across the water from Bali in Muncar, Indonesia and serves a relatively low-income fishing community who have never known waste services before. The "why" that resonates strongest for them is: A clean and healthy community, followed by economic improvement. Their needs are far more practical. They no longer want to live next to piles of smelly, rodent-infested waste. In fact, they blame this waste for poor health and general decline of their community's fishing income.

Indonesia's **TPST Mulyoagung's** "why" is: The importance of caring for one another. This organisation puts their workers and their community first. They pay their workers relatively high wages, provide health insurance, and even bank accounts. Every two weeks, health care workers come to their facility to provide medical services. This same level of care is shown to the community. They charge households a small

collection fee; just enough to keep operations going. They are known to give away all compost produced and catfish they raise from waste larvae to members of the community as needed. As a result, this organization is dearly loved by the community.

Sometimes the first “why” is not the best “why” for the community served. In the first edition of the **Municipality of Peñalolén’s** Reciclaje Inclusivo Comunal program in Chile, waste pickers were assigned a route to collect recyclable materials door-to-door. Additionally, community members who agreed to be part of the program were sold on the value proposition that they would be participating in an activity that was good for the environment. They were told that their recyclables would be picked up on certain days, at certain times. However, as the program commenced, participants found that many routes were missed or not completed on the days they were assigned. Many frustrated community members lodged complaints, forcing the municipality to take action.

To solve the community’s dissatisfaction, the municipality decided to take a new approach. They changed the value proposition, or the “why,” to better suit the community. Rather than encouraging residents to participate for the sake of the environment, residents were shown how recycling ultimately improves the lives of waste pickers. The community’s most vulnerable group, waste pickers, would now have a consistent livelihood while also doing good for the environment. Households became much more supportive and understanding of lapses in service delivery. In fact, many of them tried to work with



waste pickers as partners in the process.

POWERFUL “WHYS” ORGANISATIONS HAVE USED IN PRACTICE

- Supporting waste pickers so they can have better lives
- Cleaner, healthier community
- Importance of caring for one another by caring for the environment
- Reducing environmental pollution
- It’s the law
- Being a responsible, conscious citizen that wants to do the right thing for the planet by living a zero-waste lifestyle
- Holding God, one another, and the earth sacred
- Responsible waste management is each person’s civic duty

The right “whys” can also be powerfully inspiring to gain commitments from both the government and private sector. Governments face numerous competing priorities, from education and healthcare to infrastructure. Unfortunately, waste management rarely tops their list of priorities. However, waste management has the potential to become a higher priority for both government resources and attention if given a powerful enough and authentic “why”. Some of the most compelling reasons are listed below:

Powerful whys for greater government intervention:

- Large (green) job creator¹⁰.
- As an indicator of a government’s effectiveness.
- Improves tourism, and ocean economies.
- Is a first step in building a modern, appealing city that people want to live in.
- Materially reduces greenhouse gas (GHG) emissions and can be an important component in reaching their GHG national commitments.

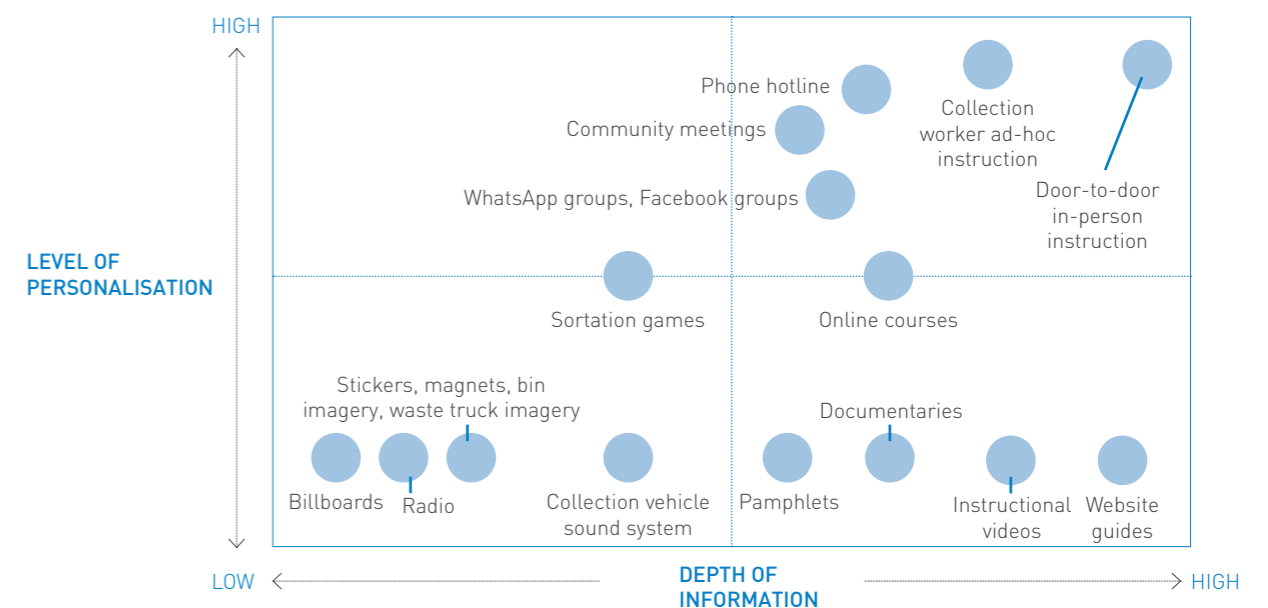
Powerful whys for private sector intervention:

- Waste is a resource. Every time it is thrown away, it is ‘wasted’ and its value is lost.
- Waste shows brand names that point to the companies that put it into the market.
- Opportunity to be a guiding light leader for the industry as a whole to move towards a more circular resource use future.

2. TEACH HOW TO CHANGE

Once people believe the change is important enough, they will be ready to try new behaviours. Of course, they will need clear instructions on not only what to do, but when to do it. For example, focal organisations use a combination of training approaches to teach waste separation techniques. These approaches usually start with high-level, simple messaging (e.g. stickers, magnets, bin colours, and pictures) before becoming more in-depth with personal training such as community meetings and door-to-door instruction. Clear, consistent messages need to be repeated across varying formats and contexts until they become top of mind and, eventually, the new norm. This is best done using communication formats favoured by the community that is trying to be reached.

Exhibit 4: Training tools mapped by level of personalisation and depth of information



Door-to-door training is especially effective because it offers both a high depth of information and a high level of personalisation to each household. With this approach, facilitators teach both homemakers and domestic workers how to sort waste in their kitchens, sometimes going as far as to empty out the household's current waste bin and discussing where each item belongs in the new sortation system. This helps to create a visual and sensory experience that is not easily forgotten. Additionally, residents can ask facilitators any questions they may have within the comfort of their own home. Often, materials like pamphlets, stickers, or magnets are left behind as simple visual reminders. Community meetings can be powerful lead-ups to door-to-door training, foreshadowing what is to come and reinforcing lessons learned. Once an initial campaign is rolled out, training still needs to be reinforced with both audio and visual reminders for years to come.

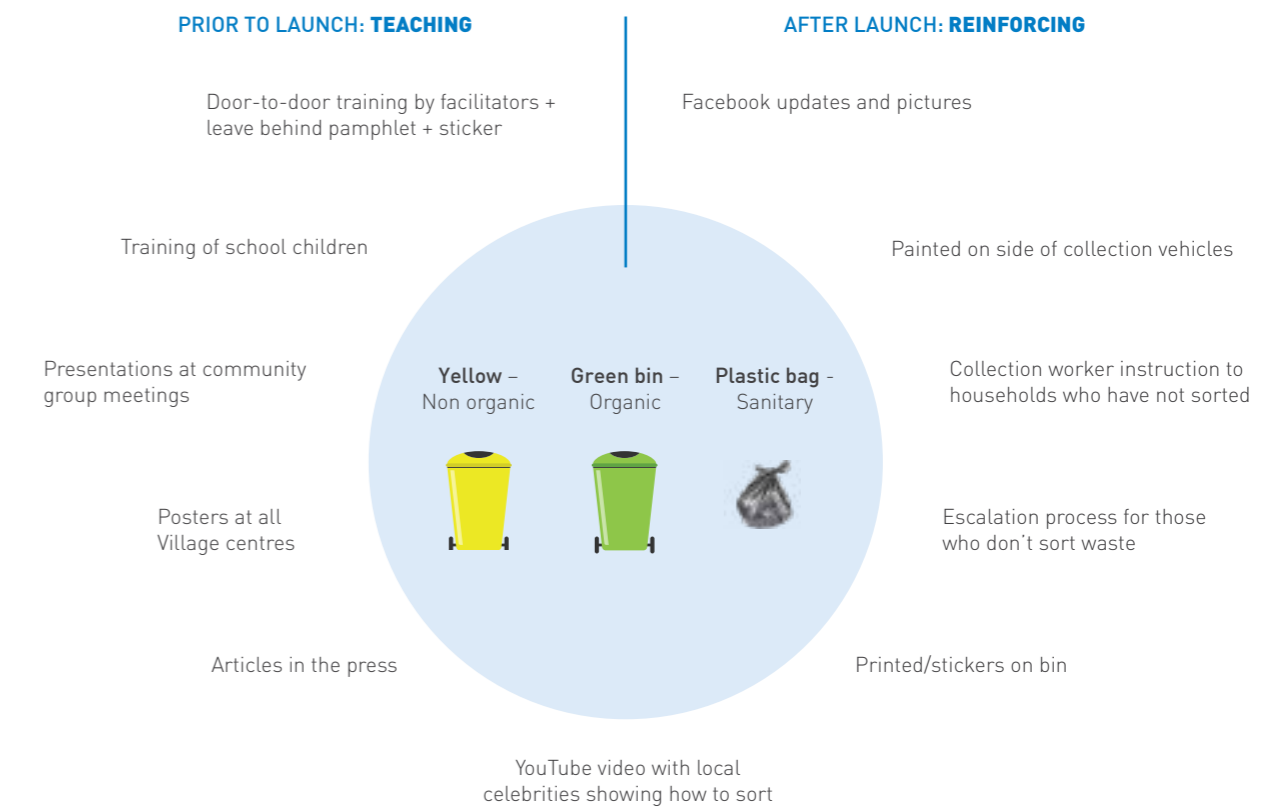
There are many behaviour change campaign elements that can be combined in different ways to both inspire and train communities:

Exhibit 5: Example behaviour change elements

AUDIO-VISUAL MEDIA	EXPERIENTIAL
<ul style="list-style-type: none"> • Documentaries • YouTube videos showing local leaders/ celebrities sorting waste • Online courses, e.g. Zero Waste certification • Billboards • Radio ads, shows, podcasts • Scientific reports 	<ul style="list-style-type: none"> • Beach clean-ups, brand audits • Door-to-door household training • Volunteer opportunities • Mobile outreach, e.g. recycling bus • Best practice organisation site tours • Community compost/recycling tours • Classes, e.g. zero waste • Waste walking/hiking trails • Waste arts • Information sessions
WASTE SYSTEM INFRASTRUCTURE	HOUSEHOLD INSTRUCTIONAL TOOLS
<ul style="list-style-type: none"> • Collection vehicle sound systems that play music and/or read message on waste sorting • Bin colouring and branding • Waste truck branding • Separate collection system 	<ul style="list-style-type: none"> • Stickers • Magnets • Pamphlets • SMS/WhatsApp reminders • Phone hotline for questions and/or to report service issues • Notification tags left on bins
SOCIAL	SCHOOL PROGRAMS / CHILD OUTREACH
<ul style="list-style-type: none"> • Multi-stakeholder convenings • WhatsApp groups • Community meetings • Facebook and other groups • Blogs • Twitter / Instagram • Citizen science - engage various age groups 	<ul style="list-style-type: none"> • Comic books • Waste/recycling curriculum (or waste incorporated into normal curriculum) • Field trips (e.g. beach clean-ups, facility tours) • Waste mascots • School composting program • School recycling/waste bank program • Eco clubs
COMMUNITY BUILDING	LEADER ROLE MODELLING
<ul style="list-style-type: none"> • Songs • Chants • Mayoral/ government awards for cleanest or greenest communities • Volunteer opportunities • Trash flash mobs • Pledges 	<ul style="list-style-type: none"> • Expert talks/forums • Solid waste management roundtables • Composting in temples

In Indonesia, **Project STOP** uses multiple overlapping communication mediums to teach and then reinforce household waste separation.

Exhibit 6: Project STOP campaign elements to teach residents how to sort waste



3. STRUCTURALLY MAKE IT EASY TO CHANGE

Most people are reluctant to change, regardless of how convincing the argument to do so may be. Ideally, to change a habit, someone has to not only believe in the importance of doing something new, but also believe that the change will be easy to implement and make their lives easier in the long run. In addition, supporting waste system infrastructure must be in place or the change cannot be sustained. Too often awareness campaigns are run but there is no supporting infrastructure resulting in people not knowing what to do with their separated waste, and quickly returning to their old habits. Prior to Project STOP, several 3-R (Reduce, Reuse, Recycle) campaigns trained the community to sort their waste in Muncar, Indonesia. But with 90% of residents without access to waste management, there was little point to sorting waste that would not be collected or recycled.

So assuming waste management infrastructure is in place, how do we make new waste management processes easy for people to use?

First, we must ask questions to understand the current waste patterns of our communities and to establish a baseline. How far must these people walk to dispose of their waste? How frequently do they dispose of it? What do they do when they are feeling lazy? In what circumstances do they use one disposal method over another? Then, map their current activities and decision flow before considering the steps it will take to set up a new household waste system and actively use it. What might make the new waste system difficult or cumbersome? What roadblocks might pop up? Compare both the complexity and effort of the old and new waste systems along with the motivation levels of the community members before considering what might be done to ease the burden.

Motivated communities are more willing to self-initiate parts of the program (e.g. buying their own prescribed bins, walking or driving to central recyclable collection points etc.), while less motivated communities need more support to instil new behaviour. Fewer self-initiated steps make it easier to embed the new change



up to a point because, of course, some personal responsibility is always necessary for real buy-in. The key is to bring affordable waste collection to their doorsteps so they no longer need to walk to the river. **Project STOP** in Indonesia, Chile's **Municipality of La Pintana** and **VRecycle** in India serve low-income communities who rarely prioritise responsible waste management. They offer door-to-door waste collection services and provide bins to their communities for free – as long as the community members agree to separate their waste¹¹. By serving them directly and providing the necessary tools to dispose of waste properly, it's actually easier for these community members to use the new waste services than to burn or dump the waste as they had previously. In Bengaluru, India, collection service for organic waste is daily while collection of dry, non-organic, recyclable waste happens twice a week, structurally forcing people to separate their waste based on the collection schedule.

4. ALIGN INCENTIVES TO REINFORCE THE CHANGE

An incentive is something that motivates or encourages one to do something. Incentives can be either positive or negative – from a “carrot” that rewards compliance to a “stick” that punishes non-compliance. Thoughtfully designed, aligned incentives, especially financial, reinforce the necessary behaviour change at every level of stakeholder interaction within the waste system and underlie lasting systemic change.

The “Whys” explored above for example, can be powerful incentives to positively change households waste behaviour. At the same time, both positive and negative incentives need to be considered for other waste sector actors as well. For example, in most cities, municipalities are actually discouraged from collecting waste from every household and business. Why? The more waste they collect, the more they will need to spend on transportation, vehicle maintenance, staff and landfill tipping fees. In addition, more waste means that precious landfill space fills up more quickly. However if the incentive structure were changed so that they were either rewarded financially for collecting as much waste as possible or were able reduce their financial burdens based on the amount of waste collected, this would ultimately change the underlying incentive leading to higher levels of waste collection within the municipality.

As another example, when landfills charge a tipping fee and/or are located far from the city's collection routes, private haulers are less keen to bring waste there. In fact, they may dispose the waste they collect in the nearby “free” environment. However, by paying these haulers only once the waste reaches its intended destination, and by tracking and monitoring collection routes along the way, less waste will be lost after it has been collected. Some more tactical incentive tools that focal organisations use include:

Exhibit 7: Sample waste incentives and disincentives for citizens, waste collectors and municipal governments

REWARDS (“CARROTS”)	PUNISHMENTS (“STICKS”)
RESIDENTS	
<ul style="list-style-type: none"> • Embedding deeper “why’s” such as improving waste worker livelihoods, reducing environmental pollution, and/or a general sense of doing the right thing for the earth and community • Cleaner home and surrounding area • Monetary discount if waste is sorted • Financial compensation for selling clean, recyclable waste • Public recognition either individually or as a community for successful waste practices • Forming deeper relationships within the community • Easier waste management than dumping or burning in the environment • Competitions between communities for best, consistent waste segregation 	<ul style="list-style-type: none"> • Monetary fines for waste dumping or burning • Non-collection of waste if not separated • More expensive waste collection fees if waste not separated • Public shaming (e.g. names and pictures posted on WhatsApp or Facebook groups) • Scolded by collection workers, or leaders in the community • Breaking trust after making a personal commitment to separate waste • Escalation processes (e.g. calls and visits to discuss sorting practices, required to watch recycling films) • CCTV cameras
WASTE COLLECTORS/ PRIVATE HAULERS	
<ul style="list-style-type: none"> • Pay only once waste reaches its intended destination • Pay based on amount of waste collected (the more waste collected and by extension residents served, the higher revenue) • Cost sharing/subsidisation • Good company reputation • Contract extensions 	<ul style="list-style-type: none"> • Loss of contracts • Financial penalties / fines • Lawsuits • Negative publicity • Closer scrutiny and more restrictive contracts and KPIs • Spot checks • Collection vehicle live tracking • Loss of licence to operate • Hidden CCTV cameras
MUNICIPAL GOVERNMENT	
<ul style="list-style-type: none"> • (Green) job creation • Perceived as a cleaner, more modern city • Win national and international green awards • Improve profile (and even fame) of government leadership • Lower incidences of certain health conditions resulting in lower health care costs • Reduces greenhouse gases and important contributor to national GHG reduction targets • Become important voice in global ocean plastic and waste management dialogue • Greater funding for city waste management • (In select cases) Financial agreements with vertically integrated waste processors which reduce the city's waste bill the more waste that is collected for processing 	<ul style="list-style-type: none"> • Negative publicity • Citizen protests and other forms of complaints • Lawsuits • Reduced tourism and sometimes ocean economies (e.g., fisheries) • Lower likelihood of public official re-election • Lose trust and goodwill of citizens • Negative city reputation

Hasiru Dala Innovation, who provides waste collection services to apartment complexes and condominiums in Bengaluru, India uses a variable pricing model as a powerful incentive to promote behavioural change. Each of three classifications of waste - organic, non-organic, and reject (e.g. sanitary pads and diapers) - are given a different price. Reject waste that goes to landfill is charged the highest price followed by organic waste which is composted while recyclable, non-organic waste is collected for free. In addition, they regularly increase the price for residential waste. Each category of waste is opened and weighed at the time of collection for transparency. An appointed building manager watches the weighing process and signs off on the final weight if satisfied. This ensures people do not put reject waste into other waste categories and that final cost is transparent and aligned. Because the final price is divided between all residents in the building, there is little incentive for illegal dumping, as they do not have the choice to “opt out”.

In 2012, when the service first launched, households that did not want to separate their waste threw all their mixed waste into “reject” waste. However, given the substantial cost, apartment associations spent time investigating their community waste patterns and when discovering the large proportion of mixed waste, put more stringent apartment rules in place. Reject waste dropped from an average of 351 to 110 grams per household per day, while the overall volume of waste did not change. Given several similar case studies, the High Court of Karnataka has now made differentiated pricing a law for waste service in Bengaluru further reinforcing source separation across the region.

III. INFLUENCING STRATEGIES TO INSPIRE COMMUNITY BEHAVIOUR CHANGE

Influencing techniques motivate people to change their beliefs and, ultimately, their behaviours. We have found the following eight influencing strategies used by focal organisation to be particularly potent. The most common influencing strategies generally used are authority (using regulations to require a change) and logic (using rational arguments backed by analysis to convince people to change). While these work well within the government and private sectors, rarely are they the most effective influencing techniques to move whole populations. Each of the below techniques will be explored using case examples. When behaviour change campaigns are successful, they often create demand far beyond the organisation itself, opening up opportunities for new businesses to fill new household and business needs.



Exhibit 8: Influencing techniques best practice organisations use to change behaviour¹²

	INFLUENCING TECHNIQUE	DESCRIPTION	EXAMPLES IN A WASTE CONTEXT
1	Inspiration/ appealing to values	Connecting to deeper values and belief systems through a shared mission	<ul style="list-style-type: none"> Communicating a powerful “why” Telling their own stories through different mediums - community radio, social media
2	Logic	Using rational arguments and facts to reason why a change is necessary	<ul style="list-style-type: none"> Communicate statistics and findings from scientific journals on the dangers of ocean plastic and of dumping/ burning waste on human health
3	Role modelling	Leaders model, teach and coach for the desired change	<ul style="list-style-type: none"> Religious, government, and cultural leaders publicly acknowledging the importance of the change and role modelling it Videos showing influential members of the local community separating their waste Common citizens are becoming brand ambassadors through social media
4	Relationship	Being open, friendly, and liked by the community and developing trust over time	<ul style="list-style-type: none"> Behaviour change facilitators forming strong one-on-one relationships with different people within the community
5	Authority	Appealing to a position of authority, rules, or law to require change to occur	<ul style="list-style-type: none"> Waste legislation requiring waste separation, payment for waste services, etc. Responsible waste practices as a mandate in religious law
6	Consulting	Asking questions and involving people in the problem and solution for full buy-in	<ul style="list-style-type: none"> Hold inclusive community meetings Partner together with different key stakeholder groups (women, youth, etc.) to work through solutions together
7	Social pressure	Showing that peers have already adopted the change and deviance will be publicly acknowledged	<ul style="list-style-type: none"> WhatsApp group where identified unsorted waste is posted Waste collectors yelling household names and whether their trash is sorted or unsorted during collection process
8	Community pride	Showing residents how special their community is and why it's worth protecting/ also shows what the change looks and feels like first	<ul style="list-style-type: none"> Public artwork Signage that reminds people how special a community is up strongly polluted areas and rejuvenating them into beautiful spaces

1.INSPIRATION/APEALING TO VALUES

The inspiration influencing technique connects to the deeper values people hold – the “why” behind a change. Theatre, dance, photography, and music will not inspire change everywhere, but they are significant in Brazil where art is an important part of the culture. **Projeto Relix**, uses art to change how people view waste pickers and to promote recycling and overall environmental sustainability. One of their techniques is to bring in top artists and hold a free, public play with the five super heroes of sustainability - repair, refuse, reduce, reuse and recycle. These productions include a waste picker as a primary character and waste pickers themselves often attend. Today, over 710 theatrical productions have been performed for 167 thousands people across Brazil.

Exhibit 9: Outdoor free, public theatre by Project Relix¹⁴



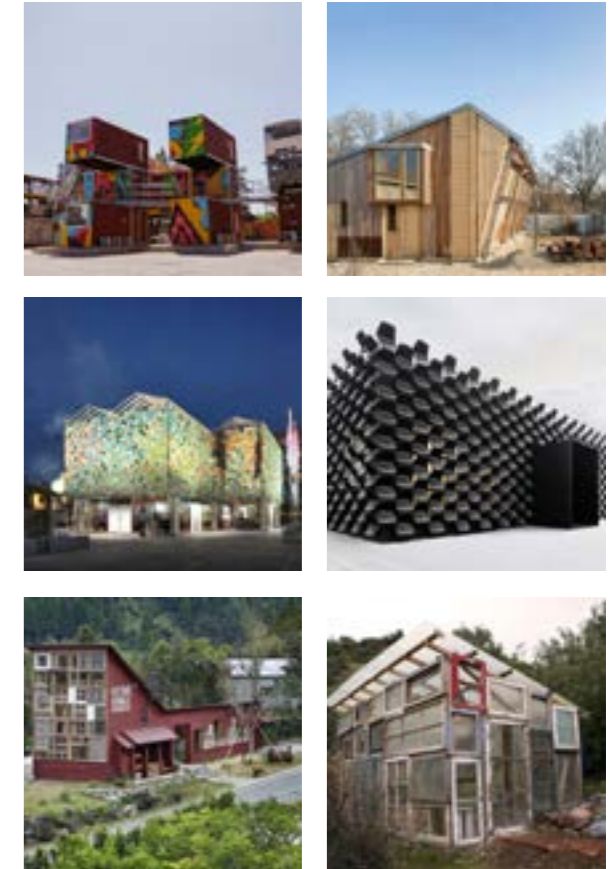
Projeto Relix’s professional photographers also do an excellent job in showcasing the lives of waste pickers. As part of their Relix photo exhibit¹³, photographers create a series of photographic essays of female waste pickers working in parlous communities. Rather than photographing them rummaging through trash in landfills, photographers show women in their homes with their children and families. The photographs capture the humanity and unique character of each person. We see them feeling loved, beautiful, bold, and shy. We see them for who they truly are: people just like us. People with lives and livelihoods worth protecting. These striking photos are then printed in huge dimensions and displayed in public art expeditions. The waste pickers who are photographed often attend these shows, eager to meet the people interested in their lives. The photographs are also bound in beautiful catalogs and shared with organisations working on human rights, women and child issues and on resource sustainability. Beyond live theatre performances and gallery showings in each community, Projeto Relix has filmed a number of emotionally-stirring, professionally produced YouTube videos to further illustrate why waste pickers are so important to protect.

Exhibit 10: Project Relix waste picker gallery exhibit¹³



Fundación Basura founder, Macarena Guajardo, was studying in Germany for a master’s degree in self-sustainable architecture. It was there that she felt inspired by the cultural movement of finding new ways to use trash – especially after learning that up to 60% of the trash found in landfills is construction materials. To inspire others, she built a website dedicated to the use of trash in architecture, design, and art projects. When she returned to her home in Chile, she started to build things using trash. Her aim was to raise awareness through architecture which eventually transformed into a comprehensive zero waste organisation inspiring thousands. Now, with a full team and more than 300 volunteers, Fundación Basura has created six interconnected programs to create a zero waste culture in Santiago, Chile. Macarena believes waste is a gateway environmental advocacy topic.

Exhibit 11: Material upcycling in architecture from Fundación Basura¹⁵



Almost all behaviour change advocacy organisations agree that duty, overwhelm, and seriousness do not work to inspire people to change. Rather, to inspire change, people need to feel like their actions matter and the war is not lost.

The humming bird tale (retold by Macarena Guajardo, Founder of Fundación Basura)¹⁶
 Once upon a time a forest was on fire. All the animals of the forest looked on in great fear. A small hummingbird filled his beak with water and flew to the fire, releasing a single drop of water on the burning embers below. He then flew furiously back and forth, filling his beak with as much water as he could and then releasing it. But the forest burned, engulfing even more land. An elephant watched on and asked what the hummingbird was doing. He replied, “I’m doing what I can.” The elephant felt ashamed and joined him, filling his trunk with so much water that it mattered. Things started to change.



Do what you can. You are more powerful than you believe.

Indonesia’s Project STOP has a simple, yet powerful chant that they use at community events to bring people together, reminding everyone why they are working to change how the city’s waste is managed. It has a remarkable way of uniting everyone – young and old, female and male – around the program and it goes like this:

Chant

"Muncar Bersih!" (Muncar clean!)
 "Muncar Sehat!" (Muncar healthy!)
 "Muncar Yes! Yes! Yes!"

Arm movement

Right fist goes up in the air.
 Left fist goes up in the air.
 Both fists pump up in the air with each "Yes"

Exhibit 12: Muncar, Indonesia residents chanting "Muncar Bersih! Muncar Sehat!"



Pak Supardi of **Rumah Kompos Padangtegal** explains that if you want to protect a tree and logically explain how trees are vital – because they release oxygen, store carbon, improve air quality, conserve the water and soil, provide a home for wildlife, etc. – people will still cut down the tree. Why? Because people have a hard time equating one tree with all of that. But, he says, the tree won't be cut down if you tell people not to cut the tree "because God resides there." This notion may be easier for people to understand and connect with their deeply held values.

2. LOGIC

The logic influencing technique uses rational arguments and facts, often backed by credible analysis, to reason why a change is necessary. It is particularly effective when trying to convince government officials and those within the private sector to change. When arriving at **ecoBali Recycling** in Indonesia, two very large signs greet people at the sorting centre entrance. They serve to remind everyone why recycling is important using simple, logical message that's meant to inspire change.

Exhibit 13: Signage posted at ecoBali Recycling's material recovery facility¹⁷



When members of **Hasiru Dala** wanted to convince the Bengaluru India municipality (BBMP) to incorporate waste pickers into Bengaluru's formal waste management and recycling programs, they first needed to convince them that waste pickers play a valuable role in society. They used data collected when registering waste pickers for ID cards to determine that the city's 15,000 waste pickers collect roughly 23% of the city's waste, saving an estimated 84 crores per annum (USD \$12 million)¹⁸. Without the informal sector subsidising the collection cost, waste services would be materially more expensive for the municipality. This analysis provided the evidence the government needed to justify new policy discussions on waste picker rights.

3. ROLE MODELLING

In role modelling, leaders model, teach, and coach the desired change and put their name and reputations behind it. Citizens are also now becoming role models and brand ambassadors themselves through the use of social media and their engagement with campaigns.

Before leaders will role model a change, they must first believe in the change they are being asked to lead. This requires communicating the change in a way that is credible to a community's leaders, ideally by people who have already earned their respect. **Projeto Relix**, a program in the north of Brazil dedicated to elevating the status of waste pickers, was formed by the well-respected company "Agência de Comunicação e Cultura", a cultural group that has been operating in Brazil on a national level since 2011. It received backing from the state of Pernambuco and the Social Service of Industry (SESI) giving it strong legitimacy before it even started. This pedigree gave them a boost, enabling them to garner support at the highest levels of political and cultural leadership and, ultimately, win the community at large.

In **Cibunut Berwarna** (Indonesia), the efforts to improve waste management were failing until the leader of the waste management improvement program became the head of the village. He then prioritised waste programs and became a committed example for all the villagers on how to reduce waste and be responsible with the waste that cannot be reduced.

Fundación Basura hosts large Zero Waste events in which influential members of society are

brought together to discuss different viewpoints around waste management principles. They even discuss legislation to promote an active dialogue on waste, and aid the transition to an overall culture of zero waste. The public has the opportunity to see what leaders think and ask questions as they make up their own minds on important waste issues.

Project STOP wanted to develop a waste system in Muncar, Indonesia: a community that had never had formal waste services before. Project STOP staff organised a tour with the head of the city, heads of villages, heads of the women's group, the head of the environmental agency and village agency and took them all on a tour to visit six best practice waste organisations across Bali, Surabaya, and Malang, Indonesia. This allowed the groups to physically see, ask questions, and interact with some of the best waste organisations in all of Indonesia. When they came back from the tour, they were inspired and, on their own, started a Solid Waste Management Roundtable to collaborate with the program and make quick decisions to improve Muncar's waste system. Through this investment in an empowering consultative process with Muncar and Banyuwangi leaders, they have inspired strong advocates and role models for the program.

4. RELATIONSHIP

The relationship influencing strategy uses personal friendships and trust between people to motivate change. When asked why Hasiru Dala has been so successful at behaviour change and program delivery in general, cofounder Nalini Shekar answered, "our success is a result of our strong relationships with people in our community; from waste pickers to the middle class, to activists and bureaucrats."

To build trust with waste pickers, organisations must prove themselves worthy. This involves going to the community regularly (at least once a week), always communicating that everyone is equal (e.g. never allowing them to call her "Madame"), and delivering on promises made, like securing ID cards and/or representing them in court. To build relationships with the middle class, activists need to position waste pickers as a source of good. For bureaucrats, it is key to show them how to accomplish their own goals and duties of poverty alleviation and waste management at once.

The **Municipality of Peñalolén** in Chile discovered just how important relationships are very early in their formation. After struggling with poor service delivery by waste pickers assigned to collect “high-value” recyclable waste, they changed tactics. They brought each waste picker door-to-door to meet the household residents they would be serving. During these meetings, households and waste pickers were introduced and quickly saw one another as human beings. They verbally committed to each other eye-to-eye that the resident would provide sorted materials and that the waste picker would arrive on the agreed upon day and time to complete the pick-up. This instantly formed a bond and increased the level of responsibility, duty, and commitment that both parties had for the program and to one another. Following this new approach, the municipality noticed a significant drop in complaints from the community and far better service from waste pickers. The program has been operating with success ever since.

Fundación Basura holds a “Zero Waste Academy” in which they select 20 people per group to go through a series of 8 experiential courses, learning how to implement a zero-waste lifestyle. They have found that the make-up of their Zero Waste Academies greatly affects their impact. By limiting the number to 20 people, they ensure that all members will actively participate, thus increasing their overall level of learning. In addition, they use an application process for accepting program participants. In doing this, they look for members who have a genuine interest in the topic and in joining their community. The course is intended to be a starting point for the alumni who will then share what they have learned with their community. Over 230 people have completed these courses in person while an impressive 11,000 have completed them online through Udemy online courses¹⁹. Almost as important as the course materials, are the relationships formed in these experiential classes. People get to know their neighbours and join a community that shares their values. Often after attending classes, people join the broader zero waste community and become part of a “family” of volunteers and social media posters where they “fit in”, have fun, and do meaningful work together. Fundación Basura stresses that when we start to live a happy life, we can build a happy community and, ultimately, a happy world.

5. AUTHORITY

The authority influencing technique appeals to those in positions of power who can help to pass rules or laws required for change to occur. **Rumah Kompos Padangtegal** was unusually determined to inspire their residents to sort their waste into organic and non-organic fractions. They tried many things until they found what worked. With the founder’s background in journalism, they designed and distributed an eco-magazine. They spoke at schools and community forums and openly gave tours of their facility. They started an SMS group and they hired a famous, well-respected Indonesian puppeteer to perform a custom show to inspire residents on the importance of waste management. They even recorded the worst offenders and went through an escalation process. While different strategies varied in effectiveness, their efforts led to two thirds of their residents sorting their waste. However, this was still not enough.

Operating in a highly spiritual community in Bali, Indonesia, they decided to appeal to religious authority rather than governmental authority. Within Bali, two governance structures work in parallel: an administrative government structure and a cultural and religious structure which can be more powerful within community networks. To this religious authority (the Banjar), they brought the names of the worst offenders. The Banjar leaders did not have the heart to call them out on it. This was a close-knit community and many people on the “bad” lists were friends or relatives of Banjar leaders. Rumah Kompos needed to approach this differently. So, they asked the Banjar leaders to formally bless a letter announcing that they would only collect a household’s waste if it were sorted. All mixed waste would be left behind. The religious authority gave their formal blessing and the Village Chief effectively issued the letter to the community as local law known as “awig-awig.”

Residents had a few months to prepare for the change. When the day came, Rumah Kompos stuck to their position and left behind mixed waste. Complaints started to pour in. Each day the unsorted waste sat, people became more verbally hostile to the drivers, lowering crew morale. By the fourth night, collection drivers were threatened with physical violence and the organisation’s founder, Pak Supardi,

accompanied them for the remainder of the time as a protector. Workers felt tremendous pressure and wanted to quit. Still, they stuck to their positions and did not collect the waste. By the seventh day, the last holdouts broke and waste was finally separated. As painful as those first few days were, more than 90% of residents have since separated their waste.

Beyond appealing to the religious authority of the Banjar, they appealed to an even higher authority to help them remain steadfast, especially given their caste. “We work for Mother Nature, for God,” said Pak Supardi. “Your God wants this island to be clean. Please don’t disturb us. We work for Mother Earth. If you challenge us, we won’t run away.”

In Bali, there are four castes: priests (1st), rulers and knights (2nd), tradesmen (3rd), and farmers, together with everyone else (4th). Waste workers are considered the fifth class, behind even the lowest caste. As a result, Balinese of upper classes do not want to listen to or be taught by the fifth class. It is only by reporting to, and being the protectors of Mother Earth that they can hold their heads high. To reinforce their moral authority, they wear blue and green helmets, gloves, and military-style uniforms, and look (and act) like a professional army.

Launched in Thailand in the 1990s, the **Magic Eyes campaign** is a powerful example of a simple, culturally relevant application of the authority influencing technique. In fact, it has since been used with great effect in Brazil’s “Clean Rio Campaign” and in other countries as well. Using a cartoon pair of watchful, green eyes paired with a jingle, “Ah! Ah! Don’t litter! Magic Eyes are watching you!”, the campaign urges children not to litter and to police their parents from doing the same. The eyes reflect the omnipresence of their ancestors who can see everything, and the responsibility of children to respect their elders and nature. The campaign was launched by an NGO, the Thai Environmental and Community Development Association (TECDA), along with board membership consisting primarily of marketing and television executives, and appeared everywhere: television advertisements, on radio and billboards, on cars, signs, stickers, and even on garbage bins. The program successfully reduced Bangkok street litter by nearly 90%²⁰.

The authority influencing technique can also be used by organisations to establish their reputation as leaders in sustainability practices. Using a different element of authority, **Fundación Basura** offers organisations an officially recognised stamp that publicly certifies their organisation of using zero waste practices. This zero waste certification can be placed in marketing materials and in government reporting in official recognition of their zero waste practices.

6. CONSULTING

With the consulting influencing strategy, campaigns and even entire waste systems are developed in partnership with a broad range

Exhibit 14: Anti-litter sign from Thailand’s Magic Eyes campaign



of stakeholders. This strategy involves asking questions and involving people in the problem and solution for full buy-in. **Project STOP** rolls out waste collection services, one community of about 100 people at a time. This starts with a large community meeting in which every member of the community (RW) is invited and is able to meet the Project STOP team. In this meeting, the community is able to ask questions and express their concerns. Together, they decide the key structure of their waste system including:

- The waste collection frequency (everyday or every other day) which determines the set collection fee
- Who will collect their waste (local individuals or official collection team)
- Where their depot to store waste before it goes to a MRF will be located
- Who will retrieve the collection fee for waste services from each household
- What is the escalation process when households don't pay for waste collection services

They also learn the schedule for when behaviour change facilitators will go door-to-door for training purposes, when bins will be distributed, and when the official waste collection service will start. They then play an interactive waste sortation game to learn the basics of Project STOP's three category sortation: organic, non-organic, and residual. At the meeting's close, the terms for the collection service are written up and the community's leaders sign this in front of their community. This agreement is then posted publicly as a transparent reminder of what the community as a whole has agreed to. They have found that, with this strategy, roughly 85% of households pay for collection services and collection roll-out is relatively smooth.

Additionally, in each city Project STOP operates in, rather than calling the waste collection service "Project STOP", local leadership choose the name and logo so that it is their waste system long after the Project STOP team has helped to set it up. In Muncar, Indonesia, the women's group PKK chose the name "Lemuru" which means two things: "Lemuru" is a commonly caught sardine by fishermen in Muncar and the word also stands for "Lestari" + "Muncari" which roughly translates to "My Sustainable Muncar". Their logo is a Lemuru fish holding a broom in one of Muncar's famous, distinctive fishing boats.

The Municipality of La Pintana serves the poorest region in Santiago, and the second poorest in Chile. Many of the residents were formerly part of homeless shelters in other areas of the country and relocated to this community for easier monitoring and service delivery during a past regime. When the municipality wanted to serve this community, it first went door-to-door listening to their needs. Many were shocked to be consulted on what they wanted. For the first time, it felt like their individual needs mattered to the city; they finally had a voice in how the municipality provided services. Together, they came up with the organics composting program. By building the program this way, the

community owned it because they felt it was built for them. To make the program stick, the Municipality went door-to-door again, asking for a commitment from each household. They agreed that it was the municipality's responsibility to process the organics into compost, while it was the responsibility of the household to cleanly separate their organic and non-organic waste. If they agreed to these terms, they were given a free bin for disposing their organic waste and were put on the schedule for organics collection.

7. SOCIAL PRESSURE

Social pressure influencing techniques are some of the most powerful for achieving quick, inexpensive compliance. It needs to be done thoughtfully, however, and generally after the initial waste campaign roll-out to convince the remaining households who haven't been reached using other techniques. This influencing strategy shows that peers have already adopted the change and deviance will be publicly acknowledged. Sometimes this public shaming happens in WhatsApp community groups, in Facebook groups, or in community or religious meetings.

At **Rumah Kompos Padangtegal**, every household is given three bins with their names printed on them (one green for organics, one blue for non-organics, and a household composter). When waste collectors arrive, one collector will shout the household name out and then shout out

Exhibit 15: Example of community mural transforming the space in Cibunut Berwarna



either "good", "bad", or "terrible" depending on how well the waste is separated, while the other collector records it in a book. Not only does this help to record household compliance but it also applies some serious social pressure. With this system, everyone knows how their neighbours are doing. Too many "bad's" or "terrible's" are followed up with SMS, in-person discussions, reporting to the religious authority, and, finally, the family's waste will not be picked up. These families will also receive messages like this: "You're one of only five families who does not separate their waste. We can't get to 100% separation because of you. Please separate your waste."

The **Pemilahan Sampah** program serves a community of 300 households within Jambangan, Indonesia. The group used social pressure influencing to achieve more than 85% household sortation within two months. The program distributed two bins to each household— one for organics and one for non-organics. Each bin was painted with the address it belongs to. The community's WhatsApp group was then used to share program progress and to announce changes and community events. To evaluate the program, the team posted pictures of each bin with non-sorted waste to the community's WhatsApp group. While no family names were mentioned, everyone in the group recognised the bins based on the addresses painted on them. A few houses objected to this social pressure

Exhibit 16: Before and after transformation of a "black spot" area²²



and were visited privately by the program and community's leaders to hear their concerns and also convince them of why it was so important the community sorted their waste. After these visits, all became champions of the program. In fact, nearly two years into the program, waste sortation is now more than 85% in the community.

8. COMMUNITY PRIDE

The final influencing technique, community pride, shows residents how special their community is and that it's worth taking care of. This technique also highlights what change looks and feels like. Om Ibo, the Village Head of **Cibunut Berwarna** in Indonesia, successfully persuaded residents in his village to join their zero waste program by repainting the community. Each block of residents selected their own community theme and colour. Big, bold nature-inspired outdoor murals dramatically changed the experience of living in the village. Residents become far more aware of their neighbourhood's cleanliness and began to take responsibility for keeping it clean and beautiful. Waste became a central topic in community meetings and was supported by a door-to-door educational campaign, teaching residents how to reduce and responsibly manage their waste.

The local Government in Bengaluru, India (BBMP), wanted to permanently erase the city's "black spots", areas along roadsides where residents habitually dumped their waste, especially where there was waste collection services. They decided to empower their own staff to lead the city's transformation through a program called "**Rangoli Habba**"²¹. Junior Health inspectors were trained and given an allowance of only Rs.1000 (USD\$14.25) per black spot. After cleaning the area, they would paint the surrounding walls with a traditional Rangoli decoration, sacred to the community. They also often put a bench as culturally few would dump their waste where people relax. The results were magical. The city's dirtiest areas were transformed into places that made the community proud. Ground staff made sure the spaces were kept clean during the day and a Marshall would tour reformed black spots at night.

INSPIRING CHILDREN

Educating families is powerful. Some programs focus on children who are more open to change and can influence their parents, while others focus on influencing parents to implement changes in the home that will be carried forward throughout their children's lifetimes. Children can be the foot soldiers of recycling programs. They have an openness to seeing and thinking about things in new ways. They also care deeply about their families, and about the impact their actions may have on animals and marine life. They also have a lifetime of decisions to make regarding consumption and waste disposal.

Role modelling can also happen between parents and their children. If parents can role model composting as the new norm at home for example, then their children will carry on the same practices in their own homes, thus changing cultural norms for years and years to come.

Different programs touch children in different ways; from learning recycling in school curriculums to actively participating in the recycling process through school waste banks. **Projeto Relix** has realised that the best way to promote behaviour change in children is by incorporating waste concepts into everyday activities so that sustainable principles become the new norm. They do this by rooting their concepts into materials such as comic books and school curriculums. In school curriculums, they not only promote proper environmental sustainability concepts into a subject of its own, but also inject these waste management concepts into daily subjects such as math, literature, and geography. This reinforces the message that proper waste management is a normal part of life— not an exception or special activity.

Similarly, the **Indonesia Waste Platform**, a hub of waste professionals working in ocean plastic and waste management in Indonesia, has partnered with Happy Green World and Indonesian teachers to develop a Bahasa school curriculum on recycling called Green Indonesia²³, complete with beautifully illustrated children's books, teacher training manuals, and recycling games. Schools will then become community recycling collection points (i.e. waste banks) where children can take their recyclable waste from home each day. They plan to roll out this curriculum to ten regions across Indonesia.



To convince schools to reduce plastic consumption, Pak Supardi from **Rumah Kompos Padangtegal** tries to convince school principals to take up this important challenge. He says, "Let's make this the best school in the district," and then he commits to showing them how to be role models for children, families, and other schools by practicing responsible waste management and reducing single-use plastic. When principals agree, they institute refillable bottle programs and school-based waste bank recycling (i.e. recyclable collection points).

ecoBali has set up a network of school-based waste banks and has become a Tetra Pak aggregator in Bali to source greater quantities of recyclable materials with income from recyclables supporting school needs.

MEASURING IMPACT

The behaviour change programs that see the most success tend to regularly measure the impact of their campaigns and constantly work to refine their approach based on the results. Members of Brazilian **Projeto Relix**, for example, judge their effectiveness by surveying waste workers on perceptions of acceptance by the community and pride in their waste work prior to any behaviour change activities. After the program has finished, generally around six months later, they repeat the survey again to see if perceptions of waste pickers has changed. Often, they overwhelmingly find a much stronger sense of acceptance and belonging of waste pickers in their communities.

Fundación Basura, based in Santiago, Chile, has also realised that in order to create successful interventions that change the behaviour of a group of people, they need to test various approaches to see what works best. In order to do this, they use a survey to measure the feelings of the students enrolled in their Zero Waste Academy both before and after completing the course. In this survey, they ask questions including, "Do you feel capable of making concrete positive changes in your environment?" and "Do you know how to take care for and improve your environment?" Their responses range from 1 - 5 in a spider diagram format (Exhibit 15). Adjustments are made to the way the courses are taught as necessary.

Exhibit 17: System Fundación Basura uses to measure zero waste belief change²⁴

Instrucciones: Contesta las preguntas marcando con un punto en un número de la escala indicada en cada línea considerando que 1 lo más bajo. Al finalizar las preguntas une los puntos. Entorno: El medio en el que me encuentro incluyendo mi casa, mi barrio, mi comuna desde una perspectiva social y ambiental. Comunidad: Personas que forman parte de la vida en mi entorno.



Indonesia Waste Platform's Green Indonesia school program measures impact based on the volume of recyclables diverted from the environment through their school waste bank programs. The more children bring in their clean, sorted recyclable waste, the more benefit to the school and the deeper the message of the importance of recycling becomes for the children.

IV. CAMPAIGN DEVELOPMENT - PUTTING THE PIECES TOGETHER

CASE STUDY 1: 2 BIN - 1 BAG WASTE SORTATION

The 2 Bin - 1 Bag waste separation campaign in Bengaluru, India's fifth largest city, shows how municipalities, along with the court, NGOs and other passionate stakeholders can work together to create a powerful and swift behaviour change campaign, inspiring many thousands of residents and businesses to separate their waste in less than a year. The program asked households, slum dwellers, commercial establishments, bulk generators, educational institutions, and government offices to separate their waste into three streams: organics, non-organics, and sanitary residuals. Three colours were chosen: green, the colour of nature, renewal and life for organics; red, the colour of danger for hazardous and sanitary waste that should not be touched by bare hands after disposal; and, white, the colour for opportunity for plastic, paper, metal, and e-waste recyclables. A green bin was used for wet organic waste, a red bin for hazardous waste (which could have sharp edges from razor blades and syringes), and a white bag for recyclables. Uniform colours provided consistency and a universal segregation culture across the entire city.



Bengaluru households, businesses, and institutions by June 5, 2016.

COMMUNICATE A POWERFUL “WHY” FOR CHANGE

Campaigns lead to social change. The “why’s” behind the 2 bin – 1 bag program are multifaceted. They needed to inspire millions of Bengaluru residents, each with their own internal beliefs that drives their behaviour, to change. At the base level was a government issued order backed up by a comprehensive campaign to teach and reinforce the necessary behaviour change. The program led with the internal belief structure “my actions matter and my waste is my responsibility”, asking citizens to take personal accountability for their waste habits. By being a responsible, conscious citizen that separates their own waste, they could choose from a menu of “why’s.” When they separated their waste, they cleaned their city. They protected the health of waste pickers and provided a reliable economic future for them. They ensured waste was a resource that could nourish soils and be transformed into new products, rather than rotting away in landfills. They protected the environment. And, on the flip side, they avoided social exclusion and fines for breaking the law.

TEACH HOW TO CHANGE

When the High Court issued the order for three-way source separation, they required Corporators, or ward leaders, to manage their ward’s trash, even suggesting that the municipality conduct awareness campaigns by releasing short videos and involving the media to embed the change. Residents Welfare Associations (RWAs), NGOs, and other community groups joined forces with the government to roll-out the campaign. Many wards gathered volunteers to roll out door-to-door training within their communities, including slums, and worked with community groups to do so. Different campaigns and educational tools targeted different groups, including maids, home owners, women, and children.

A website, www.2bin1bag.in, was set up with videos, posters, PowerPoints, manuals, and guidelines to not only teach individuals how to separate their waste but to also provide the training materials needed for others to train their own communities to separate waste. The website also had guides detailing how to segregate waste in various settings from single households to large apartment complexes and office buildings. Segregation guidelines accompanied all bin sales as well.

The Bengaluru municipality (BBMP)²⁵, with guidance from the city’s **Solid Waste Management Roundtable (SWMRT)**, a collection of active, passionate waste management advocates and NGOs, was moving away from a linear dispose-collect-landfill model of waste management towards a more decentralised approach where the lion’s share of waste was locally composted or recycled and less than 10% went to landfill. This was all part of the Solid Waste Management Rules 2016, and Plastic Waste Management Rules 2016 and towards the integration of waste pickers into the city’s waste management services. BBMP had also invested heavily in building one dry waste collection centre (DWCC) in each of the city’s 198 wards. DWCCs, run by waste picker entrepreneurs, are material recovery facilities (MRFs) where non-organic recyclable waste is sorted and sold to recyclers. The success of the DWCC program was dependent on having large enough volumes of clean, recyclable waste to work with, which was dependent on the successful implementation of segregation at the source across all of Bengaluru. Prior to this, BBMP had issued a regulation that segregation at source was mandatory into wet (organic), dry (non-organic), reject (residual), hazardous (bio-based and chemical), and demolition and construction waste, with limited success. Groups like Hasiru Dala experimented with multiple source separation models piloted at apartment complexes to arrive at the best and easiest for broader roll-out, first starting with seven-way segregation and making it simpler over time. Once they had settled on the 2 bin -1 bag model, proving it worked on a small scale, the Karnataka High Court, with support from BBMP and the SWM roundtable, mandated three-tier source segregation in a landmark verdict on December 17, 2015 to be rolled out to all

Exhibit 18: Bengaluru Municipality (BBMP) announcement of 2 bin - 1 bag program



Bruhat Bengaluru Mahanagara Palike

Segregation at Source is Mandatory. Else will attract FINE.
 ಕಸವನ್ನು ಮೂಲದಲ್ಲಿಯೇ ವಿಂಗಡಿಸುವುದು ಅನಿವಾರ್ಯ. ತಪ್ಪಿದರೆ ದಂಡ ತೆರಬೇಕಾಗುತ್ತದೆ.

 <p>Organic Waste ಹಸಿ ಕಸ</p>	 <p>Recyclable Waste ಒಣ ಕಸ</p>	 <p>Reject/Sanitary Waste ತಿರಸ್ಕರಿಸಿದ ಕಸ</p>
		

Garbage in Plastic Bags will not be accepted
 ಪ್ಲಾಸ್ಟಿಕ್ ಬೀಗಗಳಲ್ಲಿ ಕೂಡಿಸಿಟ್ಟ ಕಸವನ್ನು ಸ್ವೀಕರಿಸಲಾಗುವುದಿಲ್ಲ



SPONSORED BY:

Instructional videos on how to sort waste into the three categories were created in numerous local languages, often using well known cricketers, athletes, musicians, and elected representatives. These local celebrities also attended awareness events, conducted TV interviews, and posted on their social media accounts in support of the program. In addition, myriad news reports and journal stories were written by the media to document the changes. Sortation messages were further reinforced through a voice recording set to music describing the process of separating waste was played while collection vehicles picked up trash.

STRUCTURALLY MAKE IT EASY TO CHANGE

While red and green bins were not provided for free, their cost was minimal INR150/ USD \$2.15) and they were sold by sellers across the city, including online. Bin size and format were not mandated, (except the colour) so residents could choose different bins to suit their needs. A white recyclable bag was preferred but a reusable bag of any colour would work for non-organic waste. All bin kits included segregation guidelines as well.

Households were taught to keep green bins in the kitchen, near food preparation to make it easy to dispose vegetable peels and other discarded food. Red bins were taught to be kept in bathrooms for easy disposal of sanitary items like tampons, condoms, diapers, and hazardous items like razor blades and syringes. White bags could be kept anywhere dry that was convenient. By having bins located in convenient places, it made it structurally easier to separate waste. In addition, domestic workers were taught to not only separate waste, but also to do a final household separation of whatever had made its way into each bin, before putting waste out to be collected.

The city’s waste collection system changed too. Different trucks were used to collect different types of waste, further reinforcing the structural change.

Exhibit 19: Bengaluru TV, music, and sports celebrities show their support for 2 Bin -1 Bag²⁵

ALIGN INCENTIVES TO REINFORCE THE CHANGE

The High Court of Karnataka made differentiated pricing a law for waste service in Bengaluru, further reinforcing source separation across

the region. Rather than paying a single price for waste collection, residual waste is charged the highest price based on weight, followed by organic waste with recyclable non-organic waste collected for free, incentivising reduction of residual waste and increasing levels of clean, non-organic, recyclable waste.

Many wards released an army of volunteers, each assigned to a street and a collection vehicle to monitor, train, and enforce waste separation by residences and businesses. The Bengaluru Municipality also issued guidelines to businesses and bulk waste generators like apartment complexes on how to separate waste, or risk paying a fine. Health inspectors were given the authority to charge residents and institutions fines if they failed to separate their waste, and KMC Act 341A increased fine levels from Rs10 (\$0.14) to between Rs100 (\$1.40) and Rs5,000 (\$70). Health inspectors made rounds regularly and fined people immediately.

A public database was built to track the sortation compliance of more than one million Bengaluru

residents, incentivising compliance through social pressure. In addition, municipal waste collectors and private haulers were forbidden from collecting unsegregated waste. Variable waste collection pricing, refusal of service, and fines, plus roving ward volunteers provided powerful incentives to reinforce the desired behaviour changes.

With these changes, 80% of households that were part of the campaign separated their waste, and waste going to landfills was reduced by more than 80% in less than a year. The most passionate wards behind the program were able to reach these levels in a little over a month, debunking the theory that behaviour change needs many years to stick, if the right incentives and collaborations are in place.

CASE STUDY 2: REDUCING WASTE WORKER STIGMA

In most countries, working in waste management has one of the lowest social standings of any profession. Farming, for example, is preferred to jobs in waste management due to the higher social standing, despite the lower income and more physically demanding work. Therefore, finding and keeping waste workers can be challenging unless organisations change the stigma of working with waste and create conditions for fulfilled, productive workers.

Rumah Kompos Padangtegal in Indonesia goes through extraordinary measures to not only reduce negative waste worker stigma, but also to change how their community thinks about waste. In fact, the words “trash” and “waste” are never used. Instead, workers are “clean warriors” with the noble responsibility to keep their communities clean and to prevent further environmental destruction. They are given military-style uniforms – green for the organic collectors and blue for the non-organic collectors – which they wear with pride to demonstrate the seriousness and importance of their jobs. This message is reinforced on collection vehicles which say, “Proud to keep Padangtegal clean.”

Their facilities and collection vehicles are spotless. Collection vehicles are washed, even polished, twice a day after each collection run. Every time they enter the street they sparkle. Workers wear clean uniforms. They sort waste the day it’s collected and then transfer it to its next location each day, cleaning up as they go and leaving the floors of the facility immaculate.

Using glassware, Rumah Kompos Padangtegal also creates an environment where all people are equal regardless of job, caste, or income level. Everyone – from the president to floor cleaners – use the same glass wine goblets for drinking water because all have equal value as human beings.

CONCLUSION

Waste management is far more than the technical aspects of waste collection trucks and schedules. It is deeply tied to the social and political aspects of a community. By thoughtfully incorporating behaviour change campaigns into waste services, we recognise the humanity of waste workers, and connect to a deeper belief system of the people we serve then the typical surface level transactional waste exchange. This makes household behaviour change - whether convincing households to start sorting their waste, to stop dumping, burning or littering, to pay for responsible waste services or to humanely work with waste pickers and other waste professionals - far easier. It can also effectively be used to change government policy to be more supportive to the needs of waste systems and the populations they serve.

Behaviour change, whether for the community, government or waste workers, is not only possible, but can be faster than many believe. The most effective behaviour change campaigns thoughtfully communicate a powerful “why”

Exhibit 20: Pak Supardi shows how all staff and visitors are equal, drinking from the same glasses



using multiple mutually reinforcing influencing strategies, clearly teach how to change and structurally reinforces the change while designing into the waste system both positive and negative incentives that organically reinforce the change long term. The Pareto principle applies to behaviour change as well - reaching the last doggedly resistant 20% can take 80% of the effort, but is possible.

After reading the dozens of examples of how organisations have successfully changed the behaviour of their constituents, we hope you leave feeling inspired and ready to try a few of the tactics now.



2 Waste Picker Inclusion

Anamma is 39 and manages a Dry Waste Collection centre (DWCC) in Bengaluru, India. It is a facility that receives all non-biodegradable waste in her ward.

Exhibit 1: Former waste picker, Anamma, speaking at United Nations Conference of Parties (COP14)



“I built my house with my own design,” Anamma proudly says. “Three of my girls are educated and I now own a truck.”

It’s hard to imagine now, but Anamma started waste picking at age seven. As an adult she wore tattered clothes while living under a thatched roof as her children studied at night by street lamp. But in 2014 opportunity knocked. Anamma was offered the chance to operate one of the city’s DWCCs. She took the risk—and it paid off.

She saved everything she earned and eventually came to own her own home (INR 50,000 / USD 720). Today, Anamma teaches courses on financial management to her peers. She is living proof of all that is possible when constructive municipal policy, accessible financing, and a little support from waste picker organisations come together.

The inclusion of waste pickers in waste management systems—and a recognition of their importance—is crucial not only for their own health and livelihoods, but for the economies of municipalities as well. But how do we include the most vulnerable people in our communities while moving towards a cleaner, healthier, and less-polluted world?

These goals often seem incongruent. Product bans and clean-city programs reduce the amount of materials available for waste pickers to collect, while waste banks and high-tech entrepreneurial start-ups make it easier for households to recycle—thus taking away waste pickers’ livelihoods. The key is to thoughtfully include waste pickers into the formal waste system in ways that recognise their value and empowers them—rather than pushing them out as new programs are launched.

But how do we do this with a group who has little trust in the government, one that has become accustomed to working without bosses, timelines, or contracts? This chapter explores how organisations have successfully solved these problems—from earning the trust of waste pickers to transforming their lives and, ultimately, securing their livelihoods and those of their families.

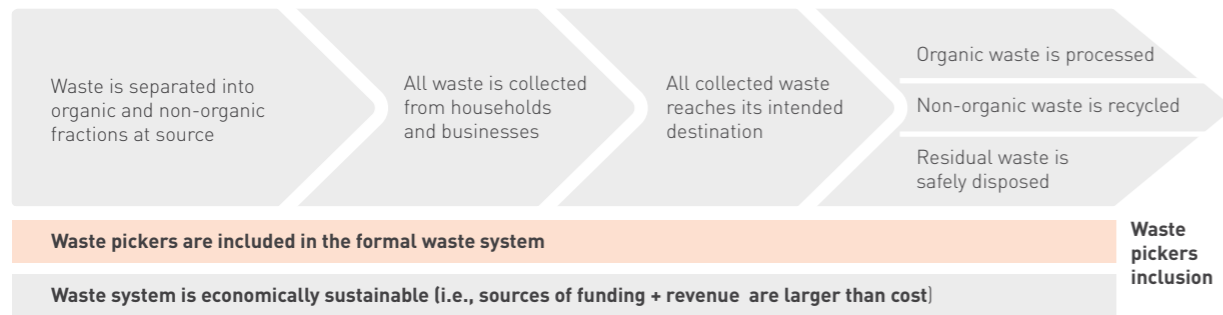
CASE STUDIES PROFILED IN THIS CHAPTER

- Chintan Environmental Research and Action Group, India
- CooperRegião Cooperativa, Brazil
- Dois Irmãos Cooperativa, Brazil
- Hasiru Dala, India
- Hasiru Dala Innovations, India
- Kagad Kach Patra Kashtakari Panchayat (KKPKP), India
- The Kingdom of BGBJ, Indonesia
- Municipality of Peñalolén, Chile
- The Movement of Brazilian Waste Pickers (MNCR), Brazil
- Pimp My Carroça, Brazil
- Project STOP, Indonesia
- Projeto Relix, Brazil
- Latin American Network of Waste Pickers (Red Lacre), Brazil
- Rede Cata Sampa, Brazil
- State Secretariat of Women Collectors of Recyclable Materials of São Paulo (SEMUC), Brazil
- Stree Mukti Sanghatana (SMS), India
- SWaCH Pune, India
- Temesi Recycling, Indonesia
- TriCiclos, Chile

INTRODUCTION

This chapter covers waste pickers—who they are, why they need to be protected, and the strategies that organisations have successfully used to earn their trust, inspire governments to change, and build economically viable business models that secure their livelihoods. Inclusion efforts support waste pickers’ participation across the entire waste value chain—from waste collection to safe disposal—rather than their working solely in recycling non-organic materials. Two of our focal countries, India and Brazil, are leading the world in waste picker inclusion and have followed similar steps to support the rights of waste pickers²⁶.

Exhibit 2: Topic covered in this chapter within the waste value chain (in orange)



I. UNDERSTANDING WASTE PICKERS

WHO THEY ARE

The term “waste picker” refers to a person who salvages reusable or recyclable materials that have been thrown away by others and sells this material for profit. Some also reuse the materials themselves. Waste pickers have existed for centuries and play an important role for both the environment and local economies. In fact, waste pickers are the world’s oldest form of waste management. Today, there are an estimated 15 million waste pickers²⁷ who remove 15 to 20 percent of the world’s metropolitan waste. They are deeply entrepreneurial, hardworking, independent, and skilled at identifying valuable waste—their livelihoods depend on it. In many cases, their work is informal, often dangerous, and wholly unrecognised by both the community and government. In recent years (since 2007 in Brazil²⁸, 2000 in India²⁹), local governments and concerned organisations have sought ways to incorporate waste pickers into the formal waste collection system in order to recognise their work and guarantee their livelihood.

There are an estimated 8.3 million waste pickers in the four countries this paper studies: India (4 million³⁰), Indonesia (2.0–3.7 million^{31,32}), Brazil (500,000³³), and Chile (60,000^{34,35}).

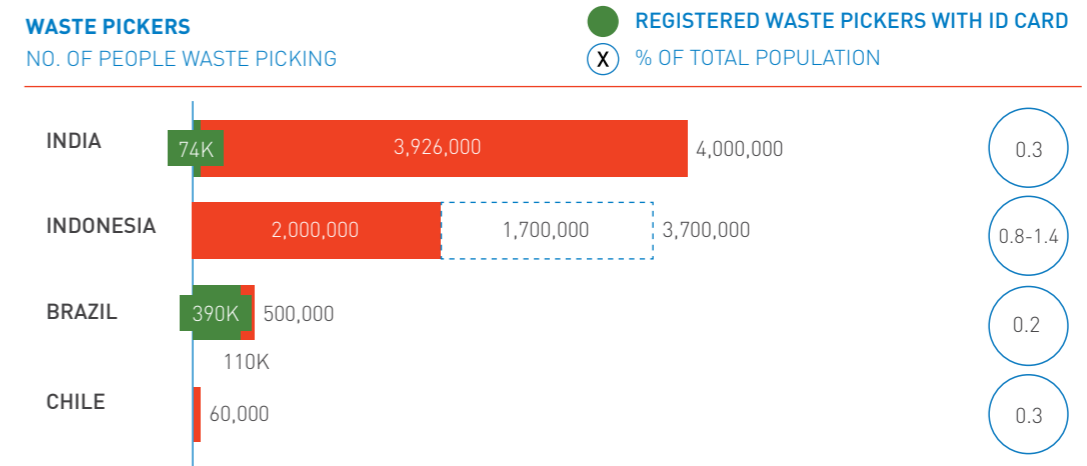
Exhibit 3: Waste picker, Ijanete Aureliano dos Santos (Janete), photographed by Projeto Relix³⁶



HOW THEY WORK

Waste pickers are very efficient at collecting “high value” recyclable waste and, based on their location, specialise in certain types of waste. Some buy waste directly from households and organisations to guarantee clean, high-value waste. Others salvage from household, business, street, or public waste bins. Once waste has been collected by formal collection vehicles, another group of waste pickers are sometimes inside the hauling trucks separating out recyclables groups

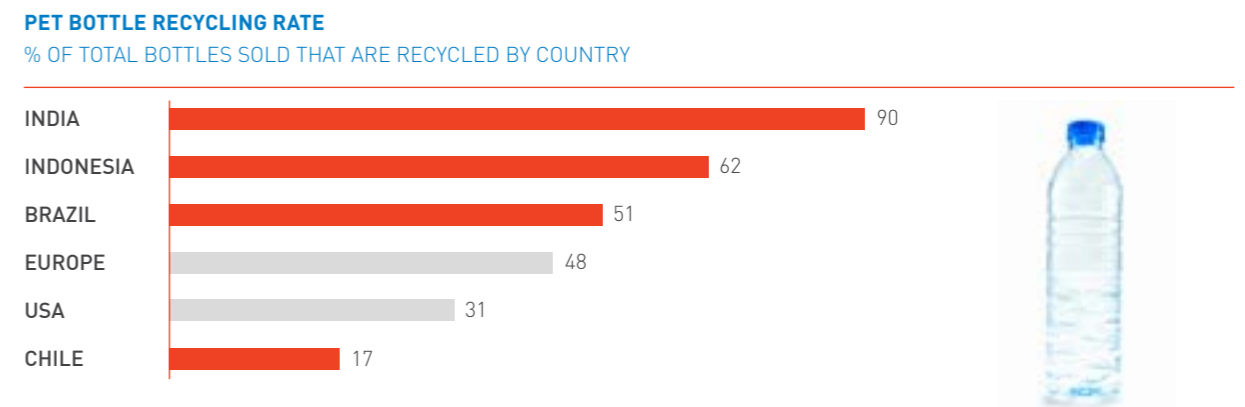
Exhibit 4: Number of waste pickers in studied countries



en route. If waste is delivered to a transfer station, then another group might sort material before it goes to a landfill. Finally, the largest of waste pickers are found sorting and collecting waste at landfills and dumpsites.

On average, waste pickers in India collect about 60 to 90 kilograms of recyclable materials per an 8- to 10-hour workday³⁷. In cities where they operate, waste pickers may collect up to 25 percent of the municipality’s waste. This saves considerable collection expenses, including transportation to a landfill, vehicle maintenance, salaries, and more. In 2014, Jain University, Hasiru Dala, and the Solid Waste Management Round Table (SWMRT) estimated that in Bengaluru, India, the city’s 15,000 waste pickers saved the municipality nearly USD \$12 million annually by collecting over 1,000 tons of the city’s 4,500 tons of daily waste. This system can be so effective that in countries like India over 90 percent of PET bottles sold are collected, proving that the recycling of certain high-value materials is not only viable, but provides much needed income for waste pickers.

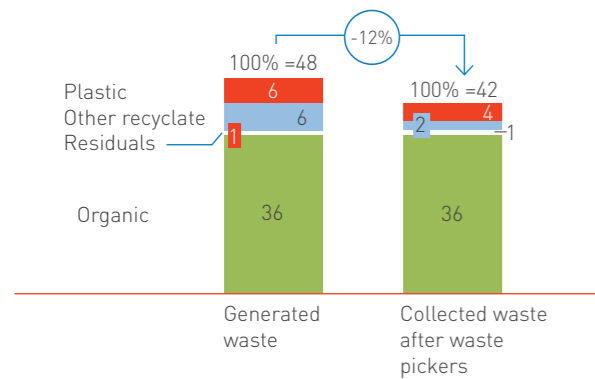
Exhibit 5: PET bottle recycling rate as an indicator of country recycling effectiveness^{38,39,40,41}



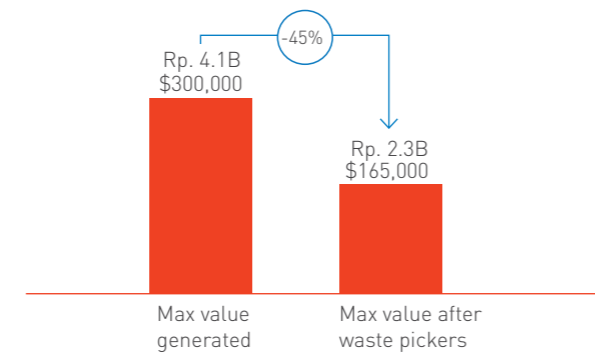
In fact, waste pickers are so effective at moving high-value materials from the waste stream that very little value remains for other waste businesses—especially for those focused on subsidising waste-collection costs with recyclable sales. A waste characterisation study by Project STOP in Indonesia found the city of Muncar generated nearly 50 tons of waste per day, 75 percent of which was organic. Waste pickers collect, on average, 6 tons of recyclables per day (12 percent of the total waste volume). That is equal to 45 percent of the overall waste value⁴². What remains are “low value” plastics, residuals, and a large portion of organic waste that still needs to be collected—but which has far less economic utility. Full waste stream collection models rarely survive without significant household and business collection fees and government or private sector support – and the economics are even more challenging when high valuable recyclable waste is removed from the waste stream by waste pickers⁴³.

Exhibit 6: Volume and value removed from the waste stream by waste pickers⁴⁴

CHANGE IN VOLUME OF WASTE AFTER WASTE PICKER COLLECTION
TONS/DAY



CHANGE IN VALUE OF WASTE AFTER WASTE PICKER COLLECTION
USD PER ANNUM FOR 80% CLEAN, SORTED WASTE



Once waste pickers have collected enough material, they sell it to junk shops, with whom they often have complicated relationships. On the one hand, dealers come from their communities, know their families, and may even loan them money in emergencies or when recycling prices decline. Yet they are notorious for delaying payment, improperly weighing scrap materials, and keeping waste pickers indebted for years. It's hard to break these communal and economic bonds. In Jakarta, Indonesia, deceased waste pickers pass their debts to the next generation. This often means waste picking will be the main job of descendants, from generation to generation, in a form of indentured servitude.

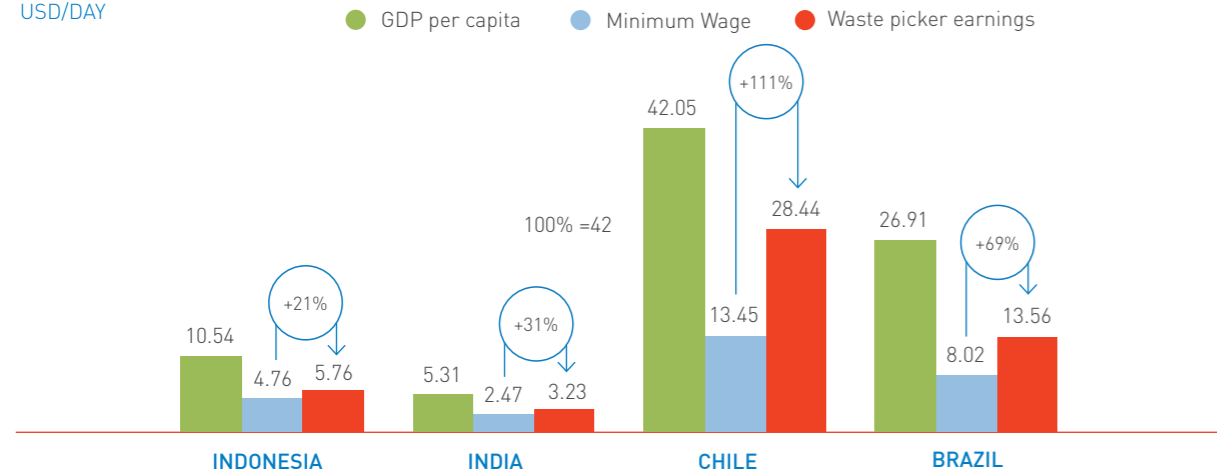
AVERAGE EARNINGS

Waste picking can be a relatively lucrative profession. It can often mean earning more than

minimum wage and comparable low-skilled professions, like domestic work, manual labour, fishing, or farming. While a move into formal waste management systems can result in better hours and working conditions, earnings often suffer compared to scavenging landfills. **Each day in a landfill in India, waste pickers pick through an average of 3.8m³ of waste (the waste of approximately 1,500 families)⁴⁵. In comparison, when collecting recyclables door-to-door on foot, waste pickers can only cover around 200 households, about an eighth as much waste.** Waste collected door-to-door is cleaner and more valuable, but it's often not enough to make up for the volume discrepancy when compared to landfill scavenging. For comparable earnings to be realised, door-to-door waste pickers need to be paid a collection service fee directly from households and businesses or through contracts from municipalities.

Exhibit 7: Waste pickers earnings relative to GDP per capita and minimum wage^{46,47,48,49,50}

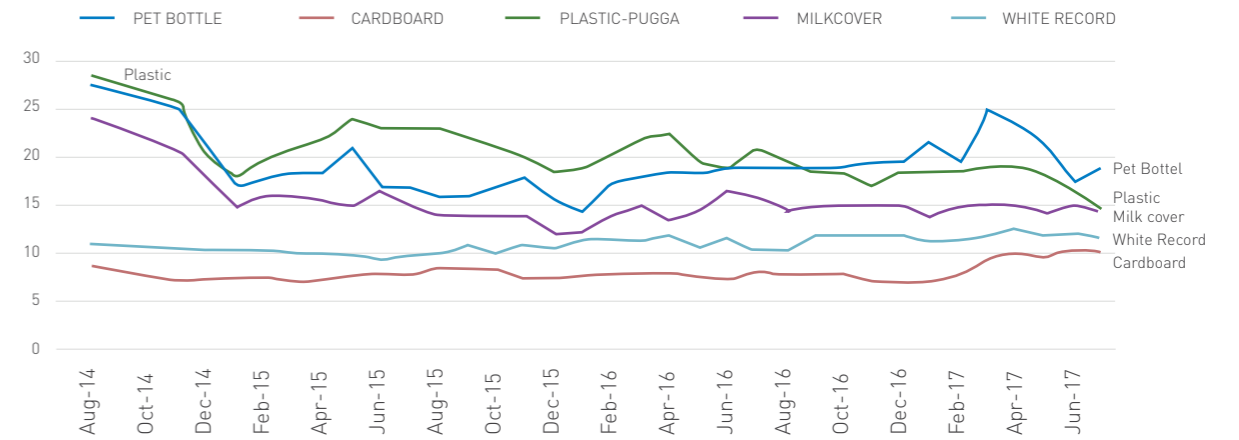
WASTE PICKERS EARNINGS
USD/DAY



Waste pickers also face fluctuating market prices based on seasonal variations, availability of imported waste, changes in commodity prices for virgin plastics, the price of oil, and the availability of imported waste. In some cases, this volatility can have a devastating impact on their household income.

Exhibit 8: Price trend for commonly recycled items in India⁵¹

TREND OF PRICES AUG2014-AUG2017



WASTE PICKER CARTS

Waste pickers collecting with a sack on foot are confined to a relatively small geographic area, forcing them to sell their waste to local junk shops at lower prices. However, mobile carts and bicycles give street waste pickers far greater mobility. Carts allow them to collect and transport larger volumes than using sacks, even if they are still on foot. With bicycles they can cover far greater distances, giving them more options on who to sell to—including the ability to join with other waste pickers and sell materials to aggregators for a higher price.

safety kits with two U.V. protection shirts, two pairs of gloves, and two caps for sun protection. In total, Relix has donated over 225 Ciclolix to waste picker cooperatives.

"This initiative brought dignity to the waste picker," said Lina Rosa, the woman leading the project.

Cart designs vary from country to country and even between national regions. In some regions bicycle carts have become more popular than push carts.

Many waste pickers, especially in northeast Brazil, do not have vehicles to carry their materials. Therefore, they carry it on their backs or with the help of animals, often with negative health consequences. To improve working conditions, **Projeto Relix**—a behaviour-change program working to raise awareness about waste issues and minimise the negative stigma of waste pickers—did an analysis of waste picker needs in their area. An ergonomically designed, lightweight bicycle cart for the collection of materials was designed—the Ciclolix eco-bicycle. These vehicles can transport 450 kilograms of recyclables and are adapted to meet ergonomic and safety concerns, including signage. Each one is equipped with a handlebar bag, safety chain, and air pump. In addition, waste pickers receive

Exhibit 9: Projeto Relix Ciclolix eco-bicycle



Exhibit 10: Example waste picker carts in focal countries⁵²

BRAZIL



CHILE



INDIA



INDONESIA



Pimp My Carroça is an organisation started by Brazilian graffiti artist Thiago Mundano. His goal is to bring colour and humour to waste picker carts and improve the self-esteem and social acceptance of workers. The organisation holds festivals when waste pickers from around São Paulo bring their carts to mechanics for free repairs. Many other professionals—including doctors, dentists, masseurs, psychologists, and hairdressers—also attend and provide pro bono services.

The event has grown beyond São Paulo to other parts of Brazil. There are now an estimated 50 “Pimpex” events where volunteers are able to engage with waste pickers, show their appreciation for their work, and improve the quality of their lives.

Exhibit 11: Pimp My Carroça volunteer mechanic repairing a waste picker cart⁵⁶



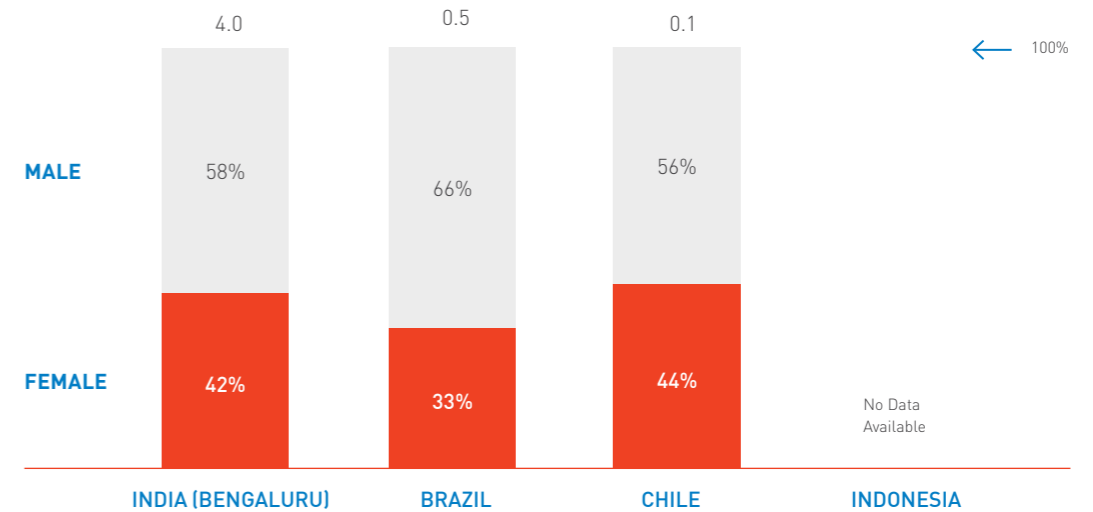
GENDER AND AGE BREAKDOWN

In 2014, after registering nearly 4,175 waste pickers in Bengaluru, India, Hasiru Dala discovered that 42 percent of waste pickers are female and 58 percent male. Of those, 64 percent are between 20 and 40 years old, while 26 percent are between 40 and 60⁵³. Only 5 percent are under 20 or over 60. Chile has a similar gender composition, although waste pickers are older, with a 56/44 male/female breakdown and 30 percent under age 42, while 34 percent are between 42 and 53 and 36 percent over 53⁵⁴. Brazil has an even higher proportion of male waste pickers—66 percent. However, women make up the majority of Brazilian waste-picker cooperative members. The average age for Brazilian waste pickers is 39⁵⁵. No reliable gender and age statistics could be found for Indonesia.

Exhibit 12: Waste picker gender allocation

WASTE PICKER GENDER SPLIT

% FEMALE AND MALE, MILLION WASTE PICKERS



HEALTH AND SAFETY

When working through mixed trash generated by households, businesses, and medical facilities, waste pickers are exposed to harmful toxins. These include human and animal bodily fluids, chemicals, toxins, and heavy metals. When working in dumpsites and landfills they are especially susceptible to skin diseases, respiratory illnesses (especially chronic cough), infections, and stomach issues (diarrhoea, intestinal pain, nausea, and dysentery). They also suffer from musculoskeletal conditions caused by constant bending and the carrying of heavy sacks. Yet they commonly lack access to government health resources and are given limited recognition of their work. Many waste pickers working in dumpsites and landfills have a life expectancy of only 45 to 65 years⁵⁷. Most are underweight due to poor nutrition, with anemia very common among women and their children.

Personal protective equipment (PPE)—including hats, gloves, and footwear—could be helpful. But many, given the working conditions, simply view this gear as uncomfortable and sometimes less efficient. It takes time to get used to the feeling of wearing them, which often requires training and supervision until new habits can be formed. Sitting inside dry, hot waste collection centres made of steel sheeting in Bengaluru while handling plastic with gloves not adapted to the work ultimately leads to reduced efficiency. Very little attention has gone into understanding, designing, and implementing appropriate PPE for the needs of waste pickers. For example, different types of gloves are needed for handling organics versus non-organic material.

CHILDREN OF WASTE PICKERS

Without intervention, children of waste pickers often end up leading difficult lives. Malnourished, frequently left alone, and often bullied and/or sexually assaulted, they usually have few options other than waste picking as they get older.

Many families keep children out of school so they can supplement the family income. Those who do go to school often drop out after excessive bullying. Organisations like India's **Chintan Environmental Research and Action Group** work to ensure children have the option to choose a different life. Their No Child in Trash program runs 18 learning centres for over 2,300 children. These centres serve as a bridge for children

working dumpsites before attending school. Teachers help prepare children, both emotionally and scholastically. A safe space is created where kids can learn their rights and catch a glimpse into a future beyond waste picking.

Another program, the **Kingdom of BGBJ**, was created by Resa Boenard, who grew up on Bantar Gebang, Indonesia's largest landfill. It is the largest uncovered landfill in all of Southeast Asia, stretching over 100 hectares and taking in between 6,000 and 8,000 tons of waste per day while providing a livelihood to over 3,000 waste pickers. Unlike many families, Resa's parents believed in the importance of their children's education. She stayed in school, dreaming of becoming a doctor despite being teased as the "Princess of the Dump."

She ended up entering university, but dropped out when she couldn't afford the fees to continue. Back home at Bantar Gebang she started both a recycling business and a community centre for children known as the Kingdom of BGBJ, which translates as "The Seeds of Bantar Gebang." She believes children are like seeds—they need to be nourished and supported to thrive and reach their full potential. The Kingdom is a safe place where children can learn, including subjects like English, IT, sports, music, art, and health and nutrition. Skills like making home crafts that can be sold are also part of the curriculum. Children are fed and given counselling. It's a place where they can simply be themselves. Resa's goal is to give children the tools they need to break the poverty cycle.

"Just because we are born among rubbish, doesn't mean we are rubbish," she says⁵⁸.

SUMMARY

The lives of waste pickers are challenging. They work long hours in difficult, dirty environments. And their work is vital to the communities in which they are citizens—the efficient movement of vast quantities of trash and debris by waste pickers makes urban life feasible in many places. If the work was not being done, then basic transport, hygiene, and business activities would degrade markedly.

Like most manual labourers the world over, they are often at the mercy of not only exploitative local businesses, but also economic fluctuations

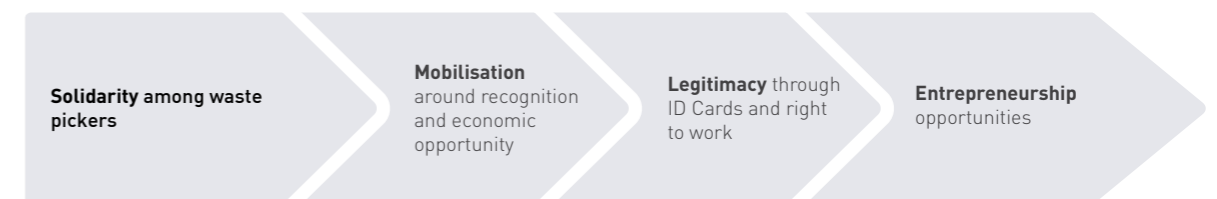
and changes in commodity prices that can sweep through their communities causing economic hardship.

But there is also found in waste pickers an ingenuity, camaraderie, and spirit of community that touches on the dignity of the human spirit. In addition, these characteristics can be the foundation of organising efforts to modernise and improve the working conditions and economic security of these workers, with a special emphasis on their children.

II. WASTE PICKER EMPOWERMENT

Waste pickers can attain a healthier, safer, and more secure future. But they can rarely do this on their own. True empowerment requires a systematic change in their rights, as well as recognition of their valuable contributions to society. Organisations that represent them need to fight on their behalf, while governments need to change the legal standing of waste pickers and heighten their economic opportunities. India and Brazil, arguably the two countries that have best supported waste pickers, both followed similar steps that moved waste pickers from subsistence living to greater opportunity. These four steps are listed below.

Exhibit 13: General pathways for waste picker empowerment



Governments share many of the same priorities, including a desire to increase recycling levels and reduce the amount of waste going to landfills. By utilising waste pickers in formal waste collection, governments can move them from dangerous and unhealthy work in landfills to more dignified work at the front of the waste-value chain. The cost is lower than municipal-led or private hauler systems and often more effective because waste pickers can travel on foot and reach otherwise inaccessible areas. However, many government officials don't view waste pickers as a valid resource in making change due to fears of poor service delivery. Therefore the evidence showing that waste pickers provide a valuable service and can be trusted with greater levels of responsibility needs to be highlighted. When enacting new systems, governments can start small by giving waste pickers a little more opportunity in a controlled context. (Please see chapter "Recommendations to policy makers and the private sector from the frontline"). When given the chance, waste pickers must seize the opportunity—either independently or in coordination with groups that support them.

There are different types of organisations supporting waste pickers. No single one covers all their comprehensive needs. Social justice and policy organisations build trust, community, and advocate for their rights. There are "waste picker livelihood" organisations that create long-term entrepreneurial opportunities. Other organisations create roles within their organisations to blend waste picker and other workforces.

Exhibit 14: Types of waste picker organisations and their role



Hasiru Dala, a registered charitable trust, and Hasiru Dala Innovations, a section 8 company⁵⁹, are sister organisations that each fill separate, yet vital, roles in securing a better future for waste pickers in Bengaluru, India. Hasiru Dala is a social justice organisation that advocates for their rights, engaging in strong policy advocacy to formally recognise their role in the waste system. Through their efforts, more than 7,000 waste pickers have been given government-issued identity cards. Laws have changed enough that waste pickers are now integrated into the city’s waste management services under the ambit of the local governing body, including servicing bulk waste generators. This kind of inclusion lays the groundwork for livelihood organisations like Hasiru Dala Innovations to bring entrepreneurial models into play.

Exhibit 15: Waste picker organisations profiled by type

SOCIAL JUSTICE AND POLICY BUILDING ORGANISATIONS	LIVELIHOOD ORGANISATIONS	WASTE PICKER COOPERATIVES	BLENDED WORKFORCES
<ul style="list-style-type: none"> • Hasiru Dala, India • Kagad Kach Patra Kastakari (KKPKP), India • Stree Mukti Sanghatana (SMS), India • Chintan Environmental Research and Action Group, India • National Movement of Waste Pickers (MNCR), Brazil 	<ul style="list-style-type: none"> • Municipality of Peñalolén, Chile • HasiruDala Innovations, India • TriCiclos, Chile • Pimp My Carroça, Brazil 	<ul style="list-style-type: none"> • YouGreen Cooperativa, Brazil • CooperRegião Cooperative, Brazil • Dois Irmãos Cooperative, Brazil • SWaCH Pune, India • Red LACRE, Brazil • Rede Catasampa, Brazil 	<ul style="list-style-type: none"> • TemesiRecycling, Indonesia

1. SOLIDARITY AMONG WASTE PICKERS

Waste picker organisations need to create a sense of belonging and trust—not only among the waste pickers themselves, but between the waste pickers and organisations’ staff. Used to working independently, most waste pickers have had life experiences making them wary of trusting others.

“It takes time to build a waste picker’s trust,” explains organiser Sangeetha John of SWaCH Pune, a solid waste management cooperative that is run by the Kagad Kach Patra Kashtakari Panchayat (KKPKP) waste picker union in Pimpri-Chinchwad, India.

Skeptical at first, thinking Sangeetha was asking questions in order to report them to the police, it took months to build trust with waste pickers. But one day Sangeetha found a waste picker—distressed after a police officer had taken INR 600 (\$4.80) from her, a considerable amount of money—and Sangeetha organised a protest. Eventually the officer returned the money. An incident that could easily have been overlooked, instead it ultimately built trust and solidarity amongst waste pickers and an organisation seeking to better their lives.

Stree Mukti Sanghatana (SMS) in Mumbai, India, was initially a women’s liberation organisation focused on bringing to light social practices that plague society and disempower women. Not until later was it that SMS came to serve waste pickers as well, starting “self-help groups” (SHG) to build the confidence of female waste pickers. The goal was to help women see themselves as strong enough to start a new life for themselves.

Each group has 10 members; each waste picker community has 10 to 15 groups. Within each, women share stories about their lives and struggles—everything from domestic violence to not having enough food to falling victim to fraud. These meetings were rough at first.

“Every woman here is conflicted. They are abused. They’ve had hard lives,” Jyoti Mhapsekar, the organisation’s co-founder recalls. However, over time, the small groups became the strongest support system the women had ever experienced. If a husband is abusive, the group will intervene and confront him—together. At each meeting members contribute INR 50 (\$0.70), which is pooled and available as a loan to any member

who needs financial support. This is often the first time members have had access to support, emotional or financial. They no longer have to rely on their in-laws, junk shops, or loan sharks for small funding.

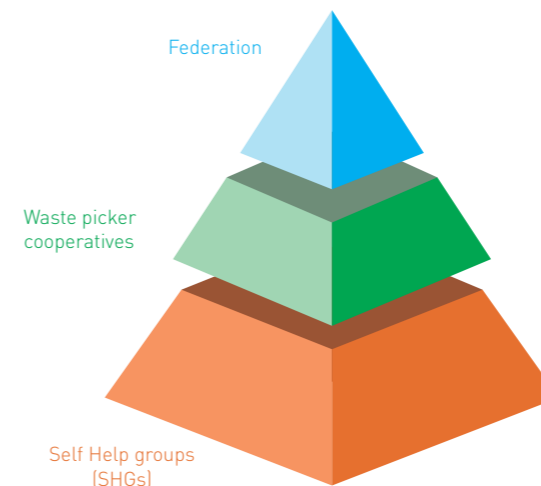
Members of these groups receive leadership, health, and vocational training. They learn how to manage organic waste and convert it into compost and operate biomethanation plants. These skills give each woman an opportunity for additional income, especially when the women form cooperatives that contract with housing complexes and businesses to perform waste collection and composting.

Not only do these women gain invaluable skills; they also gain a newfound financial freedom, often opening their first bank accounts. In short order the women feel empowered—first as a group, then as individuals. They start to take better care of their families—and themselves.

“I finally started to take up space,” is how one member put it in an interview.

Once they build greater self-confidence, they are ready to try new work models. Some start running their own businesses, a pursuit they would never have dreamed of before. Today, SMS has started over 500 self-help groups that support over 5,000 female waste pickers in India.

Waste pickers who are part of SMS groups have formed many small cooperatives that provide waste management services for the city. In order to keep administration costs low, a federation of these small cooperatives formed the Parisar Vikas Sangh, which translates as “an organisation to improve the environment.” The federation provides cooperatives front-end services like marketing and policy advocacy with Stree Mukti Sanghatana. Federation costs are met from contributions from individual cooperatives, all of which receive service fees from their clients. This model has supported women who wanted to provide waste management services in their own locality, allowing them to spend less time traveling.



“A beautiful woman is a woman that fights.” This is the slogan of SEMUC (State Secretariat of Women Collectors of Recyclable Materials of São Paulo), an organisation created in 2014 to support female waste pickers in Brazil.

The objective of SEMUC is to promote equality between men and women waste pickers and combat all forms of prejudice and discrimination. Together with the MNCR (Social Movement of Waste Pickers in Brazil), it aims to advance the appreciation of female waste pickers while strengthening and expanding their representation.

Exhibit 16: MNCR Women's march⁶¹



2. MOBILISATION AROUND RECOGNITION AND ECONOMIC OPPORTUNITY

Waste pickers are far more powerful when acting together rather than independently. Organising is the most potent way to bring change to their lives.

Oftentimes, when waste pickers first mobilise, they want to initially address smaller injustices. Many have experienced police harassment while working and want to fight back. It takes time to prepare them to advocate for broader, longer-term rights such as legal recognition, economic inclusion, and social security for their families.

THE BRAZILIAN AND INDIAN EXPERIENCE

The importance of social movements and the need for waste picker recognition has generated greater professionalisation in the field. In Brazil, the **National Movement of Waste Pickers (MNCR)** has played a fundamental role in the approval of the National Solid Waste Policy (PNRS). Similarly, **Kagad Kach Patra Kashtakari Panchayat (KKPKP)** formed a cooperative called **SWaCH Pune**, which helped establish partnerships between waste pickers and city governments that culminated in a recyclable and organic waste collection service in Pune, India. Policy changes have also been catalysed by a national network

called the **Alliance of Indian Waste pickers (AIW)**. KKPKP supported the development of AIW and its members were also involved in the formation of the Solid Waste Management Rule 2016, which defined the role of informal-sector waste pickers in the solid waste management systems of the local bodies.

With over 5,000 registered members, KKPKP operates locally in the Indian city of Pune. One of the movement's greatest wins was getting recognition of pickers in the state of Maharashtra. These workers now have identification cards and serve the Pune municipality with pride. KKPKP has a governing body of 13 waste pickers and a technical support team. Decisions are made monthly in assemblies and each waste picker is entitled to a health insurance plan at an annual cost of 100 rupees (roughly USD \$1.60). The union of waste pickers in India uses non-violent forms of resistance to make political change.

In Brazil, the organisational model is more decentralised, with the MNCR having a more complex and organic organisational structure. Anyone is allowed to join the movement and there are no fees. The MNCR is present in almost all Brazilian territories except for the states of Acre, Amapá, and Roraima, with each having its own self-governance model. It has 600 affiliated organisations, including cooperatives, associations, and informal groups⁶⁰. The work of the MNCR is guided by four principles: direct action, class solidarity, direct democracy, and self-management.

Following Gandhi's example of resistance that is active but nonviolent, the KKPKP mobilisation generally happens through collaborative discussions while the MNCR regularly takes to the streets in protest and engages in other direct advocacy strategies.

Exhibit 17: Mobilisation meetings by MNCR in Brazil



3. LEGITIMACY THROUGH ID CARDS AND RIGHT-TO-WORK

Many waste pickers strive to be recognised as legitimate workers. Government occupational identity (ID) cards help them gain this credibility. **Hasiru Dala** has forged a path for this recognition.

Hasiru Dala worked with local government officials in Bengaluru to make it the first Indian city where occupational ID cards, not “waste picker” cards, were given to waste pickers. Occupational ID cards recognise waste picking as a legitimate occupation and often guarantee certain rights to the card holder like legal ownership of waste. These cards included the city logo and signature of the Commissioner—another first. A carefully crafted circular from the local government facilitated the issuance of these cards, which are nearly identical to those of any city employee⁶². This resulted in a sudden elevation and understanding of the importance of waste pickers. Following Bengaluru’s lead, five other cities in Karnataka have issued similar occupational ID card systems.

Exhibit 18: Sample Bengaluru waste picker occupation card



Building on this success—and with continued advocacy by the Alliance of Indian Waste Pickers, a national network of organisations working with waste pickers—the National Solid Waste Management Rules (2016) mandated that local governments across India issue waste management occupational identity cards to their city’s waste pickers.

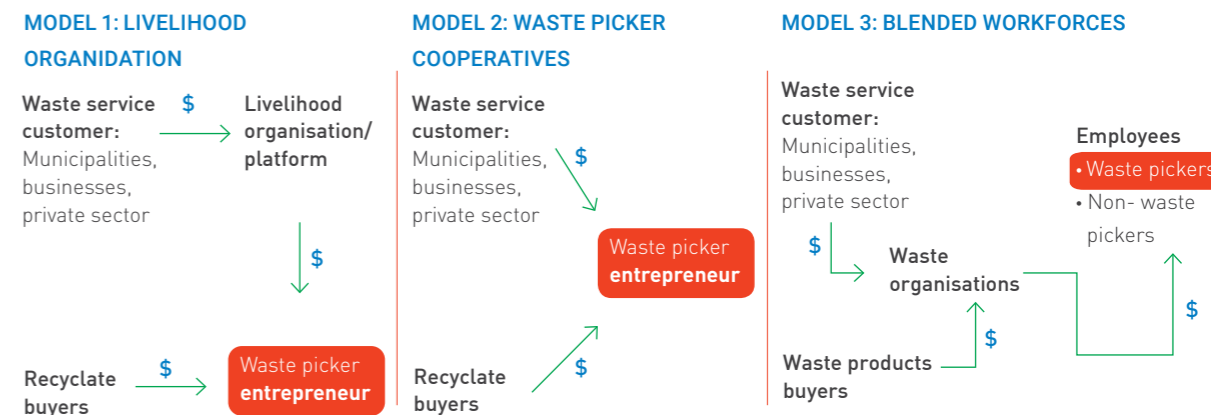
Called the Occupational Identity Card Initiative, it has spread across the country. In Panchkula, a city in Himachal Pradesh, the government in 2018 issued waste picker identity cards. That same year, in Chikkaballapur, Karnataka, Hasiru Dala was hired to organise waste pickers, issue occupational identity cards, and train them to manage inorganic recyclable waste. An industrial town in Jamshedpur soon followed suit. Four more cities in the states of Karnataka, Andhra Pradesh, Maharashtra, and Madhya Pradesh also issued occupational identity cards. As of late 2017 all Indian local bodies are mandated to provide identity cards and over 74,000 waste pickers have received them, with the number growing each year.

In addition, a special scholarship program for the children of waste pickers and a national financial-inclusion program for accessing low-interest loans was established for waste pickers holding occupational ID cards. The National Health and Urban Livelihood Mission introduced by the federal government has also included waste pickers as a special vulnerable group needing services.

Also in 2016 in Bengaluru, another policy required that all Dry Waste Collection centres (DWCCs) to serve as an aggregation point for inorganic waste in a municipal ward. In addition, the operation of such DWCCs was given to waste pickers, with door-to-door collection of dry waste also going to DWCC operators. This is the first time that informal waste workers have been given an opportunity to manage a city’s utility.

These accomplishments did not happen overnight in Bengaluru. Several hearings were conducted within the Karnataka State High Court’s alternate dispute resolution system. Panels of judges provided the opportunity for dialogue

Exhibit 19: Financial flow for each waste picker livelihood model⁶³



and discussion on the contribution of waste pickers and how they filled the gap in the local government’s waste management services. Jain University, along with Hasiru Dala and SWMRT, conducted a study finding that an estimated 15,000 waste pickers had saved the city 84 crores annually (USD\$ 11,765,000) by collecting 1,050 of the city’s 4,500 tons of daily garbage. This strengthened the argument that including waste pickers in the city’s formal waste collection and recycling programs was both economically viable and based on the facts.

SUMMARY

There are a myriad of organisations working to empower waste pickers and improve their lives. The goals and strategies are diverse—and need to be. Altering the social standing of waste pickers involves challenging long-standing cultural stereotypes and prejudices. And empowering them requires gaining their trust and faith, which is also a formidable obstacle to overcome. Most waste pickers have been mistreated in ways small and large, by individuals in positions of power and by large-scale economic forces far beyond their control. They are oftentimes survivors of trauma who are wary of those from outside their community.

But the organisations we’ve highlighted from our focal countries are developing the strategies necessary and creating templates that can and should be shared. Whether focusing on social justice, policy, entrepreneurship, or integration, the groups covered in this section are doing the hard, direct work with waste pickers necessary to “move the ball up the field.” The overarching twin goals of building social solidarity within waste picker communities and creating social recognition for waste pickers by the rest of society is moving forward in many places.

III. WASTE PICKER ECONOMIC INCLUSION

Traditionally, waste pickers are entrepreneurs. Rarely do they have an employer to report to; their pay is directly correlated with how hard they work. Therefore, it can be challenging to incorporate them into a formal waste system where they are expected to become employees, adhere to regular schedules, have a manager, and meet key performance indicators. The organisations profiled in this paper have found unique ways to address these issues. They have developed models that provide entrepreneurial opportunities for waste pickers to move to the front of the waste chain—i.e., direct waste collection and material sorting—where working conditions are healthier and more dignified than picking waste from dumpsites and landfills. Waste picker economic inclusion generally follows one of three models:

- **Model 1: Waste picker livelihood organisations** that create entrepreneurial opportunities.
- **Model 2: Waste picker cooperatives** where groups build their own non-profit organisations.
- **Model 3: Blended waste picker and non-waste picker workforce** with a combination of pay-for-performance work and salary-based operational work.

MODEL 1: ORGANISATIONS THAT CREATE WASTE PICKER ENTREPRENEURIAL OPPORTUNITIES

In this group, organisations build entrepreneurial opportunities for waste pickers that lead to viable businesses and employment opportunities. The models range from door-to-door collection, managing collection points and dry waste sorting centres and implementing app-based collection schemes. In these models, waste pickers operate as individual entrepreneurs rather than salaried employees or members of a group.

DOOR-TO-DOOR COLLECTION

Hasiru Dala Innovations (HDI) is a private-limited company based in Bengaluru, India. It aims to create better livelihoods for waste pickers by enabling them to build viable businesses that have a positive social and environmental impact. Realising waste pickers thrive in entrepreneurial environments where they have trust and responsibility, a model was designed where they continue to be their own bosses while having clearly defined expectations for quality service. In Bengaluru, municipalities provide door-to-door household collection, but waste collection service can be tendered out to bulk waste generators, commercial facilities, and large residential complexes with more than 50 households. As these entities become clients of HDI, motivated waste pickers are recruited to service them.

Waste pickers are trained, given a collection route, a truck, and a standard process to follow. HDI provides quality control (one manager for every three waste pickers) and easy avenues for clients to communicate concerns about poor service. Entrepreneurs are responsible for providing waste collection services for their route, including training households on how to separate organic and non-organic waste. They collect organic waste daily and non-organic waste weekly.

To run their businesses, entrepreneurs must recruit, train, and manage one driver, two collection workers, and sorters as needed (generally hired from their fellow waste pickers). They must manage their finances and maintain their vehicles—all while ensuring they deliver a quality service to their clients. These entrepreneurs receive a collection fee for each household served from HDI and all profits from recyclables. After four years they gain ownership of their truck outright (having paid no interest, which is covered by HDI). This results in minimal



fleet maintenance, since they are incentivised to look after their future asset. After they've proven themselves, entrepreneurs have the option to take on more than one route. In this model, asset ownership grows over time as waste picker entrepreneurs prove they are ready to take on greater challenges.

Since beginning in 2015, this model has successfully created more than 22 independent entrepreneurs who employ over 200 people. They build personal assets (i.e., truck ownership), secure stable and higher earnings, and create safer, healthier working conditions. In addition, they've achieved more than 90 percent source separation from the more than 30,000 Bengaluru households they serve, diverting more than 80 percent of waste from landfills. HDI has created a fully scalable model that is limited only by the number of bulk waste service customers who sign up for the program.

HDI has brought greater professionalism to street waste pickers as they transition to being waste management service providers. For example, waste pickers historically have worked on their own time and worn soiled clothes. Now they are required to wear clean uniforms and protective safety equipment at all times. This is a major shift in the way they have worked and it has required significant personal mentoring.

On the other side of the world in Santiago, Chile, the **Municipality of Peñalolén** has built a similar model. However, here waste pickers collect 14 categories of high-value recyclables (rather than all waste) and must provide their own collection vehicles. While there is a level of coordination and commitment amongst the waste pickers and the municipality, each waste picker is essentially operating as his or her own entity. Their livelihood is directly dependent upon the materials collected, sorted, and sold. Routes are assigned based on the volume of waste they can manage with their vehicles. Waste pickers with manual carts have smaller routes.

In order to be assigned larger routes—and thus obtain more income—waste pickers must purchase larger vehicles. The necessary savings are accomplished at their own pace and, in this way, responsibility and asset ownership grows in time as entrepreneurs prove their readiness to take on greater challenges. The municipality has seen many waste pickers start with manual push carts and ultimately advance to purchasing a large truck of their own. A few have even separated off and started their own collection businesses.

Additionally, each entrepreneur is assigned a sorting centre where they can sort and bale their recyclable materials. These sorting areas are generally shared by three to four waste pickers. However, the materials they collect are always kept and sold separately. The expenses (electricity, rent, etc.) are paid for by the municipality. To qualify, each waste picker must be properly registered in the municipality.

Models where waste pickers are given routes to collect only inorganic waste can be challenging. Sometimes recyclable waste buying arrangements are already in place with longtime vendors who have already developed relationships with individual households in the area. Also waste collectors of the other residual and organic streams always have the incentive of picking recyclable materials out of dry waste they encounter along their routes.

COLLECTION POINTS

TriCiclos in Chile has taken a different approach. Rather than provide door-to-door collection services, they establish Clean Points, which are centralised facilities where households and businesses can deliver sorted waste materials for recycling. Each Clean Point is funded by the private sector or municipalities at an expense of approximately USD \$23,000, plus taxes. These facilities include a baler and recyclable storage area. Selected waste pickers join TriCiclos for two years, learn every aspect of the Clean Point business—from recycling and administration to the fine points of running a business.

Waste pickers are trained to use the baler and develop the supply chain for recyclable sales. TriCiclos also helps them build demand through environmental education campaigns and Clean Point awareness drives.

While in training, waste pickers earn a salary of roughly USD \$485 a month, plus the sale of recyclables. This is considerably more than average waste picker earnings. There is an expectation that money is saved in order to maintain the business once they become independent. After two years, once the Clean Point is firmly established in the community, it is handed over and no further financial support is provided (though TriCiclos still provides monthly follow-up visits). Currently there are ventures in three cities across Chile.

ON-DEMAND COLLECTION

Pimp My Carroça launched an app, Cataki, that connects households and businesses with waste pickers who can collect their recyclable. Waste pickers keep recyclable earnings in exchange for handling pickup. The app format resembles the Easy Taxi E-hailing app. The project was funded by the OAK Foundation and the app has been downloaded 20,000 times. Projeto Relix, a program to destigmatise waste pickers in Brazil, is working on a similar app for Northern Brazil. I Got Garbage has launched a similar app in India and Gringgo has an app in Bali, Indonesia. These apps have the potential to shift hundreds, if not thousands, of waste pickers into working with cleaner and more valuable material in the waste chain. Other apps have been rolled out in Indonesia and India, though most are social enterprise ventures that don't utilise waste picker entrepreneurs for collection.

WASTE SORTATION CENTRES



Hasiru Dala trains waste picker entrepreneurs to manage Bengaluru's Dry Waste Collection centres (DWCC), which sort and bale non-organic waste materials for recycling. There is a tripartite memorandum of understanding (MoU) between the local government (which provides infrastructure and door-to-door collection contracts) and waste pickers (who provide collection and sortation services), while Hasiru Dala professionalises the service for both parties. The city pays for door-to-door waste collection and transportation, in addition to the DWCC operating expenses. In turn, waste picker entrepreneurs collect waste and then sort, grade, and sell recyclables and use profits to pay workers. Key Performance Indicators (KPIs) are set by the local municipality and Hasiru Dala.

Model 1 insight: Waste pickers are best integrated into the formal waste system when given entrepreneurial opportunities as individuals—as opposed to working in smaller groups.

Throughout the years that **Peñalolén**, Chile, has been incorporating waste pickers into their formal collection systems, many changes have been incorporated based on feedback from the waste pickers and the community. A critical change was allowing waste pickers to work individually rather than in small groups—and to share feedback outside of a group setting.

Feedback from the community was always an integral part of the program. In the early stages, it was given in open sessions with all the waste pickers present. However, this often resulted in arguments and blaming, exacerbated by the fact that the waste pickers were working as part of small groups. Eventually, the municipality decided to transform the system. Each waste picker was provided with feedback based on his or her own route—and in private, minimising the possibility of blame or feeling embarrassed. There was a considerable improvement in the level of service provided by waste pickers after this change.

Organisations have found the most successful waste picker entrepreneurs are people who already held leadership positions within their community (or even just within their family). Sharing similar values about the importance of environmental sustainability was also important. These types of individuals are sufficiently self-motivated to stick with the program and have confidence leading their teams. When successful, they not only build a better, safer, and more stable lifestyle for themselves—but also create jobs valued by their communities.

MODEL 2: WASTE PICKER COOPERATIVES

While waste pickers work alone as entrepreneurs—enjoying the freedom to dictate their own schedules—when they do come together in membership-based organisations like cooperatives, they instinctively look out for one another. There is a preference to make collective decisions, prioritising what's best for the common good. In Brazil, cooperatives are a social enterprise (non-profit). All members hold an ownership stake and pay an agreed upon fixed fee. They have a governance structure that includes a consulting board, president, secretary, treasurer, and supervisory fiscal consultive composed of elected members. Each month members come together in an assembly to share financials and ask questions.

Remuneration is variable, depending on how much revenue the cooperative has made. There are generally two options for income distribution, one where members evenly divide revenue and the other proportional to the amount of each individual's production.

This system was inspired by the first cooperative in the world, the **Rochdale Society**. It was an early consumer organisation in the United Kingdom. In Brazil, legislation inspired by the principles of the Rochdale Society came in two primary parts:

- 1. Law of Cooperative, No. 5.764 of 1971**
Defines the National Policy of Cooperativism and establishes the legal regime of cooperative societies.
- 2. New Law of Work Cooperatives, No. 12.960 of 2012**
Provides new compliance guidelines for cooperatives, especially with regards to worker health and safety, while reinforcing the need to guarantee minimum wages are paid by waste picker organisations.

In the Indian state of Maharashtra, a group of female waste pickers in Pimpri-Chinchwad realised they were getting far less for their materials than those in nearby Pune. The local junk shops would also take their materials with promises to pay that never materialised. The women felt exploited and powerless.

Taking matters into their own hands, they purchased a scale to test whether the junk shops were paying them fairly. After secretly weighing their recyclables, it was found that they were indeed being cheated. Furious, 20 of them decided to band together to open their own junk shop on the street (as they didn't have any land). Once they had enough savings, they rented a small shop. Eventually, the municipality gave them space underneath a freeway overpass—where they remain today.

Exhibit 20: Pimpri-Chinchwad women's cooperative junk shop



They wanted their junk shop to be everything that the local junk shops were not. A literate daughter of one member managed the shop so they could better understand the margins in waste trading. They established a group profit-sharing model with fair prices based on current market rates and pay-out in cash immediately, with receipts given (which is rare in informal waste trading since a waste picker can't challenge a buyer without formal proof). They also provide an eight percent provident fund (a type of social security). At the end of the year they split the profit with all cooperative members in the form of dividends. The group is now a part of the SWaCH Pune program with around 40 members selling two to five tons of recyclables per day.

Members also negotiated with the city to perform waste collection, using vehicles and female truck drivers—a first! – and negotiated with TATA to provide trucks. Unfortunately, they were minimally paid and had to take the city to court, winning USD \$150,000 in back pay. With contracts improving due to better negotiating,

the municipality now pays a service fee for waste collection and recyclable waste collected is kept by waste pickers. The municipality also provides collection vehicles.

In 2001, the **Chintan Environmental Research and Action Group** in Delhi, India, mobilised a wide range of informal waste workers and formed an association called Safai Sena (formerly Rashtriya Safai Seva Sangathan, "army of cleaners"). Officially registered in 2009, the vision is to enable adult waste workers to upgrade into green jobs. The Safai Sena offers a range of services, including doorstep collection of waste and improved waste collection training to all members.

Stree Mukti Sanghatana (SMS) has also started 10 cooperatives that are part of a larger federation. The Federation loans each cooperative 50,000 (\$700) a year (as opposed to loaning money to individuals).

COOPERATIVE NETWORKS

On a larger scale, three or more waste picker cooperatives can join together to become a **Cooperative of 2^o Degree**, a viable, legal modality under Brazilian law. Given that waste economics is tightly tied to scale, joining gives the newly formed cooperatives much greater capabilities, including facilities to centralise materials, share equipment, optimise waste collection logistics, and market directly with the recycling industry (as opposed to smaller junk shops). The **Rede Catasampa** is another example, formed by 17 waste picker cooperatives to centralise services and products at a facility in São Paulo, Brazil.⁶²

CooperRegião's three cooperative groups perform waste collection, sortation, and sales for more than 78,000 households in the municipality of Londrina in Brazil. They have 14 additional contracts with private and public entities while running three non-organic waste sortation centres across the city. Each one is individually operated, with its own customers and prices, as well as its own operational and commercial managers. The cooperative negotiates contracts but the centres operate independently. CooperRegião has also purchased seven trucks, two combis, a motorcycle, and a car. Each truck has one driver and three workers, collecting around 350 tons a month (of which 250 tons are recycled), reducing landfill material by 80 percent. They also partner with the local university that produces waste characterisation studies.

Exhibit 21: CooperRegião sorting facility⁶⁴



Under this same principle, but on an even larger scale, the Latin American and Caribbean Network of Recyclers shows the importance of representative organisations and workers in advancing recognition of the sector. Under the **Red LACRE** are 17 Latin American countries: Brazil, Chile, Venezuela, Uruguay, Nicaragua, Paraguay, Panama, Peru, the Dominican Republic, Costa Rica, El Salvador, Guatemala, Honduras, Ecuador, Argentina, Bolivia, and Colombia. It is a representative organisation of national recycler movements that participates in initiatives, alliances, and regional and global platforms to better the economic, social, and environmental circumstances of recyclers and waste pickers.



MODEL 3: BLENDED WASTE PICKER AND NON-WASTE PICKER WORKFORCE

Some organisations have found ways to include a per diem (flexible) workforce and a salaried workforce. Flexible roles—like separating organics from non-organics and removing labels, bottle caps, and lids—can be done by individuals on a pay-for-performance basis. This is especially attractive to waste pickers who value their independence. But other tasks require specialised knowledge and a regular schedule and are more suitable to salaried employees.

Temesi Recycling in Indonesia operates a dual remuneration structure: pay-for-performance per diem labourers for sorting waste and salaried employees for processing organics and running more technical aspects of operations. They pay a fair, fixed price for each tonne of separated organic waste to freelance sorters (often waste pickers) who have the flexibility to work when they want, with compensation based on results rather than time on the clock. These labourers also get to keep any recyclables they find, further

sweetening the deal, and some freelancers also have side agreements with collection companies. All have the autonomy to accept or reject truckloads of waste based on cleanliness. With this model, Temesi Recycling ensures that necessary sorting work is done efficiently, while avoiding the administration requirements of formally hiring and managing this large workforce.

Every livelihood model must solve a few fundamental problems. These include long-term sources of livelihood, processes for transporting materials, the ability to ensure quality service delivery, and for entrepreneurial models handling the transition when individuals are ready to take control of their business. Each model answers these needs differently.

Exhibit 22: Comparison of solutions to common waste picker organisation design questions

	MODEL	HOW TO CREATE LIVELIHOODS?	HOW TO TRANSPORT MATERIALS?	HOW TO QUALITY CONTROL SERVICE DELIVERY?	HOW TO ENSURE WASTE PICKERS ARE READY FOR HANDOVER?
INDIA					
HASIRU DALA INNOVATION	Model 1: Door-to-door collection	Collection service fees and recyclable sales	Waste pickers earn trucks after 4 years (thus incentivised to take care of them).	Extensive training. KPIs. Seven day/week customer care hotline and issue log system. One HDI supervisor for every three truck routes.	No handover. Responsibility and service area grows as waste pickers deliver successfully on initial area.
HASIRU DALA (NGO)	Model 1: Waste sortation centres	Collection Fee Recyclable sales	The Municipality (ULB) subsidises the cost of the driver and a helper, along with fuel and maintenance. The vehicle must be hired or owned by the waste picker.	KPIs are set by both municipality and Hasiru Dala.	Handed over from the start, with waste pickers responsible for managing the DWCC.
SAFAI SENA⁶⁵	Model 2: Door-to-door collection	Contracts with bulk generators, recyclables, and composting sales	Waste pickers provide their own transportation (in some cases it's in-situ processing requiring no motorised transport).	Training and mentorship by Chintan, then self-management.	Handed over from the start, with ongoing support and mentorship from Chintan.
BRAZIL					
COOPER REGIÃO COOPERATIVA	Model 2: Door-to-door collection	Collection fee and recyclable sales (plus facility rent and social security tax covered).	Cooperative buys trucks and vehicles for use of three underlying cooperatives with revenue savings.	Strict contract becoming more flexible over time. Biweekly meetings to review KPIs. Fines ranging from 20–40% of the contract revenue if KPIs not met.	Handed over from the start, with responsibility and coverage area growing as KPIs are met.
PIMP MY CARROCA	Model 1: On demand collection	Recyclable sales	Waste pickers provide own transport and PIMP ensures it's in good working order.	Sensitises customers to lower service delivery. Repeat customers dependent on good service level (so built in incentive).	No handover. Waste pickers choose whether to participate on app and can drop out anytime.
PROJETO RELIX	Model 1: On demand collection	Recyclable sales	Provides ergonomically designed bicycle carts.	Sensitises customers to lower service delivery. Repeat customers dependent on good service level (so built in incentive).	No handover. Waste pickers choose whether to participate on app and can drop out anytime.
CHILE & INDONESIA					
MUNICIPALITY OF PEÑALOLÉN	Model 1: Door-to-door collection (recyclables only)	Recyclable sales	Waste pickers provide own vehicle with route determined based on how much they can haul. Encouraged to save up for bigger vehicles in order to get larger routes.	Training. KPIs. Regular, individual feedback. Sensitises customers to lower service delivery. Face-to-face pact made between households and their waste picker.	Handover from start, with responsibility and service area growing as waste pickers deliver successfully on initial area while saving to purchase larger vehicles.
TRICICLOS	Model 1: Collection points	Recyclable sales	No transport needed (material brought to a central location).	Two years spent on training every aspect of the program. Business mentoring with waste picker until ready for handover.	Handover after two years of learning and building business.
TEMESI RECYCLING	Model 3: Organics sorting and processing	Pay-for-performance sortation	No transport needed (material brought, they come to a central location).	Only paid for minimum quality of sortation.	No handover. Can become salaried employees with greater responsibility.

SUMMARY

Designing and implementing local business models that change the status quo in waste collection is a complex task. There are logistical, quality, and integration into regional, national, and international supply chain factors that have to be understood and designed around. Another challenging dynamic is ensuring that the economic needs and rights of waste pickers are met.

A variety of “on the ground” models have been developed in our focal countries. These include livelihood organisations creating entrepreneurial templates that individual waste pickers can be recruited to embrace, cooperatives that use age-old models of economic cooperation and solidarity to create collective action, and ways to combine the skill sets of flexible per diem workers and salaried employees.

All these efforts are bottom-up examples of community organising at its finest and most effective. Lives are being bettered and economic models expanded in ways that are long-lasting and crucial.

IV. WASTE PICKER SOCIAL INCLUSION

Waste picker inclusion doesn’t stop with economic empowerment. To be truly effective, waste pickers need to be appreciated as valuable members of society. Their status needs to be in line with other labourers. In many countries this is rarely the case, though Brazil and India have made huge headway in improving the status of waste picker roles.

The leadership of **Hasiru Dala** used their social media skills to catalyse change—but have now passed the microphone to the people they represent. Waste pickers and other female volunteers speak about their experiences—accounts that are unpolished, but powerful. Journalists also appreciate having access to real people.

For example, since 2012 waste pickers have been running a daily show, *Kasa Shramika Parisara Rakshka*, on the local community radio station, Radio Active 90.4 (also shared on social

media). Many of the waste pickers have their own WhatsApp, Facebook, Twitter, and Instagram accounts—and dedicated followers. Through this process, Hasiru Dala has changed the narrative of waste pickers as “dirty, poor, disadvantaged workers” to “silent environmentalists and robust entrepreneurs.”

In Brazil, Projeto Relix aims to make the often invisible waste pickers visible to society. One way they do this is through two photo exhibitions. The first, *Relix: A força Cromossômica Feminina Por uma Vida Sustentável* (The Chromosome Feminine Force for a Sustainable Life) is a series of photographic essays of female waste pickers working in not always supportive communities at grave risk. These women—and their families—are photographed in their homes, with their lives, humanity, and unique personalities captured.

Photographs are blown up and displayed in public galleries where people have the chance to meet these waste pickers. There is also an art catalog distributed for free to organisations working on human rights, resource sustainability, and women and children’s issues. Relix has published five editions of this project.

A second photography exhibit, *Expolix*, is a travelling show capturing waste pickers in their cooperatives. Images circulate through the city on the back of the *Ciclolix* eco-bicycle carts that waste pickers ride throughout the city.

Projeto Relix also uses theatre and video to share the experiences of waste pickers and promote recycling and environmental sustainability. A commissioned play has been staged 710 times for free at schools, businesses, and public spaces to over 167,000 people. The production includes a waste picker as a primary character and features the five super heroes of sustainability (repair, refuse, reduce, reuse, recycle) while using humour, drama, and music to share the concepts of sustainability, zero waste, and reverse logistics. Waste pickers often attend stagings. The effort includes the distribution of 160,000 educational books.

Pimp My Carroça joined forces with more than 300 street artists to “pimp” the waste picker carts of Brazil with colour and humour. This improved waste picker self-esteem and helped establish

their place in society. These carts—and the people behind them—went from being an invisible aspect of Brazilian society to famous. While painting carts, waste pickers often receive social and medical services as well as safety equipment.

SUMMARY

Waste picking is a livelihood, a way to make a living. Therefore, most organised efforts to positively impact the lives of workers in this field necessarily focus on their economic realities.

But as James Oppenheim’s poem that came to be the rallying cry of the Lawrence textile strike—aka, the Bread and Roses strike—put it: “Hearts starve as well as bodies; give us bread, but give us roses!”

Several programs in our focal countries have also used the arts to bring light to and understanding of the realities of waste picking—and its vital role to society. Focused arts programs have captured the dignity of individual waste pickers via exhibitions, while collaborations with visual artists use the primary tool of the waste picker—their carts—to bring beauty to the shared public space. These efforts have highlighted the work of trash pickers and enriched their lives.



CONCLUSION

This chapter has covered the realities facing waste pickers in our four focal countries. The difficult nature of their work, the stigma attached to what they do for a living, the ways they can be exploited. The often dire straits of their children.

But it has also given concrete, scalable examples of community organizing efforts and economic models that can change the dynamic for waste pickers. The issues are complex and challenging, but true social change—especially when dealing with a long-ignored and exploited class—is never easy.

The organisations summarised above—and the highlighted individuals who have embraced the challenges of entrepreneurial opportunity and collective action—are the stories that need to be told. Stories are powerful. They provide a roadmap forward and hope for a better tomorrow. They show that it can be done.

Modern capitalism—and the consumer realities it has inspired over the past two centuries—is a complex, global cultural construct. Dealing with its outflow, its veritable ocean of waste, demands multifaceted systems implemented around the world. But there is a place for the powerful stories being created by the frontline workers who pick, sort, and move that outflow. Both to better their lot and improve the management of that waste stream—for the betterment of the world and its oceans. These frontline workers often understand what works on the ground and what doesn’t. To borrow a phrase from the U.S. military, they are the “grunts”—the infantry—who, after plans have been developed and goals set, actually have to go out and make it a reality. Listening to their stories, improving their lives, and learning from their experience can be a powerful force for change.

3 Affordable Waste Collection

At the simplest level, waste collection removes material from one location and delivers it to another yet is the foundation of the entire waste management system, and the single most important lever for keeping plastics and other waste out of the ocean. No amount of behaviour change or awareness programs will stem the tide unless basic waste collection infrastructure is in place for residents, who otherwise have few options but to burn or dump their waste into the environment. In fact, uncollected waste accounts for 75% of land-based leakage⁶⁶.

Economic development, population growth, increasing consumerism, movement from rural to urban areas and the prevalence of a disposal culture has resulted in growing levels of waste, often without the infrastructure in place to collect and manage it. Municipalities often struggle with limited financial resources, a lack of waste system training and other administrative setbacks which make managing waste both an expensive and challenging proposition. Further, many regions lack essential waste management infrastructure, including proper landfills and established recycling processors. Residents and businesses are met with poor collection services and often resort to dumping their waste away from their homes, or in the water. Without clean collection systems, waste recyclers and processors do not have a consistent supply of quality feedstock. However, many organisations have come forward to tackle the important issue of affordable collection of municipal solid waste.

CASE STUDIES PROFILED IN THIS CHAPTER

- Cibunut Berwarna, Indonesia
- Dois Irmãos, Brazil
- ecoBali Recycling, Indonesia
- Fundación Basura, Chile
- Fecunda Patagonia, Chile
- Hasiru Dala Innovations, India
- Kabadiwalla Connect, India
- Mother Earth Foundation, Philippines
- NEPRA, India
- Project STOP, Indonesia
- Rumah Kompos Padangtegal, Indonesia
- Swachha Eco Solutions, India
- SWaCH Pune, India
- Temesi Recycling, Indonesia
- Waste4Change, Indonesia
- Yayasan Pengembangan Biosains dan Bioteknologi (YPBB), Indonesia
- YouGreen, Brazil



AFFORDABLE WASTE COLLECTION

VITAL LESSONS FROM PIONEERING ORGANISATIONS ON THE FRONT LINE



INTRODUCTION

Each organisation, government, and private sector institution investing in or designing a waste collection system should ask themselves a few key questions:

1. Should the collection model catalyse an exemplary waste system model(s) of the future or support existing less-than-perfect collection models that utilise the shortest path between collection and recovery?
2. What materials should be collected?
 - A. Plastics with a market value (HDPE, PP, PET)
 - B. All plastics (A + PS, contaminated bags, multi-layer sachets, etc.)
 - C. All non-organic waste (B + diapers, textile, etc.)
 - D. All waste, including organic materials
3. Should material be collected from all households and businesses or a sub-set?
4. Should waste pickers be supported in the model—and if so how?
5. How important is reliable waste tracking (e.g., for EPR/PRO mandates or public sustainability commitments)?

From an environmental and social point of view, the best collection systems ensure all non-organic waste is collected from all households and businesses, in a way that creates the waste system a region wants long term and thoughtfully includes waste pickers in the transition.

This chapter broadens the traditional definition of waste collection, presenting the strengths and weaknesses of nine diverse waste collection models. It also distils lessons learned from the field to build economically viable waste collection systems that can withstand the test of time and keep waste out of the environment, including strategies to increase revenue through multiple income streams and reduce costs with improved operational efficiency and worker productivity.

Larger systematic change through policy regulation and greater investment are covered in the final chapter, Recommendations to Government and the Private Sector from the Frontline. Also, while issues such as the separation of waste at source, waste picker inclusion, and processing waste streams are all important in building economically viable waste collection systems, they are covered more thoroughly elsewhere in this report. The strategic levers that follow are not an exhaustive list but describe processes that have worked for focal organisations to create economically sustainable collection models.

Exhibit 1: Topics covered in this chapter within the waste value chain



I. BROADENING THE DEFINITION OF WASTE COLLECTION

While the common image of waste collection involves municipal garbage trucks and bins, it can actually take many forms. In fact, most cities have multiple waste collection systems—formal and informal—running in parallel. In Santiago, Chile, for example, municipal trucks collect bulk waste door-to-door from households and bring it to landfills, while waste pickers search for recyclables on streets, in bins, and at the landfill. In addition, there are several neighbourhood Puntos Limpios (Clean Points)—some of which are managed by waste picker entrepreneurs—where environmentally conscious households donate their recyclable materials.

Broadening the traditional definition of waste collection, there are nine unique waste collection models used by focal organisation, which can generally be classified into three types—models that charge a fee to take waste for recycling and safe disposal, those that buy recyclable waste that has value, and those that support residents in donating their valuable waste for the good of the environment and/or waste workers. What follows is a general description of each of nine models within these three categories—although individual collection programs can vary materially within each model. Exhibit 3 compares each model on level of collection and community served, capital requirements, quality control, and entrepreneurial and waste picker opportunity.

Each collection model has trade-offs. Some are less capital intensive and generate greater entrepreneurial opportunities—but are harder to ensure quality service delivery. Others are fast and efficient at collecting recyclable waste—but leave out the rest of the non-organic stream and may perpetuate less than ideal social and environmental norms. Others are capital intensive and entail managing large work forces and vehicle fleets—but have ultimate control over every aspect of the waste system.

CATEGORY 1: CHARGE FOR SERVICE

1. **Government- or community-run collection:** These programs provide door-to-door or shared-bin collection to most households and businesses in a geographic area. Collection services are provided to the community at an affordable rate and the full organic, non-organic, and residual streams are collected. But when higher value recyclables are removed by waste pickers the value derived from waste collection is lower than in many other models, while the volume of

waste collected is far greater. This is one of the most important models to reduce environmental pollution but is hard to make economically viable without support.

2. **Private hauler and social enterprise for-profit collection:** These businesses generally provide collection services to medium and higher income households and businesses that are willing to pay a premium price. They usually offer several other waste services, including consulting advice, event management, retail products, and environmental training. Some brand their collected plastic as “social” or “ocean-bound,” provide transparency on the waste’s origin, and create an inspiring story that improves value over commodity-level recyclables.

Because most of these organisations do not collect all waste—focusing instead on higher value materials—they can expand service areas relatively quickly and at relatively low capital costs. However, they often compete with waste pickers for material, have limited clientele and do not collect the lower value plastics most commonly found in the environment.

3. **Micro-entrepreneurial haulers (fixed or variable route):** In this model, rather than organisations or municipalities managing a fleet of collection vehicles, they “employ” micro-entrepreneurs—individuals with a vehicle who can collect and transport waste to a central collection point. In some programs, entrepreneurs can use any size vehicle—from waste picker carts to large trucks—with the route size adjusted to vehicle capacity. Some programs support prospective entrepreneurs in securing bank loans to buy vehicles. Others provide vehicles to entrepreneurial waste pickers and later transfer ownership if key performance indicators (KPIs) are met over a specified time period, which helps waste pickers transition to owning an asset for the first time. Fixed route models give entrepreneurs a specific collection itinerary, while variable route models are based on an app that households and businesses use to conveniently schedule pickup. These models significantly reduce governmental vehicle fleet responsibilities while creating private asset ownership.
4. **Waste picker cooperatives:** These provide entrepreneurial opportunities for waste

pickers by allowing them to move to the front of the waste chain—i.e., home and business collection and centralised sorting—where working conditions are healthier than those found in dumpsites and landfills. These models provide either full waste stream or recyclable-only collection, generally awarded by the municipality and/or bulk waste generators. The dynamics of this model are explored more deeply in the Waste Picker Inclusion chapter.

CATEGORY 2: BUY WASTE

- 1. From waste pickers:** Some recyclable materials are purchased directly from waste pickers at landfills or at central locations (which, by serving multiple waste pickers simultaneously, is more efficient considering the relatively small quantities individual waste pickers can collect). This model can take a great deal of time to fully develop, since building trust is crucial, and therefore it's only recommended when long-term buying relationships are probable.
- 2. From Junkshops:** Buyers can also use the existing informal, decentralised—but well organised—supply chain of junkshops. Purchasers signal a price they're willing to pay and junkshops communicate this to their network of waste pickers. If the price is high enough, waste pickers will change their selection patterns in order to capture the desired material and deliver it to junkshops (usually within a couple of weeks). Given that transactions happen at junkshops rather than with individual waste pickers, this model is easy to coordinate. It makes use of the existing informal recycling system. Unfortunately, as with other models in this category, it is generally limited to only recyclable waste with value.
- 3. From waste banks:** Waste banks buy recyclable materials from households, businesses, and sometimes waste pickers at a centralised collection point. Some provide a fee for materials deposited or the equivalent in electricity, cell phone, or school fee credits. Collection points can be set-up at schools, small shops, and waste transfer stations—or be mobile so as to make it easier for the community to take part. Where implemented, these tend to be small in scale.

CATEGORY 3: DONATE WASTE

- 1. Recyclable collection points:** These models establish central collection points, whether container-sized facilities or specialised bins, where households and businesses can bring recyclable materials. Individuals realise that by donating their recyclables, materials will not end up in landfill and there will often be an economic benefit for waste pickers.
- 2. Waste picker entrepreneur programs:** Similar to waste picker cooperatives and micro-entrepreneurial collection, these programs give waste pickers routes made up of households that have agreed to set aside all of their recyclables for donation. Waste pickers keep all material collected and can often sell it to junkshops or aggregators.

Each waste collection model has benefits and drawbacks. From an ocean plastic perspective, models that collect all non-organic waste—not just recyclable waste with value—have a far greater impact on environmental pollution than those that do not. As companies wrestle with the challenge of sourcing plastics, whether for voluntary or mandated EPR schemes or fulfilling public sustainability commitments, consider the benefits of each model carefully. Any financial support provided to waste collection systems helps—some just helps more than others.



Exhibit 2: Summary of nine waste collection models

CATEGORY 1: CHARGE FOR SERVICE	
1. Government- or community-run collection:	Provide collection of all waste to the majority of households and businesses at an affordable rate.
2. Private hauler and social enterprise for-profit collection	Provide collection services to households and businesses that are willing to pay a (premium) price - generally higher income households and businesses - and generally offer additional waste services.
3. Micro-entrepreneurial haulers:	“Employ” micro-entrepreneurs—individuals with a vehicle who can collect and transport waste to a central collection point, thereby creating private asset ownership and entrepreneurial opportunities.
4. Waste picker cooperatives	Award waste picker cooperatives a municipal contract for collecting a region's waste.
CATEGORY 2: BUY WASTE	
5. From waste pickers	Buy materials directly from waste pickers at landfills, central locations or through pick-up services.
6. From junkshops	Buy materials from the existing informal, but well organised supply chain of junkshops who can signal price changes to waste pickers.
7. From waste banks	Buy materials directly from households and businesses at centralised drop-off points, sometimes in exchange for electricity, cell phone or school fee credits.
CATEGORY 3: DONATE WASTE	
8. Recyclable collection points	Establish central collection points where households and businesses can donate their recyclable materials and keep them out of landfill.
9. Waste picker entrepreneur programs	Give waste pickers routes to collect from households that have agreed to set aside and donate all their recyclable materials.

Exhibit 3: Nine collection model comparison

WASTE MODELS	WASTE STREAM	COMMUNITY SERVED	CAPEX REQUIRED	WASTE TRACKING	ENTREPRENEUR OPPORTUNITY	WASTE PICKER LIVELIHOOD	QUALITY CONTROL	EXAMPLES
Charge for waste collection service								
1	Full Government/ community run (door-to-door or shared bin)	All	High	Hard depending on granularity of tracking needed	No	No	High	<ul style="list-style-type: none"> Rumah Kompos Padangtegal, Indonesia Project STOP, Indonesia
2	Recyclables, non-organic, or full Private haulers/ social enterprise models	Select unless municipal contract	Medium	Medium	Yes	No	High	<ul style="list-style-type: none"> EcoBali, Indonesia Fecunda Patagonia, Chile
3	Recyclables, non-organic, or full Micro-entrepreneurial haulers (fixed or variable route)	All (fixed route) or select (variable route)	Low	Medium	Yes	Sometimes	Low-Medium	<ul style="list-style-type: none"> Hasiru Dala Innovation, India NEPRA, India Gringgo, Indonesia
4	Recyclables, non-organic, or full Waste picker cooperative	Select unless municipal contract	Medium	Medium	Yes	Yes	Medium	<ul style="list-style-type: none"> CooperRegião Coop., Brazil Dois Irmãos Coop., Brazil SWaCH Pune, India
Buy waste								
5	Recyclables Waste pickers	Select	Low	Medium	Yes	Yes	Low	<ul style="list-style-type: none"> Junkshops; NEPRA, India
6	Recyclables Junkshops	Select	Low	Straight forward	Yes	Yes	Medium	<ul style="list-style-type: none"> Kabadiwalla connect, India
7	Recyclables Waste banks (stationary or app based mobile)	Select (those interested)	Medium	Straight forward	Yes	No	High-Medium	<ul style="list-style-type: none"> Plastic Bank, Haiti, Indonesia Bank Sampah, Indonesia
Donate waste								
8	Recyclables Recyclable collection points	Select (those interested)	Medium	Straight forward	Sometimes	Sometimes	High	<ul style="list-style-type: none"> TriCiclos, Chile and Brazil Kabadiwalla Connect "Urbin" Waste 4 Change, Indonesia
9	Recyclables Waste picker entrepreneur programs	All or select	Low	Medium	Yes	Yes	Medium	<ul style="list-style-type: none"> Municipality of Peñalolén, Chile

II. STRATEGIES TO ENSURE WASTE COLLECTION SYSTEMS ARE ECONOMICALLY SUSTAINABLE

The value created from processing waste is usually not enough to cover the full cost of waste systems, especially collection (which almost always runs at a net cost, especially when high-value recyclables are removed by waste pickers and residents). This gap between cost and value dissuades potential investors and entrepreneurs from dedicating time and resources; it is why many social impact funds are challenged to find waste entrepreneurs specialising in collection to support. However, focal organisations have found ways to make waste collection more economically viable. This section explores strategies they have used to increase revenue and reduce costs.

STRATEGIES TO INCREASE COLLECTION SYSTEM REVENUE

Focal organisations have found several ways to increase revenue, including : (1) leveraging multiple income streams (collection fees, waste material revenue, offer other waste services, retail stores, government and private sector support), (2) variable pricing based on waste generation level, and (3) detailed tracking and analytical reports

1. MULTIPLE INCOME STREAMS

All focal collection organisations have multiple revenue streams, though different waste collection models tend to rely on different revenue stream types. Community-run collection programs generally use a combination of waste collection service fees, some recyclable and valorised organics sales, and local government and private sector support. Waste picker cooperative models while similar, often go deeper into recycling revenue streams by aggregating recyclables and vertically integrating. For-profit social enterprises tend to have the widest and most innovative range of revenue streams—engaging in services like event waste management, consulting services to government and businesses, and environmental training programs.

For example, the Chilean social enterprise **Fecunda Patagonia**, the first company to bring collection and sortation services for recyclables to the remote Patagonia region, relies on multiple income streams to remain economically viable. They provide fee-based waste collection to businesses, offer company and school environmental training and tours at a cost, sell recyclables, and have a small retail store where they sell cloth diapers, sorting bins, and home composters.

RETAIL OUTLETS

Some organisations offer waste-related products in either physical or Internet-based retail stores. The most common items sold include reusable products (e.g., diapers, water bottles, straws, wax-coated food wrap, and menstrual cups), upcycled products made from waste (e.g., glassware, sunglasses, surfing fins, roofing tiles, and Frisbees), or products to better manage waste (composters and sortation bins). A few organisations go one step further by creating comic books, artwork, games, and school manuals that educate, inspire, and support waste and behaviour change programs.

Exhibit 4: Products offered for sale in Internet or physical stores by waste organisations

PRODUCTS FOR A ZERO WASTE LIFESTYLE

Reusable wax food wrap, shopping bags, cloth diapers, water bottles, menstrual cups, vegetable bags



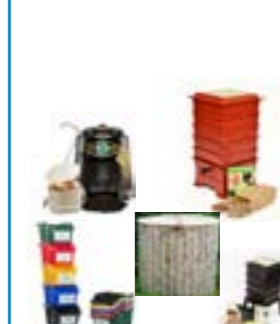
UPCYCLED PRODUCTS FROM RECYCLED WASTE

Upcycled glassware, roofing tiles, glasses, surfing fins, games and frisbees, agricultural piping



PRODUCTS TO MANAGE WASTE

- Composters
- Various bins



PRODUCTS TO EDUCATE AND INSPIRE

- Waste picker photography
- Comic books

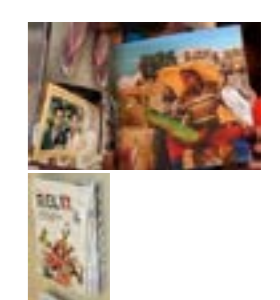


Exhibit 5: Common revenue streams seen in waste collection models⁶⁸

	REVENUE STREAMS	COMMON WASTE COLLECTION MODELS		
		COMMUNITY RUN COLLECTION	WASTE PICKER COOPERATIVE	PRIVATE HAULER AND SOCIAL ENTERPRISE FOR PROFIT COLLECTION
Collection Fees	<ul style="list-style-type: none"> Household fees Bulk generator fees¹ Business fees 	✓	✓	✓
Revenue From Waste	<ul style="list-style-type: none"> Sell recyclables Sell further processed recyclables Sell aggregated recyclables Sell end products Sell processed organics 	✓	✓	✓
Other Waste Services	<ul style="list-style-type: none"> Consulting advice Retail store (online or physical) Event waste management Environmental training Franchise fees 		✓	✓
Government support	<ul style="list-style-type: none"> National government stipend Municipal stipend Village stipend Government entrepreneurship support 	✓	✓	✓
Private sector support	<ul style="list-style-type: none"> EPR, plastic credits or equivalent Buyer recyclable premium Donations 	✓	✓	✓



CONSULTING ADVICE

Both Indonesian social enterprises, **ecoBali Recycling** (dedicated to changing how people relate to waste) and **Waste4Change** (mentored by ecoBali and providing responsible waste management in Badung, Indonesia) offer waste consulting services. The clients for these social enterprises include the Indonesian government, other waste programs, and various private sector entities that are trying to build a more circular resource system. This increases their total revenue while also magnifying their brand, reach, and impact and can be a particularly powerful force for change.

EVENT WASTE MANAGEMENT

One of the main sources of revenue for Fundación Basura (a non-profit aimed at building a zero-waste culture in Santiago, Chile) and Hasiru Dala Innovations (a waste picker collection model in Bengaluru, India) comes from their contracting waste management services for local events. Fundación Basura's "Zero Waste Challenge" doesn't simply collect the waste at an event. They are contracted to coordinate an event's waste management from start to finish, including understanding in advance the sources of potential waste and recommending changes in materials or products that will eliminate as much waste as possible. To date they have managed 42 events. Their most successful event management reduced 99 percent of waste from being generated.

2. VARIABLE PRICING BASED ON WASTE GENERATION LEVEL

Variable pricing is becoming more popular for waste collection services. For example, **Hasiru Dala Innovations** wanted to charge their bulk generator customers (i.e., residential and commercial complexes of 50 households or more) a fixed fee for collection service. However, their clients complained that it was too expensive. Hasiru Dala lowered their monthly fixed fee, but added a variable fee for each kilogram of organic and residual waste (while taking recyclable non-organic waste at no charge). With this new pricing model, their customers are incentivised to keep waste generation at a minimum and Hasiru Dala guarantees sufficient operational revenue that is sometimes more than the revenue generated from a fixed rate model.

3. DETAILED TRACKING AND ANALYTICAL REPORTS

At the simplest level, waste collection removes material from one location and delivers it to another. This service has a base commodity price. However, when organisations are able to provide transparency on the amount of waste collected by type, how this changes over time, and how much of what is collected is recycled, companies can use this information to satisfy compliance requirements and make more informed purchasing and usage decisions. This data can be almost as valuable as the base collection service alone.

YouGreen, a waste picker cooperative in São Paulo, Brazil, goes beyond offering their customers a waste collection service, to provide deep waste tracking metrics. It processes each company's waste in batches to capture data on the exact type and quantity of waste produced by each company, which is used to generate a client report at the end of each month. The report determines the variable pricing charged and is used to make recommendations on how to reduce waste, increase recycling,

lower landfill fees, and ultimately lessen waste management expenses. Any savings achieved from a change in behaviour are shared between YouGreen and their clients. All of their clients have seen an overall decrease in waste management fees after switching to YouGreen.

4. BRAND BUILDING

When waste organisations build their own powerful brand, opportunities open up for them to not only charge more and offer more services than other waste players but to also have greater influence on their region’s waste legislation and recycling ecosystem.

To build awareness of their new recycling business, **Fecunda Patagonia** initiated a campaign to collect end-of-life batteries. In five days, travelling 330 kilometres through numerous towns, they collected 23 tons of batteries. These were then transported to Santiago, Chile, for recycling. The whole campaign was inexpensively advertised via informal channels, including Facebook and word-of-mouth. This simple campaign firmly established Fecunda Patagonia as the region’s go-to collection and recycling expert.

Waste4Change is one of the most recognised waste management brands in Indonesia. A first step in building their brand was actively collaborating with as many stakeholders as possible, including schools, universities, NGOs, enterprises, media players, and governmental agencies. They worked with various levels of government—from the smallest to the largest, including village, municipal, ministerial, and the central government. They gained publicity by sponsoring events and campaigns with media partners and were active on social media, communicating with followers the latest information concerning waste management. Waste4Change coordinates community gatherings across Indonesia, including the country’s annual National Zero Waste Jamboree, thereby building a broad network of waste management stakeholders across the country.

Hasiru Dala uses social media and the press to build relationships and credibility with people outside of their immediate community in Bengaluru. They are active on both Twitter and Facebook and maintain their own blog. Despite rarely travelling to Delhi, the organisation is well known on the national level. They gauge the success of their campaigns by the amount of media attention they garner.

STRATEGIES TO INCREASE PRODUCTIVITY AND REDUCE SYSTEM COST

Waste collection organisations have also found powerful strategies to either share or reduce costs across their operations, including:

1. Sharing costs with government and/or the private sector
2. Efficient system-design choices
 - Collection point
 - Collection frequency
 - Direct collection or transfer
 - Route optimisation
 - Household bin containers
3. Vehicle and equipment maintenance
4. Thoughtful worker payment structures

1. SHARING COSTS WITH GOVERNMENT AND THE PRIVATE SECTOR

One example of sharing the burden of waste collection costs is the arrangement the Dois Irmãos municipality has with waste picker cooperative **Dois Irmãos** (made up of 38 members). They were awarded a contract with the municipality to collect 100 percent of the municipal solid waste, even though the municipality was not able to pay directly for the service. Instead, in-kind contributions were negotiated. The municipality covers most collection costs, including five trucks, drivers, fuel, facility rent, and full residual and organic waste disposal costs. Dois Irmãos keeps all recyclable materials—which are washed, shredded, and pelletised before being sold. This covers the remaining collection cost deficit.

2. EFFICIENT SYSTEM DESIGN CHOICES

When creating a waste system, there are several design choices required. These might vary within a city depending on the population density and geographic characteristics. Most organisations agree to start slow, test their chosen processes with a small number of households, and refine them until the system works well. Only then do they expand more broadly. A subset of these design choices was identified as key to operational efficiency.

Exhibit 6: Sample design choices when building a waste collection system



COLLECTION POINT MODEL

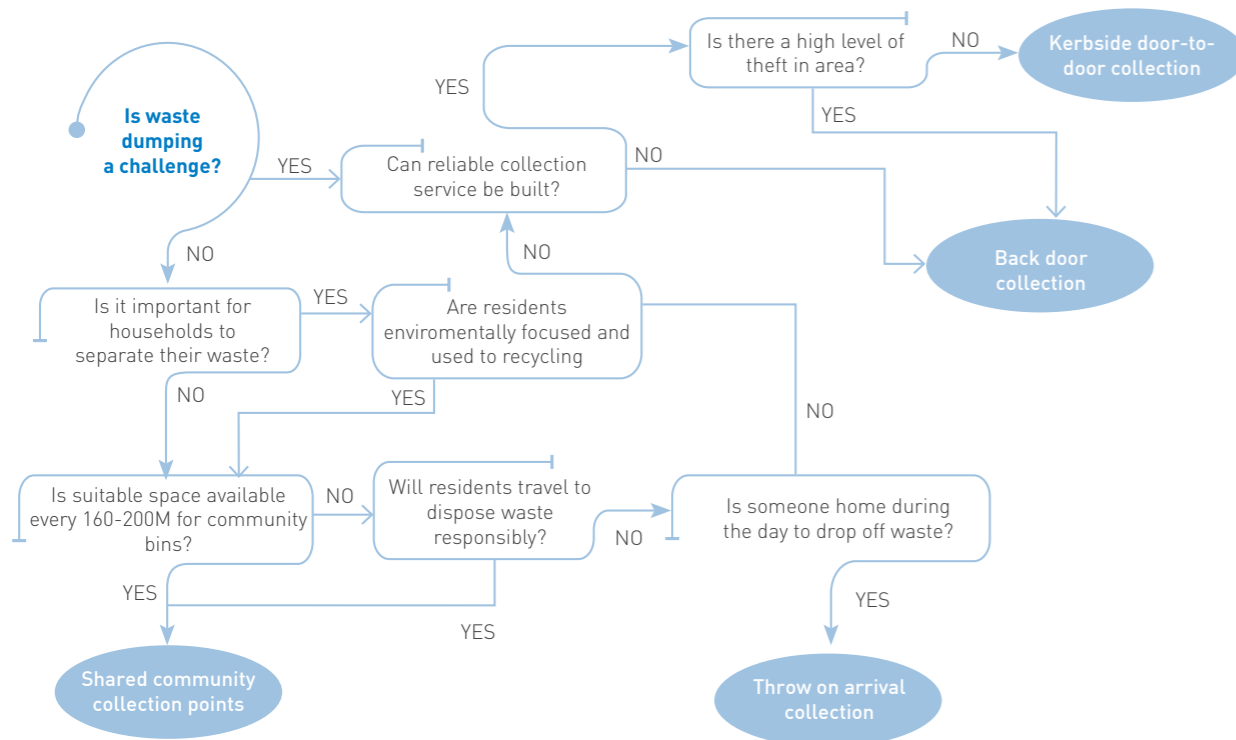
There are four common collection points – back door collection, kerbside (door-to-door) collection, throw-on-arrival collection, and shared community collection points.

Back door collection is when waste collectors come and knock on each household’s door to gather waste. Kerbside collection entails residents having one or more bins that they leave outside their house “on the kerb” for collection workers to pickup. Throw-on-arrival collection is one in which residents carry their waste to collection vehicles when they come to the community, usually at a consistent time with a distinctive sound (like music or other recording to announce their arrival). Finally, shared community collection points are when multiple households share a single bin or set of bins.

Shared community collection points are only effective if they’re located in close proximity to households (usually within a 160- to 200-metre radius). If residents deem the walk too far—or if the community collection points are overflowing with uncollected waste—residents may resort to other waste management solutions, such as dumping and burning. In any case, ease of use is a critical factor in long-term community participation.



Exhibit 7: Decision matrix in choosing which type of collection point to use



COLLECTION FREQUENCY

Existing social norms play an important role in collection frequency, as do system economics. If residents are accustomed to daily disposal of their waste, they will want daily service. This is common in tropical climates given the relatively quick degradation in humid environments—especially in fishing villages.

However, daily collection presents cost-related challenges. For systems that rely on household fees, an acceptable compromise is to provide collection services every other day or three days per week—especially if waste bins with lids are available.

Project STOP in Indonesia found that residents preferred daily service, but they were not willing to bare the associated cost. So, they agreed to collection three times per week—either Monday, Wednesday, and Friday, or Tuesday, Thursday, and Saturday. To address concerns over organic waste odours, Project STOP provides lids for household containers and incorporates odour management into its behaviour change campaigns.

DIRECT COLLECTION OR TRANSFER

The more material transferred between different parts of a waste system, the more complex and expensive it becomes. To move away from a linear disposal model—collecting waste and taking it straight to a landfill—material recovery facilities (MRFs) are required to separate waste. The goal is to divert as much valuable material as possible to recycling markets. These facilities can reduce what goes to landfill by 80 percent or more.

Another point of transfer, a depot, might also be necessary when servicing dense, hard-to-reach areas that must be accessed by foot or when a community prefers to do their own door-to-door collection (but not waste processing). Depots are temporary storage units used to store what has been collected before it's taken to a MRF. Once delivered, aggregated bins are replaced with clean ones and returned to the depot.

Rumah Kompos Padangtegal collects waste in a subset of Ubud, a tourist area in Bali. Given traffic levels, it would be challenging to manoeuvre large trucks around the city during

the day. Instead, waste is collected at night in a highly synchronised fashion that was developed over many years of trial and error. A longstanding, reliable collection schedule is used and, because of this, no depots are needed. Four workers are assigned to each truck and, when they reach a collection area, two work with mobile handcarts. These workers quickly collect door-to-door from areas inaccessible to the truck, while the other two workers collect waste from the main thoroughfares. With households setting waste out in the evening for almost immediate collection, there is little time for dogs or rodents to disturb it and the community remains clean.

In contrast, **Project STOP** uses depots in areas that are hard to reach by truck or tricycle. In their model, waste is collected by collection workers on foot in the morning in areas with very narrow lanes. It is then stored in larger bins in a “depot” area next to a road. Later, MRF collection workers arrive on tricycles to exchange the full bins for clean ones. They then travel back to the MRF, where non-organics are sorted and organics are used for black-soldier-fly-larvae farming and composting.

Common issues with depots include MRF collectors not collecting full bins on time. MRF collectors also can bring back the wrong number of bins or bins of the wrong colour. When this happens, the community quickly loses trust in the system. Ensuring clear roles and proper tools can help to mitigate these challenges.

Before activation, it's essential to calculate the expected community waste generation to determine approximately how many organic and non-organic bins are needed. Then, a suitable depot location that is accessible from the road (ideally paved) must be found, one that is centrally located but still “out of the way.” Signage is needed to remind people how to sort their waste and to make clear days of service. It is also wise to ensure that nearby public street bins use the same segregation system.

Exhibit 8: Depot collection roles and process

COLLECTION MANAGER	COMMUNITY COLLECTION WORKER(S)	MRF/TRANSFER STATION COLLECTION WORKER
<ul style="list-style-type: none"> Reviews collection schedule for the day, reminding collection workers of the number and colour of bins needed at each depot. Monitors petrol usage and vehicle maintenance. Holds a weekly or biweekly meeting with transfer station collectors and community collectors to understand any issues. Provides training on safety and other critical topics. Receives and addresses any complaints, including missed collections. Schedules backup workers to cover routes. Assists in hiring and managing staff. 	<ul style="list-style-type: none"> Collects clean organic and inorganic bins at neighbourhood depots at scheduled times. Goes door-to-door to each household, ensuring waste is as segregated as possible. After door-to-door route is complete, stores full bins at depot. Cleans site as needed. Reports daily to the collection manager, noting any issues and confirming collection is complete. 	<ul style="list-style-type: none"> Loads correct number and colour of clean, empty bins needed at depot. Drives to community depot. Unloads empty bins, storing them in a tidy manner. Loads full bins. Cleans site as needed. Returns to transfer station/ MRF. Unloads organic, non-organic, and residual bins in proper areas. Washes empty bins to mitigate smell, maggots, and other contaminants. Stores bins in a tidy manner. Reports daily to the collection manager, noting any issues and confirming that collection is complete.

ROUTE OPTIMISATION

Route optimisation is a way to chart the most efficient way to travel between a set of collection points. **Swachha Eco Solutions** in India uses a hub and spoke model to ensure their collection routes are never more than 15 kilometres from one of 11 dry waste collection centres (DWCC). They have also invested in recycling aggregation centres at two strategic locations that cuts travel times and reduces their overall carbon footprint. Organic waste is processed into compost at one of 24 farms. Each truck is fitted with a GPS system and routes are optimised to conserve fuel and save time using a “milk run” optimisation technique⁶⁷.

HOUSEHOLD BIN CONTAINERS

If supplied by the collection service, household bin containers can be one of the most expensive program expenses. This is especially true when instituting a door-to-door household separation scheme that requires multiple bins for each category of waste. Still, providing every household with branded collection containers is a best practice that boosts participation and compliance with the program.

Rather than traditional waste bins, **ecoBali Recycling** in Indonesia distributes sturdy, colourful polyethylene bags for the sorted non-organic waste of households and businesses. These bags are less expensive, lighter, and easier to transport than traditional bins. Green bags keep paper and cardboard clean and separated, while red bags are used for glass, metal, plastic, and other non-organic waste materials.

Sturdy, reusable bags like these have many advantages over bins. Bags are easy, fast, and stay clean when moved in and out of collection trucks. They can be easily stacked, enabling the utilisation of each truck’s full capacity. Also, given the bags different colours, multiple waste streams can be collected at once, without worry of mixing.

However, in outdoor locations—especially ones with roaming wild animals like street dogs—ecoBali encloses their bags in more rigid containers such as drums to avoid torn bags and scattered waste.

ecoBali also uses innovative materials for their home composting units. After establishing a decade-long partnership with Tetra Pak, the

organisations now work together to fashion composting units out of recycled Tetra Pak containers. This cuts costs and gives new life to an otherwise hard-to-recycle material. To cut costs and live by the “3R” principles (reduce, reuse, recycle), **Project STOP** takes a different approach. They give new life to old 10-litre paint containers by painting them yellow (non-organic) or green (organic) for use in door-to-door household collection.

Pune’s **SWaCH** program, which serves 625,000 households, uses a combination of these two approaches – a sack and bucket system in which dry waste is held in lightweight sacks while wet, heavier organic waste is put into buckets for clean transport.



3. VEHICLE AND EQUIPMENT MAINTENANCE

When vehicles aren’t properly maintained, service delivery may cease. This is an issue that has plagued many communities and stopped or reduced collection service levels significantly. Vehicles or equipment breaks down and repairs are complicated by inaccessible spare parts or local repair services that are inadequate - or there is simply not enough funding available for repair. In some cases, broken equipment sits for months—sometimes years—awaiting repair. Fortunately, if thoughtfully planned for, maintenance issues can be sidestepped. The chart below outlines strategies focal organisations have used to reduce their risk of maintenance issues that can derail any part of their operations.

Exhibit 9: Tactics to reduce equipment maintenance risk

OVERARCHING LEVERS	TACTICS TO REDUCE EQUIPMENT MAINTENANCE RISK
Equipment procurement decisions	<ul style="list-style-type: none"> Buy and/or design equipment locally from manufacturers/ welders who can easily fix with locally available spare parts. Buy equipment that includes a maintenance plan. Reduce specifications of equipment to only what’s critical, making repair and replacement easier. Buy extra equipment that can be used without a drop in service delivery.
Equipment training and operations	<ul style="list-style-type: none"> Provide comprehensive training to all employees on how to use and care for all equipment. Ensure supervisors monitor equipment use and are trained to solve smaller repairs in-house. Spot check likely equipment failures regularly to prevent equipment breakdown.
Dedicated mechanics	<ul style="list-style-type: none"> If a large enough operation, build a local workshop stocked with critical spare parts and hire a mechanic to look after organisation’s equipment. Share a mechanic between multiple waste programs. Invest in a mechanic training program for employees. Negotiate with governments to use their mechanics for repairs (or cover all maintenance and replacement costs) as part of service delivery agreement.
Financial decisions	<ul style="list-style-type: none"> Build equipment maintenance into cost-plus revenue model. Set aside a percentage of revenue for equipment maintenance and repairs each month.

4. THOUGHTFUL WORKER PAYMENT STRUCTURES

While no one-size-fits-all remuneration structure exists for all contexts, best practice organisations tend to strive for similar goals when designing an appropriate waste collection and sortation compensation system with the following goals:

- Improve worker productivity
- Offer a living wage
- Reliably pay out on time
- Incentivise good behaviour
- Pay calculated per day worked
- Economically sustainable for organisation
- Low turnover
- No stealing
- Enable worker flexibility
- Feels fair to all
- Build pride and prestige in an otherwise “dirty” job
- Clean environment
- Clean, valuable waste collected



The appropriate compensation system also depends on the types of workers being employed. They generally fall into two broad worker profiles: flexible waste workers (often waste pickers) and full-time waste workers in a team environment.

Payment structures for flexible waste workers: Waste pickers and other “day labourer” waste workers often integrate best into a formal waste system when initially given entrepreneurial opportunities as individuals, rather than being transitioned into salaried employment with a fixed schedule and traditional management structure. They are used to being their own boss and in control of when—and how much—they work. They often prize flexibility while caring for young children, sick spouses, or relatives or optimising their schedule with seasonal work like fishing. They intimately understand the value of their time and want the opportunity to have their pay dependent on their efforts rather than locked in arbitrarily. Best practice organisations have found that creating independent, flexible, entrepreneurial, pay-for-performance work conditions creates the smoothest transition for waste pickers into the formal waste system.

Non-waste picker, team-based payment structures: Some waste organisations need more traditional team-based setups, especially for technical, ongoing tasks like composting operations or ensuring work is scheduled at specific times to optimise machinery like managing conveyor belts. In these conditions, hiring employees who either have not worked formally or are used to more traditional, salaried employment—and then offering them a combination of a fixed salary, good working conditions, and a bonus based on either profit sharing or meeting KPIs—tends to work well for most organisations. Many have found that fixed, monthly salaries resulted in lower productivity compared to variable wages based on performance. With fixed salaries that lack an incentive to reward productivity, even initially hard-working workers quickly drop their pace to be in more line with other workers. There are, however, many compensation choices for either worker group.

Exhibit 10: Worker salary options

FIXED SALARY +/- KPI	FIXED + PROFIT SHARING	PERFORMANCE BASED
<ul style="list-style-type: none"> • Fixed only • Fixed but only if they reach KPI • Fixed + bonus if KPI is reached 	<ul style="list-style-type: none"> • Fixed + equal share of profit • Fixed + share of profit based on individual performance • Share of profit 	<ul style="list-style-type: none"> • Fee per tonne collected/sorted • Fee per household collected

Regardless of the compensation structure employed, focal organisations with the highest worker retention and productivity tended to pay more than minimum wage – sometimes as high as 2.5x minimum wage, regardless of country. Best practice organisations also pay workers on a reliable, set schedule and often offer other benefits, such as uniforms, healthcare check-ups, insurance, bank account access, emotional support groups, and small loans.

CASE EXAMPLES:

PAYMENT STRUCTURES FOR FLEXIBLE WASTE WORKERS LIKE WASTE PICKERS:

Temesi Recycling in Indonesia operates a dual remuneration structure, with 80 percent going to pay-for-performance day labourers who sort non-organics and 20 percent to salaried employees who process organics and run the more technical parts of the operation. First, they pay a fair, fixed-price for each tonne of separated organic waste (IDR 50,000 per tonne) and each tonne of screened and packed compost (IDR 60,000 per tonne). Freelance sorters have the flexibility to work when they want and are compensated based on results rather than time. Plus, they get to keep any recyclables they find, further sweetening the deal. Some freelance sorters also have side agreements with collection companies and have the autonomy to accept or reject waste based on the level of cleanliness. With this model, Temesi ensures that the necessary sorting work is done efficiently and the administration costs for formally hiring such a large workforce is avoided. Their smaller group of salaried employees, in contrast, monitor freelance workers and perform all further compost processing and quality testing.

The cooperative **YouGreen**, located in São Paulo, Brazil, pays its cooperative members based on their placement in the five levels within the organization. These are lettered A through E, each with a different hourly rate. The wage gap between A and E is set at a maximum of four.

Although there are some exceptions, virtually all entry-level members begin at level E. In order to be paid more, they must advance to the next level, which can only be done by expanding skills or productivity, usually including classroom time. This process ensures that each member is responsible for their advancement and helps maintain an entrepreneurial spirit.

NON-WASTE PICKER, TEAM-BASED PAYMENT STRUCTURES:

Rumah Kompos Padangtegal in Indonesia has two types of workers—organic and non-organic waste collectors. Every day 12 workers of each type (hired from a standby pool of contracted workers) work in three teams of four workers. They earn an average of Rp 80,000, with organic workers earning this in a five-hour shift without profit sharing (for an average of Rp 1.8 million per month). Most have a second job. In contrast, non-organic workers work eight-hour shifts but receive a share of total recyclables, giving them an average monthly salary of Rp 3.2 million (Rp 1.8 million salary plus Rp 1.4 million profit sharing). They tend not to have a second job. Profits from recyclables are split evenly between workers based on total number of days worked.






PMS and **Bhakti Bumi**, also in Indonesia, run waste sorting operations with conveyor belts. They pay full-time employees the legal minimum wage and a team bonus when sorting targets are met consistently. They also ensure a positive work environment with regular training, support for issues like debt problems, and employee performance tracking.

Swachha Eco Solutions employs a strategy of openness and transparency with workers. Finances are open and issues shared with all. Employees work eight hours a day, with five days off per month. They earn minimum wage plus a yearly bonus and are provided welfare expenses and living quarters for male employees.

III. STRATEGIES TO ENSURE COLLECTED WASTE REACHES ITS INTENDED DESTINATION (AND NOT THE ENVIRONMENT)

Once waste is successfully collected, it is essential that the material does not end up dumped into the environment. However, the temptation for crews can be strong, since dumping can save time, fuel, and the cost of tipping fees. Controlling the flow of money, setting up efficient logistics, and tracking weight-based data can ensure that material is taken to the appropriate locations.

Exhibit 11: Best practice strategies to ensure collected waste is not dumped before reaching a safe disposal site⁶⁸

HOUSEHOLDS	TRICYCLES & TRUCKS	TRANSFER STATIONS	COLLECTION TRUCKS	DUMPSITES/ LANDFILLS
				
<ul style="list-style-type: none"> Households pay waste transfer station operators rather than waste collectors directly 	<ul style="list-style-type: none"> Establish a consistent schedule for when waste will arrive from community depots to transfer stations 	<ul style="list-style-type: none"> Optimize number and location of transfer stations, ideally within a 15-20 minute drive of collection routes Pay haulers only once they deliver waste to transfer station, ideally by weight of delivered waste Require waste receiver to collect data on volume of waste delivered for hauling contracts and city waste planning 	<ul style="list-style-type: none"> Use hauler tracking technology to monitor where waste is collected and delivered 	<ul style="list-style-type: none"> Pay haulers per ton of delivered waste, tipping the load first Require waste receiver to collect data on volume of waste delivered for hauling contracts and city waste planning

1. COLLECTION HAULER PAYMENT

In most collection systems, workers are paid directly by households, businesses, and/or the government. Typically, there is minimal monitoring of where waste is taken once it's collected. To avoid transport costs and/or tipping fees, haulers sometimes dump waste at informal dumps or directly into the environment. Payment mechanisms can be a powerful tool to ensure waste actually reaches its proper destination. One way is to stop customers from paying the haulers directly. Instead, haulers can be paid based on the weight of waste delivered to transfer stations or landfill, examining the load first to ensure it is not unusually wet or composed of heavy debris like rocks. Transfer stations can be equipped with weighing facilities to make this easier.

2. TRANSFER STATION LOCATION AND QUANTITY⁶⁹

Many elements within a waste system can be modified over time, but the decision of where to locate transfer stations—and how many to build—is difficult and expensive to change after the fact. Ideally, transfer stations should be located within 15 to 20 minutes from collection routes so that it is easy for haulers to do the right thing. In countries with weak enforcement, greater distances than this results in dumping along the way to save time and fuel.

After building a centralised transfer station near the local landfill, Indonesia's **Temesi Recycling** found that it was too far for many haulers to comfortably reach—resulting in illegal dumping sites sprouting along the route. If they were able redesign their project, they would build at least 12 decentralised transfer

stations that were within 15 minutes of all their collection routes. In this case, decentralised transfer stations are a better solution than centralised ones, especially considering greater local community ownership, less illegal waste dumping by haulers and residents, lower logistics costs, and easier sales of compost and other products to local markets.

3. USING TECHNOLOGY: DATA COLLECTION KPIS AND HAULER TRACKING

The adage “what gets measured gets done” applies to waste collection. As a condition of continual funding support, national or local governments can require transfer stations and landfills to record incoming (and outgoing) volume by measuring the weight of vehicles. Some scales transfer data directly to a central database, thus minimising the opportunity for fraudulent record-keeping.

Another way to prevent illicit waste dumping is to monitor fleet locations using GPS tracking technologies. These can be fairly inexpensive but generate helpful data for route optimisation.

CONCLUSION

This chapter has focused on the primary building block of any effective waste management system, the initial collection of waste. This is the first and arguably most critical step in effectively preventing plastics from becoming ocean trash.

The organisations, governmental agencies, and private sector entities that are making investments in waste collection systems need to consider a key question – Should the collection model catalyse an exemplary waste system model(s) of the future or support existing less-than-perfect collection models that utilise the shortest path between collection and recovery? What materials should be gathered, how broadly services should be rolled out, and how to include waste pickers must be balanced with the critical need to immediately curtail the amount of plastic leaching into the world's oceans and environment. Although challenging, the long-term goal is to empower organisations that collect all available non-organic waste, thereby keeping it out of the environment.

Many regions in rapidly developing economies have limited funding for waste collection and unfortunately the economic value of the collected material usually does not cover the cost of its collection. But there are innovative organisations that are “cracking the nut” by optimising their operations to be as low cost as possible and developing multiple, new revenue streams to cover expenses. These success stories prove that the inherent challenges of effective, affordable waste collection can be met, although it is not easy.

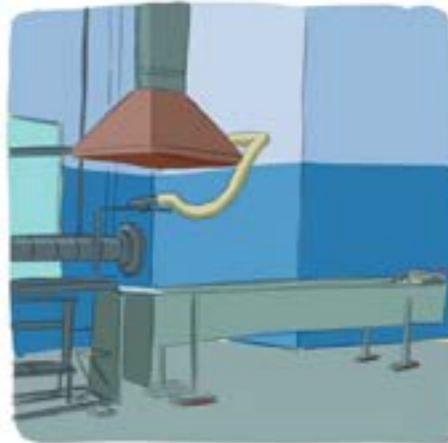


4 Recycling Plastics Economically



RECYCLING PLASTICS ECONOMICALLY

VITAL LESSONS FROM PIONEERING ORGANISATIONS ON THE FRONT LINE



Recycling matters. Recycling gives value to waste, transforming it into useful materials and products, rather than ending its useful life in a landfill or worse, in the environment. Successful recycling programs provide a social safety net and entrepreneurial opportunities to individuals with few economic options. They also improve overall environmental activism as citizens and businesses move away from the linear “take-make-dispose” economy towards one that is more circular.

Unlike the case in developed countries, in most rapidly developing economies recycling of high value materials can be profitable without subsidies (albeit with low margins). This is due in part to low labour costs and, unfortunately, often low environmental and social standards in the recycling process. However, in most cases only a small fraction of what could be recycled actually is. Many material types (e.g., PVC, polystyrene) and packaging formats (e.g., sachets, thin films) have little to no market value. Without enough value to justify the “collect-sort-transport-clean-recycle” process, waste often ends up dumped into the environment (with a high percentage of the material making its way into the ocean). Even when plastic waste materials do have enough value to normally justify the cost of the “collect-sort-transport-clean-recycle” process, there may not be enough recycling infrastructure to process them and, if there is, it may be too expensive to reach logistically. When plastics are recycled, they are often not high enough quality given extensive contamination and mixing. As a result, recycling, in its current incarnation, is not likely scalable or sustainable for many types of disposed plastic.

The organisations interviewed— from Indonesia, Brazil, Chile, and India— have not only found ways to economically recycle “high-value” plastics, some have also created methods that work through significant constraints, including building economically viable organisations that catalyse hundreds of tons of plastic without compromising environmental or social safeguards. Some are also leading the way in processing hard-to-recycle and “low-value” materials, incentivising industries to design easily recyclable products, and creating the conditions needed to shift multiple recyclers across the full recycling value chain to embrace stronger social and environmental practices.

This chapter focuses on the bottom-up initiatives these waste organisations have used to get around system constraints to build viable plastic recycling organisations. It focuses on how these frontline organisations are changing the “facts on the ground” of recycling and setting an example of how to tackle common, yet difficult, plastic recycling challenges. The larger recycling ecosystem constraints are addressed in a later chapter on recommendations to government and the private sector.

CASE STUDIES PROFILED IN THIS CHAPTER

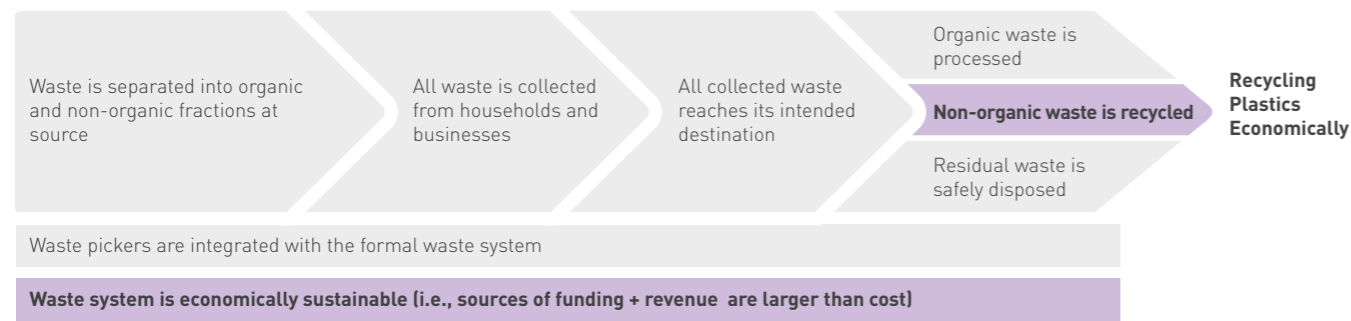
- Bureo’s Net Positiva project, Chile
- Chintan Environmental Research and Action Group and Safai Sena, India
- Diageo, Brazil
- Dois Irmãos Cooperative, Brazil
- Fecunda Patagonia, Chile
- Hasiru Dala, India
- Hasiru Dala Innovations, India
- Plastic Collective, Australia, Indonesia
- Plastics for Change, Canada, India
- Plastics for Change Bangalore Consortium, India
- Precious Plastic, global
- Project STOP, Indonesia
- Robries, Indonesia
- Swachha Eco Solutions, India
- TriCiclos, Chile and Brazil
- Waste4Change, Indonesia
- YouGreen, Brazil

INTRODUCTION

This chapter explores strategies that selected best-practice organisations use to recycle plastic waste that have resulted in economically sustainable waste businesses, despite often-difficult operating realities. While many of the strategies work for all types of recyclable waste materials (e.g., paper, glass, metal), this chapter focuses primarily on recycling both “high” and “low” value plastics. Strategic levers that are examined do not represent an exhaustive list but are those that the interviewed organisations felt were most important to their success.

A later chapter outlines how both the public and private sectors can play a catalytic role in bringing large numbers of entrepreneurs (and investors) into the waste sector, while also helping to integrate informal waste pickers into solid waste management services, in ways that protect social and environmental standards.

Exhibit 1: Topics covered in this chapter within the waste value chain (in purple)



I. UNDERSTANDING PLASTIC RECYCLING

PLASTIC WASTE MATERIALS: RECYCLABILITY AND VALUE

Plastic is a rapidly growing but still relatively small fraction of municipal waste streams (between 9 and 18 percent) and is comprised of multiple resin types. Virtually all kinds of plastic are technically recyclable; however, not all of them are economically feasible to recycle without additional sources of funding in addition to the value of the material.



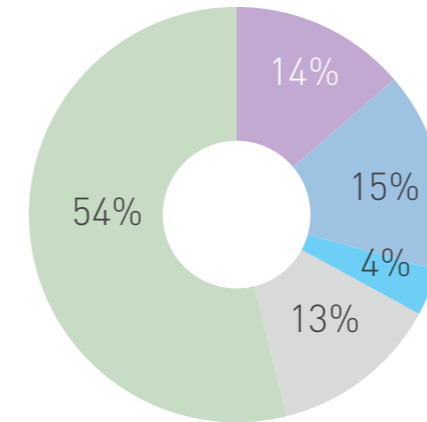
Exhibit 2: Average municipal solid waste compositions for studied countries^{70,71,72,73}

WASTE COMPOSITION

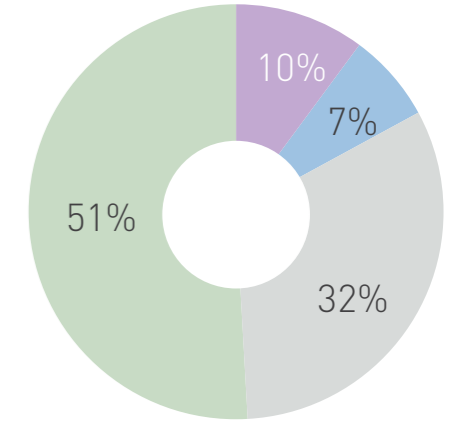
PERCENTAGE OF TOTAL

- Plastics
- Glass & Metal
- Organics
- Paper & Cardboard
- Other (Primarily residuals)

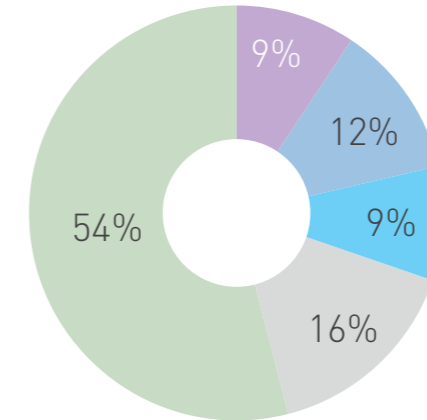
INDONESIA



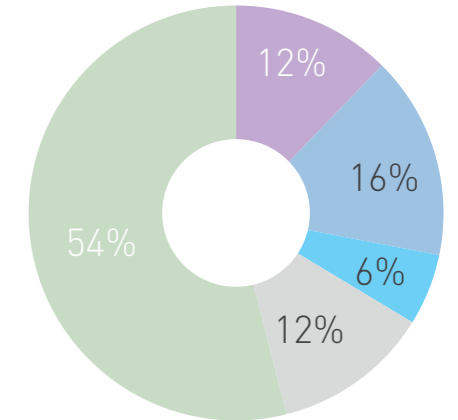
INDIA



CHILE



BRAZIL



Each type of plastic has a different recycling market value. “High-value” plastics, like PET bottles and rigid HDPE or PP containers, are collected by the informal sector, formal collection (public or private), take-back and EPR systems and easily sold into either formal or informal recycling markets around the world.

In contrast, “low-value” plastic materials, like single-use sachets made with multilayer materials, polystyrene, and thin films, often struggle to find a viable market. Even if a market exists, waste pickers and other collectors may avoid collecting these materials given their low price and weight, which results in substantially more time spent to achieve the same payout as the collection of higher value materials. Unlike in OECD countries, the composition of plastic waste in rapidly developing economies tends to have far higher proportions of flexible plastics given the types of products more commonly sold into market⁷⁴.



Exhibit 3: Muncar Indonesia plastic waste composition⁷⁵

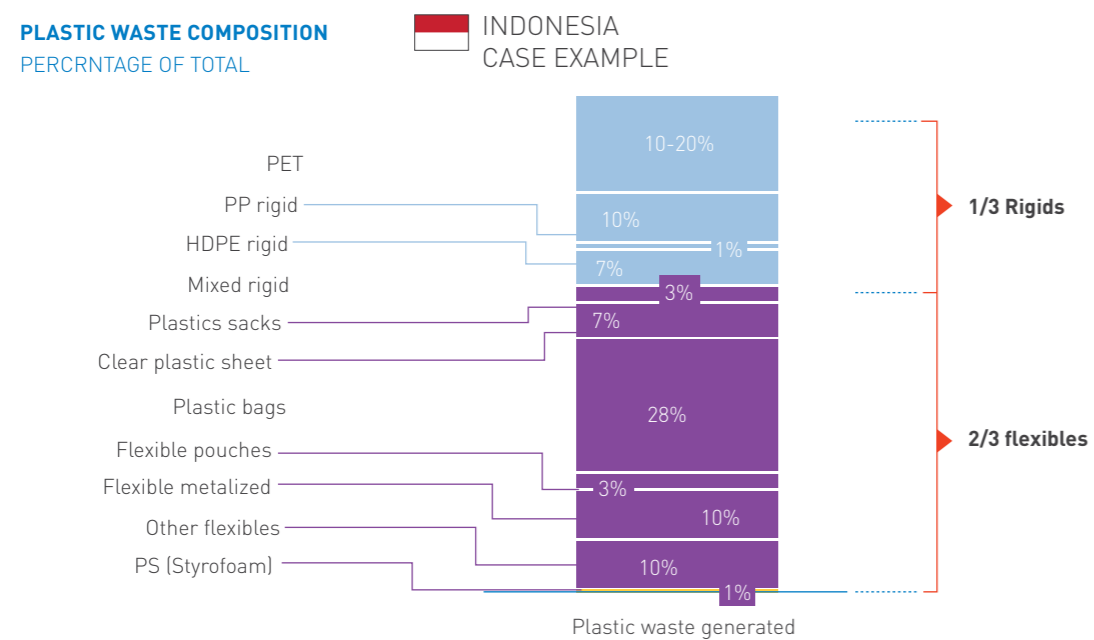


Exhibit 4 shows the relative prices for commonly recycled “high-value” and “low-value” plastics in our four focal countries: Indonesia, Brazil, Chile, and India. Please note that PVC and similar “low-value” plastics are not commonly accepted in the recycling market and are thus excluded.

Exhibit 4: Junk shop pricing for commonly recycled plastic items in Indonesia (November 2018), Brazil (December 2018), India (November 2018), and Chile (December 2018).

The highest price offered for each material is in bold. Please note that recyclable pricing is volatile and the figures below reflect a specific period of time.

Material	Picture	Product	INDONESIA		BRAZIL		CHILE		INDIA	
			IDR/kg	USD/kg	\$R/kg	USD/kg	CLP\$/kg	USD/kg	INR/kg	USD/kg
“High-value”										
PP		Clear cups glass	6,000	0.42	1.20	0.31	150	0.22	30	0.43
		Colour ed cups	5,000	0.35	0.90	0.23	150	0.22	25	0.36
		Injectio n mouldi ng	2,750	0.19	0.90	0.23	150	0.22	25	0.36
PET		Clear Bottle	3,500	0.24	3.00	0.77	320	0.47	27-30% ⁷⁶	0.39-0.43
		Colour ed bottel	2,500	0.17	3.00	0.77	200	0.29	20	0.29
HDPE/PP/PET		Bottle Caps	4,600	0.32	0.90	0.23	70	0.10	22-25	0.31-0.36
HDPE		Colour ed blow mould ed bottles	5,600	0.39	1.00	0.26	200	0.29	25-30	0.36-0.43
		Milk bottles	6,000	0.42	2.20	0.56	200	0.29	30	0.43
“Low-value”										
PE		Pouch refill	500	0.03	.70	0.18	No market	No market	3-4 ⁷⁷	0.04-0.06
MIXED (PP + AI)		Flexible sachet	700	0.05	No mark et	No mark et	No market	No market	3-4	0.04-0.06
PP/PE		Clear film	1,500	0.10	0.70	0.18	120	0.18	3-4	0.04-0.06
HDPE/LDPER		Coloured film	600	0.04	0.70	0.18	120	0.18	3-4	0.04-0.06

THE PLASTIC RECYCLING VALUE CHAIN

Plastic waste flows through a series of steps in the formal and/or informal recycling markets to be recycled into pellets. Plastics are collected, broadly speaking, by four separate groups: waste pickers (who generally collect plastic waste from households and businesses, roadside, or dumpsites), collection workers (municipal or private haulers), households, and businesses.

Plastic materials are then either sold to informal junk shops or brought to central processing facilities, where they are further sorted and aggregated with similar materials. Once they've amassed a significant bundle of plastics, junk shops and central processing facilities sell materials to aggregators, who usually add value by further sorting, cleaning, shredding, and/or baling. Sometimes there are almost always multiple junk shops, aggregators and processors within the value chain, each taking a small margin for the aggregation, segregation, processing (baling, washing, shredding, pelletising) movement, and connection to the next buyer in the process. Some only aggregate and/or bale, others segregate (and/or wash/pelletise), and others even make new pellets or half-way products.

Aggregators and processors then sell to formal or informal recycling processors. Recycling processors further prepare waste plastic for the production specifications of their buyers. This may include melting plastics with pressure and heat, extruding them into fine spaghetti strands, and finally cutting them into pellets. Manufacturers then buy these pellets to re-melt and mould into final products.



Exhibit 5: Processing steps to convert waste plastic into plastic pellets



Sometimes, early stages of the value chain happen in one country and then the unfinished materials are exported for further processing in another country. In Indonesia, the Ministry of Environment and Forestry conducted interviews with waste recyclers in five cities (Batam, Bogor, Magelang, Makassar, and Pontianak) that span four islands, finding that the majority of recyclable plastic and other recyclable materials such as metal and paper are exported overseas to neighbouring countries: Vietnam, the Philippines, Taiwan, and China. It should be noted that some value-chain routes have changed since implementation of China's National Sword Policy, which restricts the importation of plastic waste, unsorted paper, and textile waste.

Exhibit 6: Flow of plastic waste recycling trade from Indonesia to other countries⁷⁸



II. STRATEGIES TO INCREASE PLASTIC RECYCLING REVENUE

Best practice organisations, sometimes working in partnership with other organisations, have created new markets for waste materials. They've not only turned plastic waste into more than a simple commodity, but also created a way for the private sector to engage in reducing ocean pollution and to improve the lives of waste pickers. These organisations have also expanded their traditional role from collection, sorting, and on-selling recyclables to creating valuable products for both local and international markets, thereby securing a much higher value for these previously wasted materials. They've learned to aggregate materials, sometimes with other organisations, in order to increase the revenue possible and to become established brands in their own right. These strategies have enabled focal organisations to build financially secure businesses for the long-term by earning more than traditional waste organisations and micro-recyclers:

Exhibit 7: Summary of strategies to increase recycling revenue

STRATEGY	DEFINITION	CASE STUDIES PROFILED
Partnering with other organisations	Collaborating with organisations with different core competencies to create a better overall product offering than any one organisation can do on their own	<ul style="list-style-type: none"> Plastics for Change Bangalore Consortium
Vertical integration	The more an organisation vertically integrates throughout the value chain, the more value is captured from waste materials.	<ul style="list-style-type: none"> Dois Irmãos Swaccha Eco Solutions
New market creation	Finding new uses for waste materials, often requiring vertical integration from collecting materials to transforming them into new end products, and in the process creating new markets where none existed previously	<ul style="list-style-type: none"> Bureo
Developing or adopting new technologies	Inventing or using technology that enables materials that were not easily recyclable before to become recyclable	<ul style="list-style-type: none"> CooperRegião Creasolv Precious Plastics
Materials of purpose and material traceability	Waste that is traceable and has a story of hope (e.g., social plastic, fairtrade, ocean-bound plastic) which sells at a premium and/or fixed price and gives buyers a way to participate in the solution.	<ul style="list-style-type: none"> Plastic for Change Consortium Bureo
Aggregation of recyclables	Pooled materials fetch a higher price and provide access to recyclers that require a minimum volume threshold.	<ul style="list-style-type: none"> Dois Irmãos Project STOP



1. PARTNERING WITH OTHER ORGANISATIONS

Before frontline waste organisations can become economically viable, they first need to gain relevance in the communities they serve (and to the organisations that can fund them). Very few can provide services that do everything, such as support marginalised workers, alter consumer behaviours, create high-quality recyclable materials that can be competitive on the global market or speak in the language and formats credible to international funders. Different skill sets are needed to become successful in each of these areas. Many best-practice organisations have partnered with other organisations to leverage strengths and amplify their overall impact.

Plastics for Change Bangalore Consortium was created to implement a solution addressing two challenges prevalent in urban India: a sustainable way for large consumer packaged goods companies to reduce their carbon footprint and meet EPR requirements and stabilising the market price of recyclable plastic waste to ensure predictable, “fairtrade” income for waste pickers, the backbone of the informal plastics recycling chain.

The four main parties of the PFC Consortium include:

- 1. Plastics For Change** has developed a marketplace platform that connects waste-pickers to global markets and ensures a consistent supply of high quality recycled plastic for brands. This initiative is about creating better livelihoods for the urban poor while keeping plastic out of the ocean. Plastics For Change has developed a franchise model to fortify recycling businesses that pay waste-pickers decent incomes, train them in techniques that boost their incomes, and make investments that benefit entire communities.
- 2. The Plastics For Change Foundation** is on a mission to help formalize the informal waste economy by Improving infrastructure capabilities of the recycling industry and provide holistic development of the waste-picker communities in India
- 3. Hasiru Dala (HD):** A social-impact NGO focusing on social justice for waste pickers via interventions and cooperation with waste pickers.
- 4. Hasiru Dala Innovations (HDI):** A social

enterprise that focuses on creating better livelihoods for waste pickers by supporting inclusive businesses that pursue a positive environmental impact.

PFC creates demand for 'fairtrade' recycled plastics with multinational FMCG companies, connects them to local Indian organisations like HD and HDI where the plastics can be sourced from and brings technical expertise to both track materials through the recycling system and fulfil the high quality standards for recyclable plastic that are required by these manufacturers for incorporation into their products. By doing so, recyclable plastics form a growing portion of the material to create finished consumer goods, thereby reducing the amount of virgin material used by brands.

HDI and Plastics For Change work together to build a continuous and reliable supply chain of post-consumer plastic to be used as feedstock while HD ensures that waste pickers and other informal waste workers (and their families, who are an integral part of this supply chain) receive access to social programs and financial reward. The complementary roles of the three organisations maintain the standards of quality and reliability required by the global supply chain while positively impacting waste picker livelihoods.

Brands offer the PFC Bangalore Consortium long term buying contracts at a price premium of rPET commodity prices. In exchange the PFC Bangalore Consortium works to ensure collected post consumer feedstock meets minimum quality requirements specific to their manufacturing processes, that the plastics are tracked at each stage of the recycling process to meet EPR reporting requirements and that waste pickers and other waste workers along the full recycling value chain are paid a fair wage.

What began as an rPET pilot with two global FMCG brands has now become a multi-million dollar contract with the Body Shop to purchase 250 tonnes of this "Community Trade recycled plastic", doubling to 500 tonnes in 2020⁷⁹. The success of this engagement will hopefully demonstrate that fair prices and community trading principles can be adopted in the informal waste sector, and will hopefully be extended to other brands and other types of less commonly recycled plastics.

In another example, Chilean **TriCiclos** partnered with Sodimac (home improvement retailer) and Comberplast (recycler), to create a program, The Virtue of Recycling (La Virtud de Reciclar). It involves post-consumption residential plastics being recovered and recycled in Comberplast facilities, transformed into high-value and competitive products such as recycling containers (from 100 percent recycled plastic), which are then sold in Sodimac stores. This closes the loop of recovery, recycling, and revaluation.

2. VERTICAL INTEGRATION

Waste organisations generally operate on a single level of the recycling value-chain hierarchy. For example, at the base level, are collectors of waste plastic who sell to junk shops. Then junkshops sort and aggregate materials. Others may shred, bale and/or wash materials and still others will mechanically recycle the materials. With each processing step, materials become more valuable. Some companies have realised that if they vertically integrate (i.e. perform activities on multiple levels like collecting, sorting, washing and shredding), they will have better margins and thereby increase economic profit. Some, though, do this out of necessity as they are either working with "low-value" waste materials without buyers (see: Bureo case example) or in geographic locations far from an existing recycling value chain, see: Dois Irmãos case study below.

Dois Irmãos Cooperative, a waste picker cooperative located in Dois Irmaos Brazil, 1,200 kilometres away from São Paulo and even further from Rio de Janeiro and other recycling hubs, was able to essentially create a new market for themselves by vertically integrating and partnering with plastic recyclables buyers. The cooperative's 38 members have built strong partnerships with both their local municipal government and several commercial manufacturing enterprises. In partnership with the Dois Irmãos Municipality, they collect all the city's municipal waste. While the city does not pay them a collection fee, it does cover the majority of operating and capital costs, including trucks, drivers, fuel, maintenance, and rent and they are allowed to keep all recyclable materials they collect.

Beginning in 1997, they realised that several

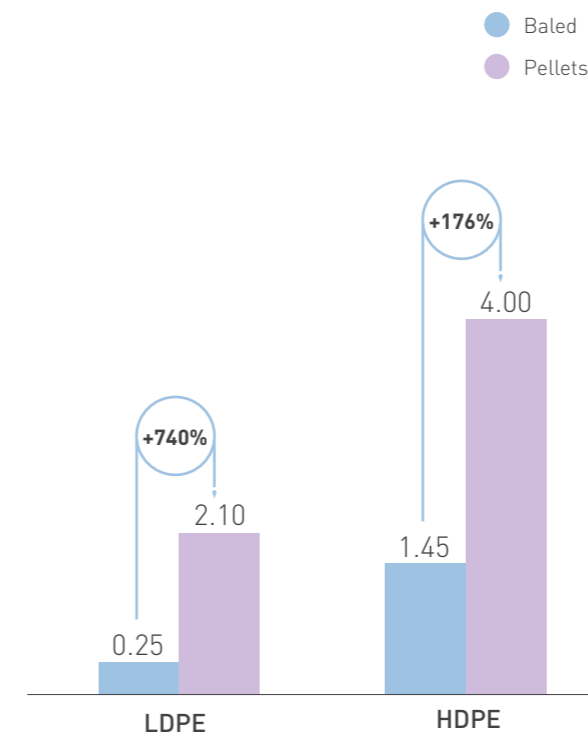
Exhibit 8: Dois Irmãos Cooperative⁸⁰



plastics types they collected (HDPE, LDPE and PP) were recyclable, but there was no market for them in their region and shipping to the nearest recycling market was too expensive. To solve this dilemma, they built win-win partnerships with local private sector manufacturers interested in buying recyclable materials. Together, they developed a recycling process with a manual separation area and an automated end-to-end recycling process including washing, heating, and pelletising that met buyers' manufacturing needs for quality recycled content. Their private sector partners purchased the recycling equipment for Dois Irmãos and guaranteed material buying contracts. It was less expensive for these private sector buyers than setting up inhouse recycling departments which was outside their core business focus, and they were able to support the Dois Irmãos waste picker cooperative.

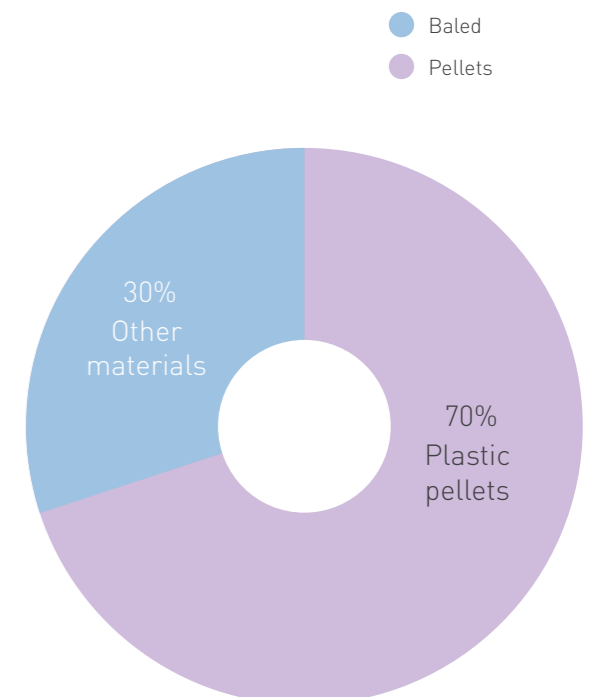
Exhibit 8: Value difference in additional processing steps

Material sales price at different processing steps
Brazil R\$/kg



Dois Irmãos CASE EXAMPLE

Dois Irmãos recyclable revenue split
% of total



By vertically integrating, Dois Irmãos is now able to capture additional margin from each stage of the recycling process, ultimately earning more income than they would have selling unprocessed plastics. Dois Irmãos also provides their commercial partners with a monthly report detailing the tonnage of plastic material recycled to help them comply with Extended User Responsibility laws. This project has also empowered Dois Irmãos to build economic opportunities for other waste picker cooperatives in their area. While an exception in the world of waste picker cooperatives, this example does prove that such a holistic, financially stable evolution is possible.

Swachha Eco Solutions, started by three young friends in Bengaluru, India, is another cogent example of using vertical integration to achieve economic sustainability. The friends wanted to be part of solving the city's waste issues while leaving a zero-waste legacy for future generations. Weathering multiple business model iterations, including some significant financial losses, they kept to their core mission of transparency, supporting positive social and environmental practices, and paying taxes. With each failed business they learned and continued to experiment towards a more self-sustaining model.

At first they collected waste door-to-door for free and sold it in the gray market, using a small garage for sorting. But they couldn't compete with other informal sector players, including some who did not pay taxes and ignored pollution-control measures and legal labour standards.

They then decided to model themselves on junk shops and smaller aggregators, moving to another level of the waste value chain by purchasing already sorted recyclable waste. The economics were better, but not enough to break even. So they moved into processing plastics and being a recycler. Their first attempt at processing low- and high-density polyethylene into "lumps" failed because there weren't enough buyers. In fact, one buyer took eight tons of material but never paid for it, claiming the lumps "weren't good enough quality." This nearly bankrupted them, so they switched to making granules, a product that did have a market—especially with manufacturers of piping for agricultural uses.

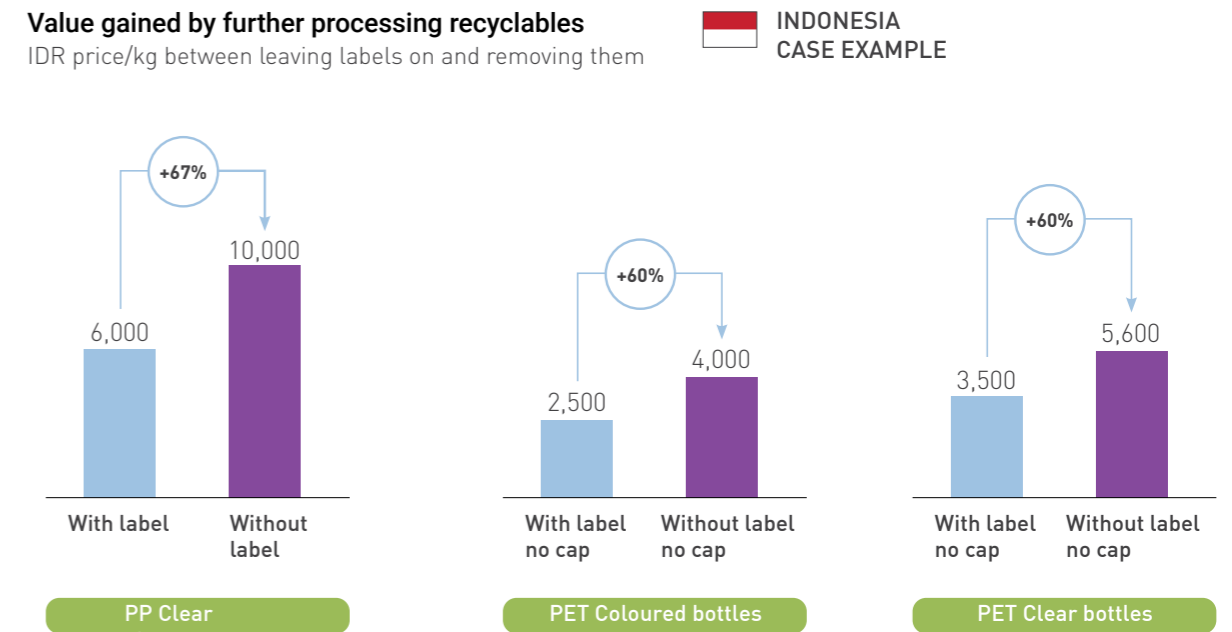
They soon realised there was an opportunity to move directly into producing their own end-to-end agricultural irrigation piping by building a pipe-making facility using PP materials collected from bulk generator waste. Experimentation with other end-market products followed, including roofing tiles, paver blocks, and bricks—all weather-resistant, load-bearing, and even recyclable again after obsolescence. To get the manufacturing process right, they experimented continuously and worked with local engineering students on various prototypes (some of which are open source). Equipment is always purchased and fabricated locally with affordable parts for easy maintenance.

In addition to their pipe-making business, they started a bulk-generator waste collection service⁸¹. Recyclables are brought to their dry-waste centres, where they are sorted and then either sold outright or recycled on the premises. Non-recyclable dry waste is taken to cement kilns, organics are taken to one of 24 farms for composting, and almost nothing goes to a landfill.



Most focal organisations interviewed use vertical integration—but on a smaller scale. They remove labels and bottle caps, then bale materials and store them until they have enough quantity to sell to aggregators (sometimes bypassing local junk shops). By removing bottle caps and labels, the recyclable value they receive for PET bottles and PP glass containers in Indonesia for example, increases by up to 60 percent however additional labour is involved and must be accounted for. The removed labels are also recycled.

Exhibit 9: Recyclable price difference between bottles with and without caps and labels⁸⁷



3. NEW MARKET CREATION

Sometimes valuable materials are available in the waste stream but no local market exists to process them. Some focal organisations saw a vision of what could be possible and went through a trial-and-error process to create a market for waste materials when none previously existed. This required many of them to vertically integrate across the full value chain from collection, processing, to even producing their own end-market products.

Three friends from New England, who were avid skateboarders and surfers, wanted to do something important to protect the ocean they loved. They discovered that the single most destructive material to ocean life globally, and one of the most proliferate, was discarded fishing nets⁸². There was no end-of-life value for them, even though they were made of high-performance Nylon 6 that give them their strength - the same material used in skateboards, some high-performance carpets and other products⁸³. To make this work, they needed to build a new market for this material and solve how to collect the nets en masse before they were thrown into the sea. With their knowledge of the skateboard market, they thought there would be interest in an ocean plastic derived skateboard. Yet, despite the plethora of used fishing nets, there was no existing market in place. They would need to

build one from scratch.

They soon launched **Bureo** as part of the Start-up Chile project, which supports entrepreneurial start-ups. They crowdsourced funding through Kickstarter, eventually manufacturing the world's first skateboard made from recycled ocean-bound plastic from end-of-life fishing nets, the Minnow. Since starting with skateboards, the company has gone on to design and manufacture frisbees, surfing fins, sunglasses, and "ocean" Jenga—becoming one of the first organisations to exclusively market ocean plastic derived products. As a commodity, used fishing nets are worth less than a dollar per kilogram, but when transformed into skateboards and other products they fetch above \$100/kg. This profit margin enables Bureo to comfortably outsource almost every step of the supply chain to local Chilean businesses, and provide generous support to local fishing communities.

But they didn't stop there. Companies soon approached them to buy "ocean bound" fishing net material to construct their own products. What started out as a niche social enterprise, has become larger and more sustainable through partnerships with six companies in the United States and South America to supply pellets made from end-of-life fishing line. These companies use a much larger volume than what Bureo needs

for their skateboard and game market, thereby magnifying their impact and giving them the opportunity to focus on what they enjoy most—engaging with local fishing communities and ultimately putting an end to harmful fishing lines being discarded into our oceans and seas.

4. DEVELOPING OR ADOPTING NEW TECHNOLOGY

Sometimes the adoption of innovative technology creates a recyclable materials market when none existed before. One case example of this is Brazilian waste picker cooperative **CooperRegião**, which among other things specialises in recycling polystyrene (PS) products, a type of plastic that is rarely recycled, given its large bulk and low weight. One of the cooperative's main buyers, a Styrofoam company, lent them a special PS extrusion machine that removes the air from PS products and condenses PS into dense balls that can then be sold. The machine can recycle any type of PS product, as long as the material is clean. Almost all of the PS in southern Brazil (1.45 tons per month) now flows through their recycling process. The balls are then sold to a recycling centre called Termotecnica in Southern Brazil, that produces a light plaster material used for manufacturing lightweight wall skirting and ceiling lining.

Exhibit 10: CooperRegião polystyrene extrusion machine



Another example of both adopting new technology, new market creation and vertical integration is **Precious Plastic**⁸⁷. Precious Plastic is an organisation based in the Netherlands that has developed relatively easy-to-construct recycling machines such as shredders, extruders, and injection and compression machines. Blueprints, how-to-videos, and other information make small-scale plastic recycling do-it-yourself. The machines are designed to be as simple as possible so that people with basic skills of machine manufacturing can build them, and people with no recycling experience can operate them. Many organisations around the world have started small-scale recycling ventures with the company's help, especially in smaller, rural locations cut-off from existing recycling markets.

For example, remote Sabang Island in Indonesia's Aceh Province—famous for its beautiful coast and diving—has a population of less than 35,000 people. Given the high logistical costs to the nearest recycling markets in Medan—even for highly valued plastic waste such as HDPE, PP, and PE—recycling was not economically feasible. This even after the government provided plastic shredder machines, which were neglected because there was no market near enough to sell the shredded materials too. This condition changed after one community heard about

Exhibit 11: Precious Plastic's shredder, extruder, injection and compression machines⁸⁸



Precious Plastic. They constructed their own compression machine for less than USD\$140 and now, using rigid waste plastics, build products they need themselves with plans to sell products locally in the near future. While such efforts do not solve the full plastics problem on the island, they are a start.

Robries in Surabaya, Indonesia also built their own 'Precious Plastics' extruder and injection machines. While operating within the recycling hub of the country, Surabaya, the team at Robries saw that they could create far more value by creating products themselves rather than on-selling recyclable waste as a commodity. With funding and guidance from Indonesia's Ministry of Research and Higher Education, Robries constructed several Precious Plastic machines that now allows them to make products sold online, including recycled PP, HDPE, and LDPE filament for 3D printing. They sell not only to Indonesian buyers, but also to US and European markets. The 3D filament sells for Rp150,000/kg (~USD\$10/kg), which is only 25 percent of the price of filament from virgin material, yet this still produces revenue 30 times higher than selling the waste plastic to nearby waste banks or local recyclers as a commodity.

The **Plastic Collective (PC)**, an Australian social enterprise with projects in Indonesia, Malaysia and Australia, empowers remote communities from 4,000 inhabited islands of the Asia-Pacific region—where waste management services are often lacking—to recycle plastics for profit. Founder Louise Hardman has adapted the Precious Plastic's designs to make a "Shruder", a single machine that combines both shredding of plastic (up to 10kg/hr) and extruding (120m/hr) so that remote communities can have a plug-and-play option that produces filament/cord and moulded products. Weighing 150kg, it's relatively easy to transport and maintain, with a three-phase motor

that runs off single-phase electricity, solar energy, or a 3kva diesel generator. Depending on the types of plastic materials processed, communities can recycle 15-25 tonnes of plastic per machine per year in their own micro-enterprises and generate revenues of up to AU\$60,000, making machines self-sustaining once initial capital costs have been paid for. The majority of processed material is sold to manufacturers while some material is made into products the community designs for themselves or for local sales.

Hardman has created two corporate engagement strategies. First, companies can sponsor a program for a remote or island region for approximately AU\$100 thousand (depending on location and requirements). Second, PC has created a Certified Ethical Plastic TM program for global manufacturers to purchase the processed ocean-bound plastic (OBP) from communities using Shruder machines. PC provides complete transparent tracking (types and volumes of materials processed, job created), operational Sustainable Development Goal compliance and dedicated media 'stories' of these unique remote community programs which can be used by the

Exhibit 12: Plastic Collective Shruder



global brands in their marketing and compliance needs⁸⁴.

5. MATERIALS OF PURPOSE AND MATERIAL TRACEABILITY

Ocean plastic has gained global attention⁸⁵. People are pushing companies to act more responsibly, with many voting with their dollars. Companies are not only beginning to see a moral obligation to respond, but are also seeing this as an opportunity to connect with their customers in a deeper, more meaningful way.

Some brands have started either publicly or privately incorporating “materials of purpose” (i.e. recycled content that would have otherwise entered the environment and/or that guarantees social conditions to employees like a living wage or more sustainable production methods) into their products. Also known as “social,” “Fairtrade,” “ethically-sourced,” or “ocean-bound” plastics, these materials fetch a premium price in part because they convey a story of hope and business practices with integrity —giving material buyers an opportunity to be part of positive change. However these “ocean bound” and “social” plastic markets are still niche and require more buyers to participate for such programs to be viable long term⁸⁶.

Waste organisations can build an inspiring mission-focused brand while ensuring their supply chain is transparent. This traceability requires that waste organisations engage along the entire waste material supply chain, beginning with the on-the-ground source and continuing through the sales to manufacturers. This traceability also helps companies comply with any necessary EPR regulatory requirements. A few of our best-practice organisations have successfully managed this.

Plastic for Change Bangalore Consortium

in India, consisting of organisations Plastics for Change, Hasiru Dala and Hasiru Dala Innovations, explored earlier, achieves a price premium for their rPET from fast moving consumer goods companies because they guarantee fully traceable plastics and a Fairtrade, living wage for the waste pickers who collect their PET bottles. In addition, to be part of their recycling ecosystem with access to higher material prices, aggregators and recyclers must comply with a social, environmental, and transparency code of conduct as well as meet quality production standards.

All PFC Consortium rPET is tracked at each stage of the recycling production process. Waste pickers sell their materials through a PFC created app. Materials are then bundled together and given a unique ID that is tracked as materials move through various processing steps in batches. Plastics for Change provides extensive training and onsite management to help aggregators and recyclers improve their output quality, traceability and environmental safeguards.

It’s a win-win model for all: aggregators receive stable, premium prices and safety and quality control training; the PFC Consortium improves the social and environmental conditions of their industry; waste pickers receive a livable wage; and manufacturers receive plastic feedstock that not only has a powerful story of hope, but that also meets stringent quality and EPR tracking requirements.

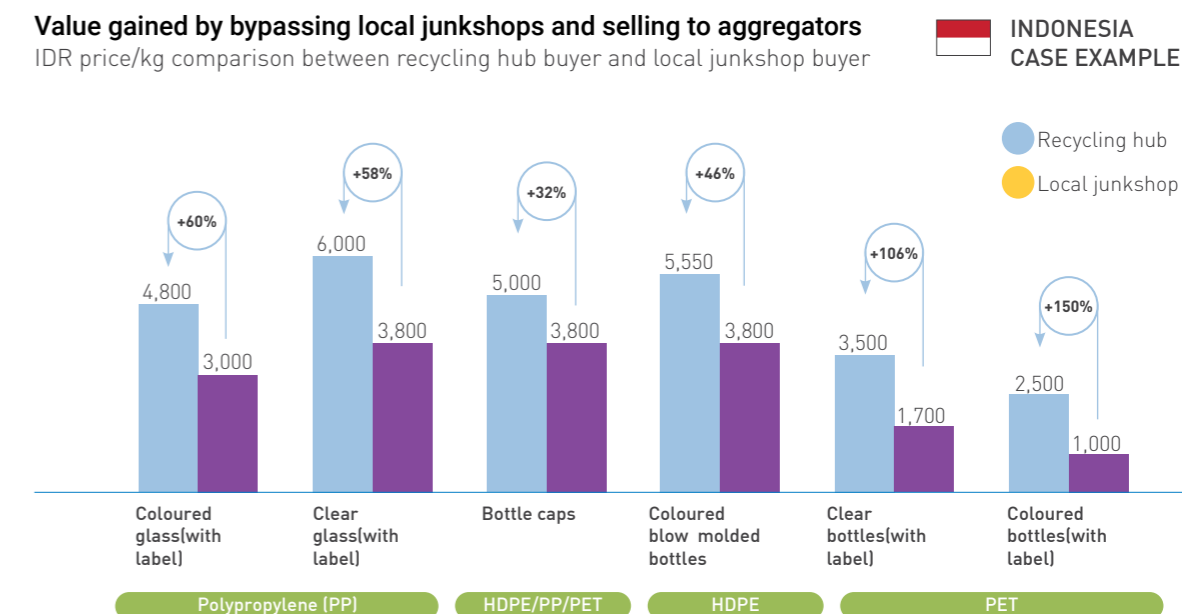
Bureo, the Chilean skateboard manufacturer using end-of-life fishing lines, explored earlier, also sells “materials of purpose” with powerful stories and full traceability. Soon, each skateboard sold will be able to be scanned to learn the fishing village where fishing lines were first collected, giving buyers a deeper connection to the origins of their skateboard material and ultimately the difference their purchase has made. This deeper buyer engagement converts into greater brand loyalty for Bureo, and for the customers of the other buyers of their fishing line material.

6. AGGREGATION OF RECYCLABLES

Junk shops will take nearly any amount of plastics. They then aggregate it until they have enough volume to sell it to an aggregator for a higher price. If organisations want to sell directly to an aggregator, and thereby bypass junk shops, they need to aggregate the same volume. This often requires baling and storage (which can create cash flow and space difficulties) or pooling materials with other organisations in order to reach minimum quantities.

Indonesia’s **Project STOP** found that by aggregating recyclables, then shipping them by truck 7.5 hours to the nearest recycling hub in Surabaya, they would increase revenue considerably for most recyclable materials versus selling to local junkshops.

Exhibit 13: Recyclable price difference between local junkshop and aggregator buyers⁸⁹



Brazilian **Dois Irmãos** waste picker cooperative, explored earlier, needs a minimum volume of 110 tons/month of LDPE and HDPE for their pellet production process to be economically viable. But they were collecting only 90 tons a month. They realised that if they were not reaching this minimum it was unlikely other nearby cooperatives were either. So, they decided to pool their plastic waste. Rather than simply selling their materials together (and splitting the revenue based on their inputs), Dois Irmãos acts as the buyer, purchasing 20 tons of materials per month from three nearby cooperatives. They then process it before selling to manufacturers. They can transfer some of the increased value back to the other cooperatives at a higher price than the cooperatives would normally receive for unprocessed materials.



III. STRATEGIES TO REDUCE RECYCLING COSTS

While focal organisations use several techniques to reduce costs within their recycling operations, four stood out as particularly effective:

Exhibit 14: Summary of strategies to reduce recycling costs

STRATEGY	DEFINITION	CASE STUDIES PROFILED
Collection points	Rather than external recyclable waste collection, recyclable materials are brought to a central location by households and businesses.	<ul style="list-style-type: none"> • TriCiclos • Waste4Change
Partner at source	Build win-win partnerships with large waste producers in order to protect waste from dumping, burning and landfill and to secure the cleanest waste feedstock.	<ul style="list-style-type: none"> • Bureo • Chintan Environmental Research and Action Group
Reduce logistics costs	Aggregate and bale materials and transport in larger trucks.	<ul style="list-style-type: none"> • Project STOP • TriCiclos
Build win-wins with logistics providers	Create relationships that go deeper than merely transactional payment of services.	<ul style="list-style-type: none"> • Fecunda Patagonia • TriCiclos

1. COLLECTION POINTS

Collection points establish a central location that households and businesses can bring their recyclable materials, saving organisations the expense and time of having to collect door-to-door. Some collection points pay a fee for the quantity and type of materials deposited, sometimes with credits for electricity, cell phone, or school fees (e.g., Plastic Bank's Incentive Points or Indonesia's Waste Banks). Others simply take recyclables for free and thank residents for doing their part to help the environment (Chile's TriCiclos Clean Points). However, the central collection point does not have to be in one fixed location. Numerous models are sprouting up in Indonesia, Brazil, and India where households can use an app to schedule the pick up of their recyclables, sometimes by waste pickers.

These models are based on revenue from the sale of aggregated recyclables, often including the support of private sector stakeholders who sponsor the capital investment of a building and equipment and sometimes contribute to operations in the form of a premium on collected materials. They may do this as part of extended producer responsibility (EPR) requirements to "take back" a proportion of materials they sell into the market, similar to packaging recovery organisation models.

TriCiclos has developed a network of 55 "Clean Points" in Chile. Each clean point accepts between 6 and 12 types of recyclable materials while operating as small processing centres that consist of a lockable container-based building with a recyclable segregation area, baler, and storage space. Each

is modular in construction and costs a fraction of comparable solutions. Clean Points give conscientious residents the opportunity to recycle and gain an environmental education from attendants. The profit from donated materials supports operating costs, including the wages of workers. Not only do Clean Points lessen the cost of collecting waste—because materials are brought to them—they also save on sorting costs, since residents categorise waste themselves, generally keeping it separate and clean before transporting it to a Clean Point.

The Proyecto de Reciclaje Colectivo (Collective Recycling Project), begun in 2013, is an alliance with private companies—including Coca-Cola, Unilever, Walmart, PepsiCo, CMPC, Nestlé, PF, and TriCiclos—that establishes Clean Points. Walmart, for example, provides land and pays capital costs. Other companies have split operating costs. The project has established five Clean Points with more than 30,000 users and 140 tons of material recovered monthly.

Waste4Change, in collaboration with **PRAISE** (an association of producers including Tetra Pak, Danone, Unilever, Coca-Cola, Indofood, and Nestle), has started a recyclables drop box programme. Over 80 drop boxes have been distributed in public spaces like bus stops, schools, malls, offices, cafes and restaurants. Each has its own caretaker, which is usually the institution where it's located, and local citizens have an easy deposit option for their recyclables. When full, the caretaker contacts Waste4Change, which directs a partner recycler to handle pick up, including standardised record keeping. Waste4Change even takes non-recyclables (if any) and process it into fuel through collaboration with a local cement factory.

PRAISE members are funding the operational costs and receive a monthly report of materials collected. The report is also shared with the Ministry of Environment and Forestry that is developing EPR legislation.

Exhibit 15: TriCiclos Clean Point facility



2. PARTNER AT SOURCE BY BUILDING TRUST

The cleanest, and therefore highest value waste materials, are those collected at the source of disposal prior to any mixing with other waste. But getting this waste is not always straightforward. By and large, recycling in our focal countries operates informally, underground through a series of relationships often invisible to the outside world. Some recycling players desire anonymity so as to avoid tax collection and/or regulatory oversight on their environmental or social practices to keep costs low⁹⁰. Others sit outside the normal recycling value chain and need to be convinced of the benefits of doing something new with their materials.

Chile's **Bureo**, explored earlier, recognised that end-of-life fishing nets, made of Nylon 6, could be a valuable, abundant resource easily harvested all over the world. One of the biggest challenges, however, was collecting nets before they were thrown into the sea. In some cases, large commercial fishing companies were passing their nets down to smaller companies, then eventually to individual fishermen. But in the end, nets were either dumped in the ocean or sent to a landfill. Bureo realised that in order to capture nets from fishing communities, they needed to convince fishermen that selling their nets was worth the trouble. Fishermen feared that participating in the program would require extra work for very little, if any, reward.

Bureo overcame this by establishing a physical presence in each community, then working through the concerns of fishermen. Slowly building trust over time, they show how old fishing lines can be transformed into new, valuable products. The fishermen receive a payment for their end-of-life nets, even if they are too degraded to be recycled⁹¹, in contrast to before, when their nets were valueless. When fishermen prefer to donate their nets, the money saved is invested in local environmental projects and other community activities, which furthers community development and pride. Additionally, numerous locals are employed preparing and transporting the nets for recycling. Bureo has made the "right thing to do" the "easy thing to do" for fishermen.

They've found that each fishing community requires three to six months of in-person trust building. They now have agreements with 15 commercial fishing groups and 12 artisanal fishing communities. This represents more than 300 tons of fishing nets processed per year, with a goal of exceeding 1,000 tons annually by 2020 and expanding the program into Argentina and Peru.

In 2001, the **Chintan Environmental Research and Action Group**, in Delhi India, mobilised waste pickers, doorstep waste collectors, small junk dealers, itinerant and other small buyers, and other recyclers to form **Safai Sena**, meaning "cleanliness army." Safai Sena offers a wide range of services, from doorstep waste collection to train cleaning.

Their train-cleaning program involves waste pickers, dressed in yellow and sporting gloves and masks, entering each train arriving at the New Delhi Railway Station. Within minutes, they clean it from top to bottom, including emptying waste bins and collecting rubbish from around seats. Another team, dressed in green, sweeps the tracks. Waste is handed off to another Safai Sena crew, who take it to a nearby MRF shed for sorting.

At the shed, non-organic material is divided into 12 categories, with food waste becoming either animal feed or composting material. Of the 4 tons of train waste generated everyday, 3.25 tons is recycled while the residual goes to the landfill. Enough value is extracted from the recyclables that the train cleaning service is provided at no cost to the railway (and compost, worth INR15 per kilo, is also provided to the station gratis). A clear win-win for both entities—Safai Sena gets waste with a high proportion of high-value recyclables for free, at the source before it's mixed with other waste, while the railway gets a comprehensive no-cost cleaning service.



The **Plastics for Change (PFC)** Consortium in Bengaluru, explored earlier, uses a high-tech, high-touch material recovery model. Their experience is that a price premium is not enough to entice secretive recyclers to become part of a transparent recycling system. They must first build trust, proving they will protect them from authorities and that participation in a new recycling program will not jeopardise their current buying and selling relationships.

They do this in several ways. First, PFC spends significant time building personal relationships with recyclers and partnering with already trusted organisations to waste pickers like Hasiru Dala. Second, they design a closed system where recyclers and pelletisers only interact with Hasiru Dala, an organisation they know and trust, while manufacturers only interact directly with Plastics for Change. In addition, recyclers are not required to have an exclusivity agreement; they are free to work through the PFC Consortium or through their other traditional buying relationships, giving them the flexibility to weigh trade-offs and choose their best option on the market.

3. REDUCING LOGISTICAL COSTS

A number of strategies are used by organisations to reduce logistical expenses, including properly choosing trucks, baling material prior to transport, pooling materials with other organisations in order to reach volume, and negotiating with transportation companies (especially taking advantage of empty containers making a return trip).

CONSIDERATIONS FOR REDUCING LOGISTICS COSTS

- Use largest truck available (relative to cost) and fill load
- Bale materials
- Pool materials with other organisations/cities to reach significant volumes
- Negotiate transport for materials without a market (e.g., sachets)
- Negotiate with suppliers of trucks/ships that would otherwise be empty on their return trip
- Lobby for logistics government subsidy or infrastructure improvements
- Build new recycling infrastructure locally (see Recommendations section)



4. BUILD WIN-WINS WITH LOGISTICS PROVIDERS

Fecunda Patagonia was founded by four Chilean mothers who were angry that their local school was teaching a curriculum that included recycling when there were no recycling services available in the Aysén region of Patagonia (1,600 kilometres from the nearest recycling centre in Santiago). All of their waste went to landfill. With the support of Start-up Chile, Chile's national business incubator program, they opened the first recycling collection and sortation point in Coyhaique, Chile. Fecunda Patagonia operates the clean point, accepting and sorting high-value recyclable materials (plastics, paper, glass, metal, batteries and electronics) from local citizens. In addition to drop-offs, they provide recyclable collection services at local businesses and operate a small store where bins, home composters, and environmentally sustainable products like reusable diapers are sold.

Because Patagonia, a geographically challenging region with two million people spanning Chile and Argentina, does not have any material processing plants (and is approximately a 30-hour drive from Santiago), logistics is a constant challenge. It was not feasible to get material to Santiago at market rates, even for the most valuable of recyclable plastics. To overcome this, Fecunda Patagonia established relationships with companies that can provide logistical support and create relationships that go deeper than merely transactional payment.

One example, is their partnership with **Cristalerías Chile**, a company that produces most of Chile's glass bottles. While not plastic, the case example illustrates a type of private sector relationship that could be possible transporting other materials like plastic. Given the company's size, it already has an extensive logistical network throughout Chile. Fecunda Patagonia devised a system that would bring glass bottles from Patagonia to Santiago in trucks that would otherwise be empty after deliveries. Going one step further, Fecunda Patagonia brought the Elige Vidrio (Choose Glass) campaign to the region, which encourages citizens to select glass bottles over other types of containers. They have introduced Cristalerías Chile to their local politicians and are marketing the campaign among their considerable community of supporters. They are working on an end-to-end

supply chain system for glass, which is a hard to recycle material. This partnership is seen as a precursor to arrangements with other companies to less expensively transport their other types of recyclable materials.

Similarly, a partnership between **TriCiclos** and **Sodimac**, a major home improvement retailer in Chile, sees Sodimac trucks used to haul material from their TriCiclos Clean Points. The home improvement retailer has a fleet of trucks to supply its stores—that then returned to Santiago empty. Now, each store has a Clean Point and trucks return with compacted post-consumer packaging.

CONCLUSION

As with the fight against global warming, leadership is required at the international level to curtail the dumping of plastics into the environment—material that inevitably ends up accumulating in the world's oceans. National governments, international organisations, and non-governmental organisations are starting to step forward⁹².

But, as this chapter has shown, leadership is also occurring organically at the local level, far from the world's decision-makers. Entrepreneurs, waste picker cooperatives and local community groups are forging ahead to deal with the accumulation of plastic waste in their communities. These local organisations have found often innovative ways to build viable recycling businesses, often in difficult environments, and to do so without sacrificing social and environmental safeguards.

This leadership, and the ingenuity inherent in it, should not only be recognised but also supported by those with greater resources. Leadership need not only come from above, but recognised and embraced when it percolates up from localities. And not only supported, but also amplified with resources and shared around the globe as success stories that can be emulated.



PROCESSING ORGANICS WITHOUT A LOSS

VITAL LESSONS FROM PIONEERING
ORGANISATIONS ON THE FRONTLINE



5 Processing Organics Without a Loss

In many countries, at least half of the waste generated – sometimes as high as 85 percent of the waste – is organics waste, especially after waste pickers have removed higher value, non-organic waste. Organics waste is moist and heavy, bringing with it a greater burden to waste collection efforts, both financially and technically. Once organics waste reaches a landfill, it releases harmful, fast-acting methane greenhouse gas, contributing to each country's GHG balance. When organic waste is not separated, it contaminates recyclable non-organic waste, reducing the non-organic waste value by up to two-thirds⁹³. Organics themselves are also known to have far lower economic value than comparable recyclables, important when designing an economically viable waste system. For these reasons, figuring out how to process organics without a loss is a significant part of an economically sustainable waste management process.

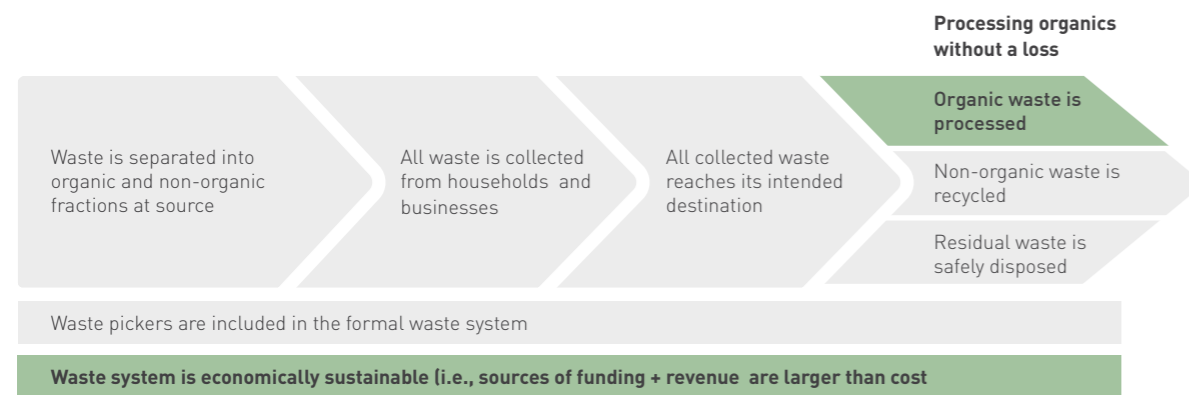
CASE STUDIES PROFILED IN THIS CHAPTER

- Chintan Environmental Research and Action Group, India
- Ciclo Organico, Brazil
- ecoBali Recycling, Indonesia
- Fundación Basura, Chile
- Klungkung Regency TOSS Program, Indonesia
- LSM Pelita Klabat, Indonesia
- Municipality of La Pintana, Chile
- Project STOP, Indonesia
- Stree Mukti Sanghatana, India
- Temesi Recycling, Indonesia

INTRODUCTION

In most waste systems, organics are processed at a loss. The value derived from selling common organic products, like compost, is simply not enough to cover the cost of producing them. Best practice organisations, however, have managed to find ways to process organic waste into valuable resources that cover their costs, while also feeding the food chain, enriching the soil and plants, and/or providing low cost energy. These organisations have also found effective ways to lobby the government to enable low-cost organic waste handling, to derive as much value from organic waste as possible, to employ tactics that reduce operating costs enough that the revenue generated is sufficient to break even, and to engage the community to care about not wasting their organics. From interviews, we noticed many strategies shared among these organisations that can serve as starting points for other organisations and governments to learn from.

Exhibit 1: Topics covered in this chapter within the waste value chain (in grey)



I. UNDERSTANDING ORGANIC WASTE PROCESSING OPTIONS

While processing organic waste into compost is the most common practice, there are several other organic processing methods available to organisations that might better match the unique market they're operating within, their organic waste characteristics, and organisational constraints. However, not all options will work in all contexts. **Organic processing method depends on waste cleanliness, process simplicity, waste content, land availability, regional climate, and operating/ capital cost considerations.**

CONSIDERATIONS FOR CHOOSING ORGANIC PROCESSING APPROACH:

- Local market need
- Value of organic product(s)
- Quality of organic product(s)
- Organic waste cleanliness
- Organic waste content
- Processing simplicity
- Processing speed
- Capex/Opex requirements
- Land requirements
- Local climate conditions
- Environmental impact

1. COMPOST AND FERTILISER

Compost nourishes soil while fertiliser nourishes plants. Beneficial organisms and minerals in compost restore depleted soil, providing nutrients plants need in small amounts, like boron. While fertiliser can be used without compost, soil that is regularly nourished with compost becomes dark, crumbly, and filled with nutrients. Plus, it requires less fertiliser than soil that does not benefit from regular compost. The continual use of chemical fertilisers without compost can throw a soil's chemistry out of balance, discouraging microbes. Naturally-derived organic fertilisers, however, can fix depleted soil and increase plant yields by up to 20%. For example, today in Indonesia, 50% of agricultural land is depleted. While healthy soil typically has 10% organic content, 4 million hectares of Indonesia's 8 million hectares of agricultural land has an organic content of less than 2.5%⁹⁴. Compost can restore soil health.

The quality of a compost is dependent upon the quality of waste separation, a proper carbon-nitrogen (C:N) ratio (30:1), electrical conductivity (less than 5 millimhos/cm), heat, oxygen, and water content⁹⁵. The C:N ratio is often achieved through a process of layering equal parts (by weight) of kitchen waste or market waste (nitrogen) and dry leaves and other yard waste (carbon).

What to do with coconuts and palm leaves: Coconut husks compost much slower than most other organic materials and therefore should be managed separately from the composting process. They can, however, be transformed into several products with greater value than traditional compost. They can be shredded, washed, dried, sieved, and pressed to make "cocopeat," a multipurpose fibrous growing medium that has high water holding capacity and air-filled porosity.

They can also be used whole to improve the aeration of compost heaps. During the sieving they stay with the rejected part of the materials and are reused in a new compost heap, where they slowly break down over time. Coconut husks can also be used inside mattresses and shredded into a mulch that can be distributed on top of soil to stop weeds from growing.

Palm leaves, popular in Bali's Hindu religious offerings, tend to be the slowest decomposing fraction of an organic waste stream. Given how large a component they are in many waste streams, they will set the pace of the composting process – i.e., only when palm leaves have decomposed is the composting process finished. Other slow composting green matters include banana leaves and elephant grass.

Rather than separating coconut husks and palm leaves from their organic waste stream, **Temesi Recycling** increases their compost processing time, which gives more time for larger size waste components to decompose, eliminating the need and cost for shredding material into smaller pieces or further sortation efforts. Temesi also smokes coconut husks into a natural derived pesticide for agriculture use.

Several techniques can be used to reduce the time composting takes and, in some cases, improve the overall nutrient quality of compost. Reducing time also reduces the amount of space needed, as well as the amount of labour, energy, and cost. Mechanical tools like shredders and pulverisers physically breakdown raw materials, especially for items like pumpkin, melon, and citrus peels that would otherwise take a more significant time to decompose. Shredders break organic matter into smaller, more easily digestible pieces while pulverisers go one step further, breaking down raw material into an almost chutney-like consistency. What normally takes bacteria a week and a half to break down only takes minutes with a pulveriser⁹⁶. Non-mechanical, natural accelerators like cow dung, sour curd/ yogurt, earthworms, and insect larvae introduce beneficial bacteria into the composting process, both speeding decomposition and enriching compost quality. Earthworms, for example, feed off the microbes and bacteria, helping the organic material decay.

While various packaged microbe inoculates claim to have similar effects, Temesi Recycling and other composters interviewed found that many inoculants have little to no influence over composting time, or at worse produce un-matured compost that can harm plants, as essential microorganisms are already in the waste and start the composting process on their own.

2. BLACK SOLDIER FLY

Black soldier fly (BSF) organic processing is gaining momentum the world over. In this process, black soldier fly larvae feed on organic waste, reducing waste volumes by up to 80% in just 12 days. What remains is the larvae themselves, a high-quality source of protein (+/- 35%) and crude fat (+/- 30%) suitable for fish and chicken feed, and a nutritious organic residual, that can be used for applications similar to compost after a two week further maturing phase. Black soldier fly "farms" have a high waste-to-biomass conversion rate from 15-20%, are easy to operate, have relatively low capex setup costs, and are modular. Operations can easily be scaled over time as clean organic waste sources and markets for larvae are identified. However, BSF does have relatively large space requirements⁹⁷.

Exhibit 2: Space needs for various black soldier fly processing levels

BSF PROCESSING CAPACITY	SPACE NEEDS
1 ton/day	<ul style="list-style-type: none"> • ~170m² for treatment • ~35m² for a nursery
2 tons/day	<ul style="list-style-type: none"> • ~240m² for treatment • ~45m² for a nursery
20 tons/day	<ul style="list-style-type: none"> • ~2,150m² for treatment • ~180m² for a nursery and harvesting

A major challenge with almost all organic waste processing, and in particular BSF is access to clean, source separated, non-contaminated organic waste. Black soldier fly larvae require a diet of very clean, kitchen food and market waste. The black soldier fly larvae are eaten by fish or poultry, which is then sold to households for consumption. Besides the role they play in the food chain, they are sensitive to contamination like detergents and pesticides and will not grow, or in the worst case die, if fed contaminated waste. Therefore, many BSF farms start with market waste. There are few large-scale facilities over 5 tons/day today, given the challenge of finding enough clean organic non-garden waste feedstock. Success with BSF requires successfully convincing families to strictly separate their organic waste. As most BSF facilities have not been responsible, or have the capacity, to also organise waste collection and source separation behaviour change campaigns, they have stayed small.

3. CHARCOAL BRIQUETTES

The **Klungkung Regency** in Eastern Bali, Indonesia, is trialling an organic waste to charcoal briquettes program called TOSS. The program works by filling bamboo containers with daily mixed waste consisting of 80% organic waste and 20% non-recyclable, residual inorganic waste. The inorganic waste can be paper or soft plastic, but no hard plastic like bottles or metal cans. Mixed waste is added along with one litre of bioactive water and ten litres of normal water, then left for 4-5 days where it dries out and begins a fermentation process called *peuyeumisasi*. Once dried, the processed material is shred and then pelletised. Pellets are then sold to the state electricity provider at the market price of coal, in place of coal as an electricity source. For each tonne of mixed waste, 600 kgs of pellets is produced generating electricity equal to 400 kWh. In one hour, the facility in Takmung Village can process 3 tonnes of mixed waste.

Given the non-organic content of this fuel, burning the briquettes releases toxic fumes and therefore should only be sold to responsible users with the right environmental safeguards to burn them, rather than to residents for use as a fuel in cooking stoves⁹⁸.

4. REFUSE DERIVED FUEL (RDF)

Refuse Derived Fuel is a type of fuel produced from various types of waste, including organic waste. Based on lab analysis, the highest heating value of RDF is about 36 MJ/kg obtained with organic waste content of 40% with moisture content about 5%⁹⁹. RDF can be used as a coal replacement in cement kilns or in coal power plants. It can also be fed into plasma arc gasification modules and pyrolysis plants. The process usually involves a mix of mechanical and/or biological treatment methods such as:

- Bag splitting/shredding
- Size screening
- Magnetic separation
- Air classifier
- Coarse shredding
- Refining separation by infrared separation

An RDF facility with capacity of about 120 tonnes per day needs an area of about 1 ha¹⁰⁰ and investment cost around \$4 million USD to produce 30-40 tonnes of RDF per week.

5. BIOGAS

With biogas generation, organic waste is pulverised and added into a digester in an airtight, anaerobic (oxygen-free) environment with bacteria. This is a phenomenon that occurs naturally at the bottom of ponds and marshes. The bacteria present in the digester then break down the waste, producing methane and other gases as well as other nutrient rich by-products (slurry) that can be used as an organic fertiliser. This biogas is then pulled from the digester with a vacuum and used for cooking, fuel, or power needs. Sometimes, to maximise the process, manure is added to the digester as it is often available in larger quantities (cows produce up to 12kg/day) and has a suitable C:N ratio. Using manure also benefits environmental health as pathogens in the manure are killed during the digestion process.

The volume of reactor required is about 85 m³ for each tonne per day of organic waste. Digestion time varies from a couple of weeks to a couple of months. CV Energi Persada, a member of MaBI (Masyarakat Biogas Indonesia - Indonesian Biogas Society), estimates that each tonne of organic waste can produce 120 hours of fire for a single burner stove, 200 kg of compost, and 200 litre of liquid fertiliser¹⁰¹.

The ideal C:N ratio is between 25:1 and 30:1. A gas cooking burner needs 300 – 600 litres of gas per hour, while a lower income family uses an average of 4,000-5,000 lt/month per person¹⁰².

Exhibit 3: C:N ratio and gas yields of different waste materials

WASTE MATERIAL	C:N RATIO	GAS YIELD (LITRES PER KG)
Human excreta	6-10	-
Cow dung (up to 12 kg per cow per day)	18	90 – 300
Pig manure (up to 2.5 kg per pig per day)	-	370 – 500
Chicken manure	7	300
Grass (hay)	12	Not suitable alone
Grass with chicken manure	-	350
Paper	-	Not suitable alone
Paper with chicken manure	-	400-500
Sewage sludge	-	600
Wheat straw	150	Not suitable alone
Bagasse (sugar cane waste)	150	Not suitable alone
Sawdust	200-500	Not suitable alone

The scale of simple biogas plants can vary from a household system to large commercial plants of several thousand cubic metres. Two popular simple digester designs have been developed for use in developing countries: the Indian 'floating cover' biogas digester and the Chinese fixed dome digester. HomeBioGas¹⁰³ in Israel is an example of a household size biogas and Carbonlites¹⁰⁴, from India, is an example for restaurants and small facilities. Temisi Recycling also recommends the BEKAN method. Both the Indian and Chinese digesters operate in the same way, but the storage chambers have slightly different designs.

6. SILAGE

Silage, a cattle and sheep feed made from fermenting grass crops like elephant grass, maize, sorghum or other cereals; is used by farmers to feed their cattle and sheep during times of the year when pasture is not good or

when there is not sufficient grazing pasture available. Cattle consume roughly 25 kg/day of silage. This preserved pasture, after compost, is the most common product made from organic waste globally. In Indonesia, cows traditionally eat silage made from elephant grass, while silage mixtures with elephant grass, banana leaves and stems are also suitable.

Ideally grasses are cut when at their highest nutrient levels just before they are fully mature. They then wilt until reaching a moisture content of 60-75%, are shredded to 10-20 ml chop length and are then compacted as tightly as possible and covered with thick plastic tarps weighted down by old tyres to remove and keep out as much oxygen as possible. Anaerobic (oxygen-free), acidic conditions (pH 4-5) are important for lactic acid bacteria to thrive, or other bacteria will ferment the organic materials resulting in nutrient loss and ammonia and other unappetising by-products to animals. Lactic acid ferments the grasses, preserving most of its nutrients.

7. OTHER ANIMAL FEED

Common in rural areas, organic waste can be used for animal feed as long as it's fresh, uncontaminated, and separated by type. Fish waste in particular, if captured quickly, can be a high-quality source of protein for chicken and fish. Most animal feed programs in Indonesia are small-scale given the complexity of finding and separating enough quality organic waste to feed large ranches. To produce animal feed from organic waste, **LSM Pelita Klabat** purchases mixed organic waste from traditional markets with price of Rp5,000 per 50 kg (←USD\$0.01/kg). If the organic waste is clean and separated, the price increases to Rp35,000 per 50 kg (USD\$0.05/kg). The product is used to substitute commercial animal feed with prices range from Rp7,500 to Rp12,000 per kilogram (USD\$0.50-0.80/kg), depending on protein content¹⁰⁵.

Exhibit 4: Animal feed by organic waste type

TYPES OF ORGANIC WASTE	GAS YIELD (LITRES PER KG)
Silage (elephant grass, banana leaves and stems)	Cattle, sheep
Raw banana skin	Goat
Raw vegetables	Duck
Meat leftovers	Catfish, eel, mujair fish, bawal fish
Fly larvae (maggots)	Mujair fish, catfish, chicken
Kitchen food leftovers (excluding bones)	Pig
Processed fish waste	Chicken and fish

We've focused primarily on organic options successfully applied in several waste organisations in focus countries. While not covered in this paper, organics can also be converted into fuels¹⁰⁶, gas through gasification, protein using microorganisms¹⁰⁷, and even plastics¹⁰⁸, although many of these technologies are nascent.

II. SOLVING LOCAL MARKET NEEDS

To derive profit from organic waste, choose a processing approach that results in a product needed by local businesses, given the level of organic waste cleanliness available.

The sustainability of an organic processing system lies in its economic viability, its simplicity, and the resources available for an organisation to invest in equipment. Ideally, economic viability needs to be coupled with simple processes for high compliance rates¹⁰⁹. The ideal systems are also modular, enabling the testing of various configurations and processes before larger investments are required. Processing approach is also dependent on land availability and budget. There are myriad methods to make compost, for example. Some require a great deal of land while others can either be done vertically or in less time using microbial inoculants, resulting in less standing levels of organic waste in a particular area. Numerous machines can reduce processing times and/or automatise parts of the process if budget allows. In addition, how cold and wet a climate is, has direct implications on how best to process organic waste.

To derive profit from organic waste, or at least break even on processing costs, choose a processing approach that produces a product with local market demand. Organic waste can be used to produce compost, fertiliser, animal feed, biogas, charcoal briquettes, natural pesticides, and other products. Communities with fish farms and/or chicken farms struggle to find affordable, high-quality, protein-rich feed, and are good markets for black soldier fly larvae. Similarly, communities raising pig and goat livestock require extensive quantities of nutrient-rich feed that can be derived from fruit, vegetable, and dairy waste. Agricultural communities, from food production to vineyards, need fertiliser for plant growth and compost to enrich soil. Tourism centres with upscale hotels, universities, and government facilities also all need compost to maintain their beautiful landscaping. Institutions like schools, hospitals, and restaurants need gas for cooking and some use biogas for running public buses. In addition, some local power companies will buy charcoal briquettes (or refuse derived fuel) at market rates to replace coal or other energy sources in their power production processes.

Exhibit 5: Matching organic waste products to local market needs

LOCAL INDUSTRIES	BUSINESS TYPES	KEY BUSINESS NEEDS	ORGANIC PRODUCTS TO SATISFY NEEDS
Tourism	<ul style="list-style-type: none"> Hotels/resorts Restaurants Parks 	<ul style="list-style-type: none"> Landscaping Cooking Cooking Landscaping 	<ul style="list-style-type: none"> Organic compost Biogas Biogas Organic compost
Farming	<ul style="list-style-type: none"> Agriculture Livestock Chickens 	<ul style="list-style-type: none"> Soil nourishment Plant nourishment Natural pesticide Vegetarian and non-veg feed Feed 	<ul style="list-style-type: none"> Organic compost Organic fertiliser Smoked coconut pesticide Waste derived feed Black soldier fly
Fishing	<ul style="list-style-type: none"> Fish farms Cold storage Transport 	<ul style="list-style-type: none"> Fish feed Electricity Fuel 	<ul style="list-style-type: none"> Black soldier fly Biogas Biogas
Other	<ul style="list-style-type: none"> Universities Government institutions Transportation Energy 	<ul style="list-style-type: none"> Landscaping Cooking Fuel Electricity 	<ul style="list-style-type: none"> Organic compost Biogas Biogas Charcoal briquettes/RDF

Each organic waste derived product has a different value to the market, and different capital and operating expense requirements to convert them into valuable products. Market prices also vary substantially between countries and between urban and rural areas within countries.

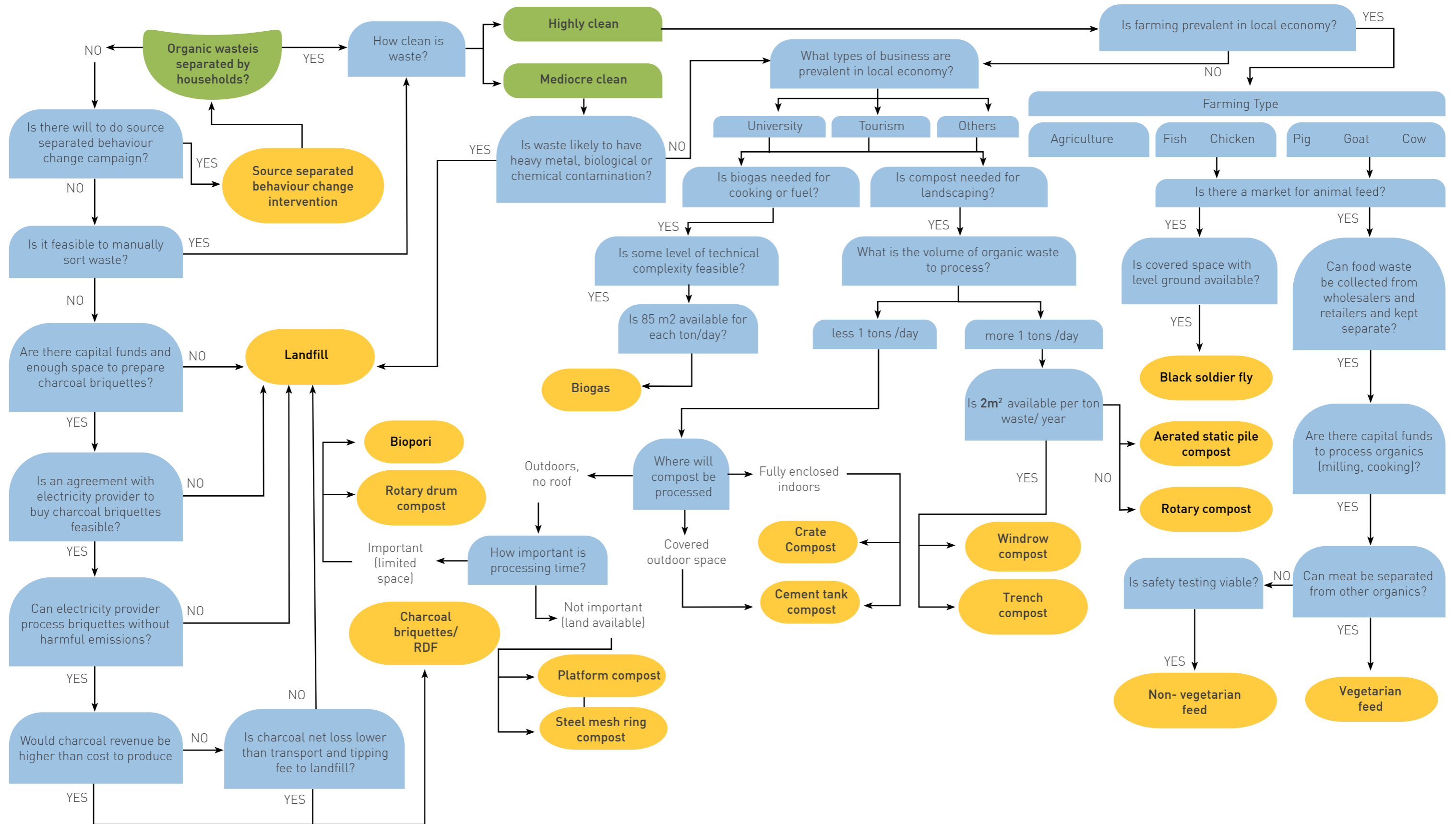
Exhibit 6: Value of organic waste derived products in different markets¹¹⁰

Organic Products	FORM	INDONESIA		INDIA		BRAZIL		CHILE	
		IDR/kg	USD/kg	INR/kg	USD/kg	BRL/kg	USD/kg	CLP/kg	USD/kg
Organic Compost	Bag	500-750	3.5-5¢	7-16	10-23¢	0.30-1.00	8-27¢	340-2,290	0.50-3.30
Organic Fertiliser	Bag	3,750	26¢			5.00 ¹	1.33	3,140	4.50
Biogas	Litre	Gas usually used directly (not sold)		62	0.89-1.05	N/A		1,200-1,600	1.70-2.30
Animal Feed	Bag	7,500-12,000	50-80¢	N/A		N/A		N/A	
Black Soldier Fly	Live	5-7,000	33-45¢	15	22¢	N/A		N/A	
Charcoal/RDF	Mcal	75 for size less than 50mm	less 1¢	N/A		N/A			

The quality of organic waste derived products is dependent on the underlying organic waste cleanliness - how well have households and businesses sorted their waste. Organic waste used in food production should ideally come from “clean” household and business pre-sorted waste, with minimal risk of chemical or heavy metal contamination. While non-contamination is always important, ‘dirtier’ organic waste can sometimes be used for compost in landscaping or nursery plants, or in some energy use cases if environmental safeguards are in place (e.g., some charcoal briquettes processes).

Project STOP in Muncar, Indonesia, for example evaluated four organic processing options before choosing how to process their waste. Home to 130,000 residents, Muncar’s economy is built around the fishing industry (wild and farmed fish, canning, cold storage, fish feed and oils) and agriculture. The Muncar waste system is particularly challenging for economic viability, given its highly organic waste composition (75% organic as generated, and 85% organic after waste pickers have removed much of the ‘high-value’ non-organic waste that can be sold into local recycling markets). Project STOP considered traditional compost for agriculture, black soldier fly larvae for fish and chicken feed, bio-digestion for compressed natural gas to be used for cold storage and canning facilities and charcoal briquettes used for power by the national electricity company. After evaluating the capital and land requirements, potential revenue, operating costs, complexity and testing the market demand for each product, they chose to process organic waste in urban areas using black soldier fly larvae and to introduce home composting using the simple trench method in rural areas. With Muncar’s 68 fish farms and 20 chicken farms buying 18 tons of feed per day at Rp9,000/kg, selling high protein live black soldier fly larvae for Rp5,000/kg guaranteed an automatic market for every tonne they could produce— not only covering their organic collection and processing costs, but also generating more profit than recycling sales. Finding a way to effectively valorise their organic waste has been fundamental to creating an economically sustainable community waste system.

Exhibit 7: Decision matrix for choosing organic processing approach



III. STRATEGIES TO INCREASE ORGANIC REVENUE

Beyond choosing the right organic product for the market, we found organisations use five strategies to increase their revenues from processing organic waste to changing the all too familiar dynamic of revenue obtained from organic product sales being less than the cost to produce organic products:

1. Quality guarantee
2. Subscription fee
3. Vertical integration
4. GHG mitigation
5. Government or private sector buying agreements

1. QUALITY GUARANTEE

Buyers are often fearful of waste derived organic products like compost, fertiliser, animal feed, or black soldier fly larvae used for food production given the potential contamination from chemicals, heavy metals, or other harmful elements. Incorporating a quality control system and credible testing mechanisms builds up buyer trust and secures higher product prices. Indonesia's **Temesi Recycling** uses an ISO 9000 quality control system and lab testing to verify the safety of their compost and also pass the strict criteria for CDM verification. They regularly test and report on their compost's oxygen, PH, ammonia, and nitrate levels. **Project STOP** is planning to test and certify their black soldier fly larvae to educate prospective fish and chicken farmers on the nutritional composition and protein content of larvae, as well as any level of detectable contamination. India is setting up government-run testing facilities to aid in this process.

2. SUBSCRIPTION FEE

Some environmentally-minded customers are willing to pay a subscription fee for an organisation to collect their organic waste and process it into compost, even when comparable compost available at retail stores is far less expensive. **Ciclo Organico**, a social enterprise organics processor operating in Rio de Janeiro, Brazil, is economically sustainable through a subscription fee model. Their customers pay a monthly membership fee which varies based on the size of their receptacle, frequency of pick-up, and certain discounts (condominium, business, etc)¹¹¹. Upon becoming a member, customers are

provided with a bucket and a biodegradable bag to collect their organics. On a weekly basis, these biodegradable bags are collected by bicycle and brought to the centre where they are composted using a 40-day vermiculture process.

But the value provided to the customer doesn't just stop with a pick-up service and the feeling of knowing they are doing the right thing for the environment. They are also provided with a monthly 2kg bag of compost, garden seeds, a surprise gift and instructions to start their own home gardens. Their organic waste is turned into compost and then they turn the compost and seeds into plants, nourishing their families and providing for more beautiful surroundings. **Ciclo Organico** is changing the narrative by showing that waste can be transformed into something beautiful. This model has allowed **Ciclo Organico** to grow at an impressive rate since their inception and capture subscription fees materially higher than the physical value of the compost and seeds the members receive, separating them from organic processors that rely on the commodity value of compost alone. The model is easy to replicate and has inspired at least five similar social enterprises around Brazil.

3. VERTICAL INTEGRATION

The more an organisation vertically integrates down the value chain, the more value is captured from waste materials. Programs around the world have processed organic waste into compost but rather than selling compost, which generally fetches a low price (if it can even be sold at all), they've gone one step further and used these products to nourish nursery plants, flowers, and vegetables. These are then sold to the community at a higher margin than the worth of compost or fertiliser alone.

In the **Municipality of La Pintana** in Santiago, Chile, organics processing is done through local government services. Organic waste is collected three times per week and then brought to the municipality compost processing area where it is processed using either windrow or trench with vermiculture composting techniques. Once ready, the compost is shared with the community as well as with the government itself to subsidise numerous projects, from tree planting programs, community beautification projects, government building landscaping and the government's own nursery, with over 800,000 m² of green space and 160 thousand plants. The city also plants 80-100 trees every month. The compost they produce supports a much larger city "greening" program.

4. GHG MITIGATION

One complex but potential way of significantly subsidising organic waste processing costs is by receiving official certification and sponsorship for greenhouse gas (GHG) mitigation through either the voluntary carbon market or through the clean development mechanism (CDM). In Indonesia, for example, over 60 million tons of organic waste is generated per year and, when dumped in the environment, in open dumps, or in landfills, emits the equivalent of 3 million tons of methane, (approx. 11% of Indonesia's total greenhouse gas emissions¹¹²). In response, the country has set a national goal to reduce emissions by 29% by 2030¹¹³ compared to 'business as usual' and incentivises those who can prove meaningful emissions reductions through the CDM. Despite this, Indonesia has only 2% of global CDM projects (2014)¹¹⁴. Given that the CDM is part of intergovernmental agreements on carbon reduction and requires a formal approval process, applying through the voluntary market is often less expensive, faster, and relatively easier, although the final price paid per credit is often lower than the equivalent CDM. Projects can be registered for ten years under either method. The two most relevant methodology classes for organic waste processing are "waste management" and "emission reduction of methane."

To qualify, projects must prove they would not be commercially viable without carbon credit, and can demonstrate GHG improvement against a baseline. One test of additionality is whether it is possible for the project to secure bank loans without the income from carbon credits – if not, they qualify. Other common pitfalls include misalignment with the types of activities contained in the Nationally Determined Contributions (NDC) policy and employing technologies that are considered common practice. Common practices are defined roughly by a 10-15% adaptation rate in the industry (e.g., common windrow composting would fail the common practice test but the more novel black

soldier fly composting would not).

In the voluntary market, organisations go through a 2 to 4 year process, costing USD\$ 40,000-70,000, to prove how their project will reduce emissions, and by how much. If successful, they are certified by a third party independent verifier like Gold Standard and can legally sell credits to other organisations. The average price of carbon credits from methane reduction from landfill ranges between \$2.20/credit to \$19.00/credit depending on whether a willing partner can be found. If an organisation introduces new projects using the same certified methodology, the "new" certification process only takes six months.

The application process for the Clean Development Mechanism is comparable to the voluntary market, except that it requires an additional approval from the National Designated Authority (NDA), must be an approved activity within the NDC, and can only be bought by countries participating in the CDM, making it considerably longer, more difficult, and less certain. Organisations typically go through a 3 to 5 year process, costing roughly \$90,000, plus \$20,000 for annual reviews. Once certified, credits sell for \$10 on average if eligible for sale on international carbon markets such as the European Trading Scheme or the California cap-and-trade scheme and last for ten years. Indonesian GHG reduction projects can register under the CDM or a Japanese – Indonesian partnership called the Joint Crediting Mechanism (JCM) which offers simplified procedures.

Exhibit 8: Comparison between voluntary carbon market and Clean Development Mechanism processes and costs

OPTION 1: VOLUNTARY CARBON MARKET			OPTION 2: CLEAN DEVELOPMENT MECHANISM (CDM)		
	TIME	COST		TIME	COST
Units	Months	USD		Months	USD
Eligibility assessment	1	\$2-3k	METHODOLOGY SELECTION¹¹⁵	less than 12	\$25-115k
Project document drafting	3	\$30-70k	Project document drafting	3-12	\$25-60k
			APPROVAL BY NDAs¹¹⁶	5	Variable cost
Validation by auditor	6		Validation by auditor	6-12	\$10-25k
Registration by the Standard Committee	2		Registration by CDM Executive Board	less than 2	\$0.10/CER for 1st 15k then \$0.20/CER
Monitoring and reporting	6-18		Monitoring and reporting by project	6	
Verification Issuance	8		Verification and Certification by auditor	less than 6	\$7-25k
			CER ISSUANCE BY CDM EXECUTIVE BOARD	0.5	2% tax
TOTAL	2-4 YRS	\$35-70K	TOTAL	3-5 YRS	\$50-\$90K

SHARED PROCESS STEPS	KEY QUESTIONS TO ANSWER
Eligibility assessment	<ul style="list-style-type: none"> Is the project eligible to receive carbon finance? Is it technically and financially feasible?
Project document drafting	<ul style="list-style-type: none"> How does the project reduce emissions and by how much? Why does the project need carbon credits?
Validation by auditor	<ul style="list-style-type: none"> Is the project document in line with activity on the ground and the Standard requirements?
Monitoring and reporting	<ul style="list-style-type: none"> Parameters are monitored, quantified and carbon credits calculated
Verification Issuance	<ul style="list-style-type: none"> Are parameters measured according to protocols / methodology? Are calculations accurate?

Temesi Recycling was the first organisation in Indonesia to apply for and receive carbon credits through CDM for compost production. Temesi processes roughly 30 tons of organic waste per day (10,000 tons per year) and found their compost sales at Rp 1,000/kg (\$0.07/kg) only covered one third of their operational costs. To solve this economic constraint, Temesi received many grants and then went through the CDM certification process, a 40 month process that cost them USD 50,000 to complete. Once certified, they took out a grant for USD 240,000 from myclimate that was paid back over time by getting a carbon price of first USD 22.00 per credit from myclimate and then USD 14.00 until the loan was paid back. Temesi's 10 years with CDM ran out November 3rd, 2018 but they were able to extend getting carbon credits for another five years at a price of USD 8.50 per credit through Gold Standard voluntary market certification, motivating them to develop better local markets for compost. Each credit is equal to emission savings of a mass equal to one tonne of carbon dioxide. Temesi sells roughly 9,000 credits per year through myclimate which is enough to cover their remaining operation costs and set aside a small profit.

Sponsoring voluntary credits, and supporting organisations to apply for them, is one of the most substantial opportunities for the private sector and government to catalyse the processing of large tonnages of organic waste viably.

IV. STRATEGIES TO REDUCE ORGANIC PROCESSING COSTS

Besides choosing cost-effective technology and techniques to transform organic waste, focal organisations used four tactics to reduce their business costs:

1. Community or household self-run processing
2. Barter for land
3. Buy and build equipment locally
4. Engage student and volunteer labour

1.COMMUNITY OR HOUSEHOLD SELF-RUN PROCESSING

Rather than processing organics themselves, some organisations introduce home-based or community-based composting, selling the equipment so that communities can process their own organic waste. Indonesia's **ecoBali**

Recycling makes a profit on organic processing by selling well-tested, do-it-yourself, home composting kits to avoid picking up organic waste in their waste collection service. They make it easy for families to start composting at home by providing a full composting kit, including a composting container, anti-vermin net, kitchen bucket, five compost bags, manure, straw, anti-ant treatment, and worms. The home composting kit cost also includes delivery and installation, as well as an in-person instruction and one follow-up visit to ensure families have all the instructions, equipment, and support they need. A family has full control over what goes into their composting system to create very clean, high-quality compost for a range of applications.

Project STOP collects organic waste from urban areas where households have very little space for composting practices. It also teaches those in rural areas the method of simple trench composting; digging a hole and burying organic waste to enrich soil.

In Mumbai, Bengaluru and Pune, national and local legislation is requiring restaurants, hotels, and bulk waste generators and others to process their organic waste locally. Many organisations, like Stree Mukti Sanghatana, have introduced home composting kits and even biomethanation plants for easy community and business adoption. They have also trained waste picker members on how to manage organic waste, converting it to compost and operating bio-methanisation plants. This gave them an opportunity for additional income to take up processing of waste and provide waste management service for businesses and organisations across the city.

2. BARTER FOR LAND

Rather than processing organics at their own facilities, which takes up considerable space, some organisations have partnered with local farmers to process organics on their land, minimising their transport costs and land needs. Farmers, in return, receive a portion of the compost produced and sometimes a small fee. **Swachha Eco Solutions** has partnered with 24 farmers in Bengaluru, India to compost the organic portion of the waste they collect from residential complexes, apartments, restaurants, hotels, and sports facilities. They pay rent to farmers for the land and the farmers compost the organic waste, generally using a

vermiculture trench composting method with manure from their farms. The resulting compost and fertiliser is shared with both the farmer and the community. To save costs, compost is never bagged— but residents can visit the farms and pick up as much compost as they need in their own containers.

While in operation, **Sr. Compost** in Santiago, Chile, would take residential organic waste to one of several farms or a community garden where the compost is made using vermiculture. Half of the processed compost was then returned to program subscribers while the other half was kept by the community garden and farms for their own composting needs. In return, Sr. Compost received free space to do the composting.

3. BUY AND BUILD EQUIPMENT LOCALLY

To keep costs down, focal organisations strive for the simplest processing methods using equipment that can be sourced or at least repaired locally. This may mean bringing technology into a country from elsewhere and then transferring the knowledge to local ingenuity for manufacturing and maintenance, especially when similar solutions do not exist elsewhere in the country. When **Temesi Recycling** was considering different compost approaches, they chose a relatively low-cost, low-tech forced aeration composting facility and taught local suppliers to make the aeration equipment needed. This involved “inventing” several air flow meters that were manufactured and calibrated locally at 3% of the cost of imported air flow meters. They also developed low-cost butterfly valves at a fraction of commercial valve prices.

4. ENGAGE STUDENT AND VOLUNTEER LABOUR

Many focal organisations have worked with students, academic institutions, and volunteers to run organic processes and to do low-cost research on improving quality and processing steps. **Temesi Recycling** partnered with the Swiss Institute of Technology and other academic institutions to host several students doing their theses on organic processing. The students, with support from Temesi Recycling tested several organic processing options from various composting methodologies to biogas production, black soldier fly larvae, silage and vermiculture. They found that due to the

unique organic waste composition on Bali with its high fraction of temple offerings and low kitchen waste, composting was the most viable processing option. They further refined how to prepare the best possible compost through 100 research batches. The students also tested the effectiveness of various design choices from commercial inoculants, shredding, whether a roof was needed and various temperature and humidity considerations. This produced a great deal of useful and bespoke research at minimum cost.

Some focal organisations receive organic processing equipment, vehicles, facilities and/or land from government and/or the private sector as a springboard to make an operationally viable economically sustainable waste system. Employing the above tactics can make a substantial difference to the profit and loss statements of waste organisations.

V. STRATEGIES TO ENGAGE THE COMMUNITY IN ORGANIC PROCESSING

Motivating households and businesses to sort their own waste is never easy. Some focal organisations, however, have found ways to teach their communities the value inherent in organic waste. They have convinced hundreds to thousands to care enough to change their practices. These three tactics in particular stood out:

1. Build community green spaces
2. Train green curriculum
3. Introduce more fashionable designs

1. BUILD COMMUNITY GREEN SPACES

As part of their composting operations, Brazil's **Ciclo Organico** built a beautiful, free, green space in the middle of Rio de Janeiro, open to everyone, co-located with their composting operations. People can use the space to relax during their lunch breaks, meet up with loved ones, and just enjoy nature outside of the city's busy hustle and bustle. Rather than conduct composting operations out-of-site, out-of-mind, composting is connected with an experience that people value. Residents can directly experience the benefits from the circular processing of waste management.

2. GREEN CURRICULUM

Some organisations incorporate curriculum about

composting and other circular organic processes into school lessons and adult training programs. In addition to **Ciclo Organico's** green space, they host monthly community days. During community days, courses are conducted on how to compost and other environmental practices. Students can then get their hands dirty and engage in the composting process directly - a win-win to the community in learning-by-doing and for Ciclo Organico as a bit of free labour in their composting operations. Through this process, Ciclo Organico gains recognition and advertising, and the community learns sustainable practices for the future.

As part of **Fundación Basura's** experiential “Zero Waste Academy”, attended by 230 students in-person and over 11,000 students online through Udemy online courses, they learn not only how to compost but also how to build their own home composter using common household materials. With this knowledge, home composting is often one of the first steps students take to live a more zero-waste lifestyle.

3. FASHIONABLE DESIGN

Composting equipment is often sold by emphasising technical merit. Some organisations are making composting “sexier” by updating equipment design to create more premium and stylish versions. **Chintan Environmental Research and Action Group**, an NGO in India supporting waste picker rights, is also working on breaking the myths around composting by investing in the aesthetics of composters and in behaviour change through the middle and upper class communities. From surveys and interviews, they realised middle and upper class communities were interested in becoming “greener” but didn't trust traditional pit-style compost systems to work and not smell. They wanted a “nicer looking” composter that matched their aesthetics. Chintan responded by piloting a more fashionable terracotta composter which has since become quite popular.

VI. SELECT ORGANIC PROCESSING TECHNIQUES

The next few pages lay out tested organic processing techniques suitable for low funded organic processing environments some of which are used by our focal organisations. They are to give a high-level overview of different processing

techniques available.

COMPOSTING

The quality of a compost is dependent upon the quality of waste separation, a proper carbon-nitrogen (C:N) ratio (30:1), electrical conductivity (less than 5 millimhos/cm), heat, oxygen, and water content¹¹⁷. The C:N ratio is often achieved through a process of layering equal parts (by weight) of kitchen waste or market waste (nitrogen) and dry leaves and other yard waste (carbon). As kitchen waste is much denser than dry leaves, to reach the same weight, dry leaves can take up a disproportionate amount of space. This can be solved by mixing kitchen waste with sawdust or cocopeat, which both act as a sponge of leachate, working to reduce the amount of overall garden waste needed. To do so, first mix a small amount of waste with cocopeat or sawdust and then mix it with the rest of the organic waste stream, ensuring the sawdust or cocopeat is spread uniformly throughout the waste. With industrial scale composting, however, adjusting this ratio may not be feasible, but the resulting compost should still be fine for most applications.

Heat, oxygen, and water are all important elements to monitor. For optimal conditions, the temperature of a compost should be between 65 and 70 degrees Celsius. The larger the pile, however, the harder it is to control temperature. Larger piles from windrow or aerated static piles can reach 80 degrees Celsius which, while not optimal, does have the advantage of killing pathogens, weed seeds, and insect eggs. However, anything above 80 degrees can lead to chemical oxidation and should be avoided by turning the compost pile or watering it down. The ideal water content should be between 40 and 60%. At 40% moisture content, odours are neutralised and dust is contained. **Temesi Recycling**, a composting facility in Bali Indonesia which processes roughly 30 tons/day of organic material, uses a simple test to gage the water level of a compost: Simply squeeze a handful of compost into a fist; if water droplets are released, it's too wet but if the hand stays dry, it needs more water.

Finally, the oxygen content is monitored with an oxygen meter and should be at least six percent. The best meters, according to Temesi Recycling, are those that use a sensor in acid medium to avoid neutralisation by carbon dioxide¹¹⁸. Oxygen enters through the pores on the surface of the

pile, as well as when pores are filled up with oxygen during the turning process. To increase oxygen content, turn piles more frequently, make the piles smaller, or aerate piles continuously using aeration ducts (most effective). The higher the pile (above 4 metres high), the more likely forced aeration is needed. The best forced aeration uses screen-covered channels housed in concrete slabs and delivers air at below 20 km/hour, using centrifugal blowers (versus axial blowers) that can build up pressure when back pressure increases. Otherwise, aeration pipes can collapse under the weight of the piles or they can become damaged as piles are turned with a front loader. If piles are not on sturdy ground, a more expensive excavator can be used to turn piles.

Compost sieves are used to separate finer compost material from larger lumps and clumps. The smaller the mesh size, the more granular the final compost material. Temesi Recycling

uses 0.9 cm mesh size for compost to be used in nurseries and 0.5 cm mesh size for rice farmers who prefer homogenous compost of a similar size and shape to the granules they use in chemical fertilisers. To go one step further and formulate compost into granules, they combine compost with water and use a locally manufactured disk fertiliser granulating machine fitted with a 4mm sieve.

Composting progresses in stages and at each stage, certain types of microbes enter the pile to do their part. Composting can generally be done outdoors although waste separation, shredding, sieving, and final finished compost are generally done in covered areas.

Beware of 24-hour composting machines. Natural processes take more time and what often comes out of such machines is burnt carbon with harmful electrical conductivity that can damage soil and harm plants.



COMPOSTING - COMMUNITY SCALE (<1 TON/DAY)

1. PLATFORM COMPOSTING



Description – To build a platform, lay wooden logs into a structure on top of 12 cement blocks (or stones) one foot off the ground. Cover logs with woven coconut branches (or palm leaves, or sheeting). Shred kitchen waste and garden waste together and dip shredded waste into slurry of water and cow dung (or yogurt). Stack on platform. Water once and cover with jute cloth to keep in moisture. Leave for 2 months.

Equipment – Shredder, cement blocks, logs, woven coconut branches or other covering, jute cloth.

COMPOST TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
2 months	Outdoor, no roof	1.2 Tons/M ² /yr	Very low	Very low

2. CRATE COMPOSTING



Description – Shred mixed 1-part cocopeat (or shredded leaves) with 3 parts kitchen waste. Layer in milk crate with 2 inches cocopeat on bottom, the kitchen waste mixture, and then 3-4 inches of cocopeat on top. Leave for 25 days.

Equipment – Shredder, milk crates, milk crate stand.

COMPOST TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
30 days	Fully enclosed, indoors (to protect from rats)	4.8 Tons/M ² /yr	Medium	Medium

3. CEMENT TANKS (WITH EITHER MICROBES OR VERMICULTURE)

Description – Construct roughly 3ft high x 3ft wide (any length) cement tanks with slope to help excess water drain through an outlet fitted with mesh. For microbial, on bottom of tank layer shredded dry leaves, then equal parts food and dry waste, mixed with microbes and then put dry layer on top. Turn piles every 2-3 days. Harvest compost after 30 days. For vermiculture, introduce 5 kg of worms with 5 kg of cow dung mixed with compost on the bottom. Then layer mixed kitchen and garden waste, churning every few days. Harvest after 20-25 days.

Equipment – Cement tank construction, shredder, pipe for leachate drainage.

COMPOST TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
20-30 days	Roofing required	2-3 Tons/M ² /yr	Medium-high	Medium

4. STEEL MESH RING COMPOSTING

Description – To build a platform, lay a few cement slabs down and cover with a steel mesh plate (or other covering). Then make a steel mesh ring (3 ft diameter x 2.5 ft high), keeping both the top and bottom of the ring uncovered. Layer bottom with 8-10 inches dry leaves. Then mix kitchen waste with sawdust cutting down moisture significantly and cap off with dry leaves on the top layer. Wrap the ring with gunny sack to avoid contents spilling out. Leave for one month. Then open contents onto ground and let cure for another 2-3 weeks.

Equipment – Cement slabs, steel mesh, gunny sack or other material.

COMPOST TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
60 days	Outdoor, no roof	1.1 Tons/M ² /yr	Very low	Very low

5. STEEL BIN COMPOSTING

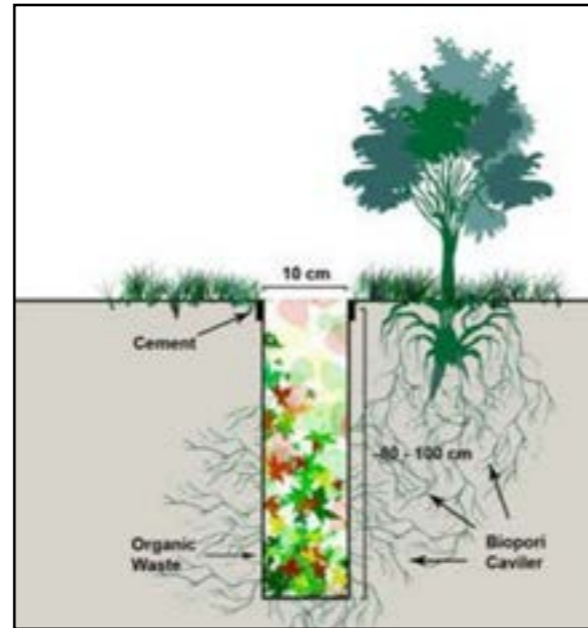
Description – Construct one set of bins for processing wet waste and a second set of bins for curing compost. The first set of bins should be roughly 2ft wide x 2 ft high x whatever length made of stainless steel with holes on all sides to let air in, sturdy wheels, and lids. Place hole on bottom of bin to let out leachate. The second set of bins made can be made of mild steel and are 2ft wide x 1 ft high x whatever length. Shred kitchen waste and mix with sawdust, leaves or wood slivers to absorb extra moisture and place in first set of bins. Once in bin, turn piles once a day for 7 days and leave in sun to cure. After 7 days, transfer to smaller bins for curing. On 15th day, remove compost to dry, sieve and then use in garden.

Equipment – Stainless steel bins, mild steel bins, shredder.

COMPOST TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
15 days + drying time	Roofing required	1.2 Tons/M ² /yr	Medium-High	Medium-High

6. BIOPORI COMPOSTING¹¹⁹

Description – Create a 10cm wide by one-metre deep hole in the ground (or deeper) using a soil auger. Make sure that the pipe distance to the nearest water pipe line (or other lines) is at least one metre to avoid contamination. Place organic waste in hole (this can be done routinely until the hole is 90% full). Cover hole with cap to remember where it is and to strengthen the hole so it's not closed naturally. After a few weeks, compost can be taken out and the hole can be refilled with kitchen waste to begin the process again.



Equipment – Biopori hole digging tool or shovel, hole cap.

COMPOST TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
3 months	Outdoor, no roof	0.4 Tons/M ² /yr	Very low	Very low

7. ROTARY DRUM COMPOSTING

Description – Buy pre-made rotary (in-vessel) composter in appropriate size (sizes range from single household to industrial scale). Shred kitchen and garden waste and add to rotary composter with or without microbial additive. Turn rotary drum evenly. Continue process for 2-3 weeks until compost is ready to harvest.

Equipment – Rotary drum, shredder.

COMPOST TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
40-90 days	Outdoor, no roof	3.4 Tons/M ² /yr	High	Medium

8. TRENCH COMPOSTING

Description – For home trench composting, dig hole 18-24 inches deep by any length and any width. For industrial scale trench composting, dig holes 3-5 metres wide and 2-3 metres deep (any length) and fill with garden and kitchen waste. Put layer of garden waste on top and then backfill with original dirt. Leave for 4-5 months.

Equipment – Shovels, excavator.

COMPOST TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
4-5 months	Outdoor, no roof	0.3-2.7 Tons/M ² /yr	Very low	Very low

COMPOSTING - INDUSTRIAL SCALE (<1 TON/DAY)

1. WINDROW COMPOSTING

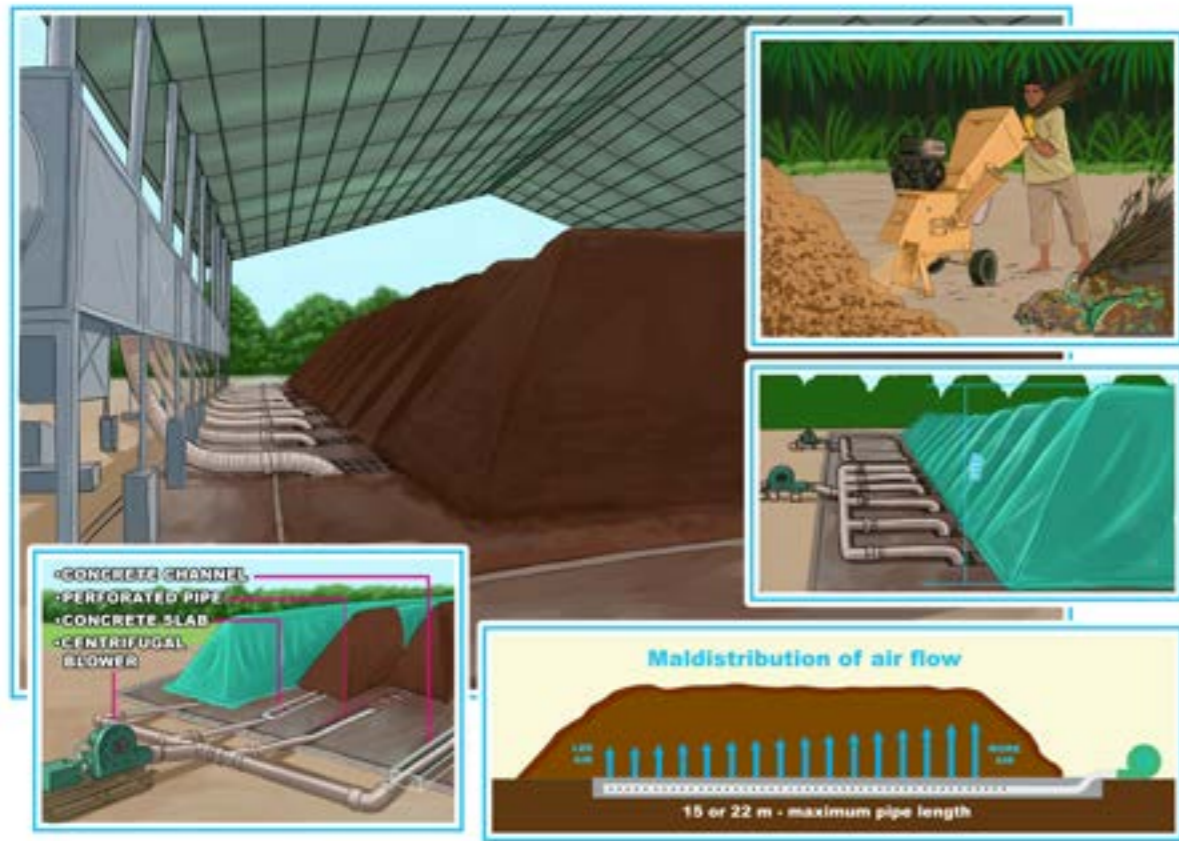


Description – Form piles of organic waste (garden and/or kitchen) of 2-3 metres high, 3-5 metres wide and up to 100 metres long to keep temperatures high while allowing oxygen flow to the centre core. Turn compost piles periodically with a front-end, bucket loader, or tractor (or specialised windrow turner) to circulate oxygen and release heat. Water occasionally. Harvest compost after 5 months.

Equipment – Front-end loader, bucket loader or tractor, sieves, shovels,

COMPOST TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
5 months	Outdoor, no roof	1.9 Tons/M ² /yr	Medium	Medium

2. AERATED STACKED PILE COMPOSTING



Description – Construct concrete foundation with horizontal aeration tubes on surface through which air flows upwards into the waste pile. Organic waste is then shredded and deposited onto this floor similar to windrow composting in piles 2-3 metres high, 3-5 metres wide and up to 100 metres long. The pile is then covered by cloth to keep organic vapours and moisture in while allowing passage of nitrogen, CO₂ and unused oxygen. Water roughly every two weeks.

Equipment – Concrete foundation civil works (if needed), shredder, aeration tubes and fan system, cloth, sieves, excavator, loader, shovels.

COMPOST TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
3 months	Roofing recommended	3.2 Tons/M ² /yr	High	Medium High

OTHER ORGANIC PROCESSES

The two other organic processes explored include biodigestion and black soldier fly.

1. BIODIGESTION

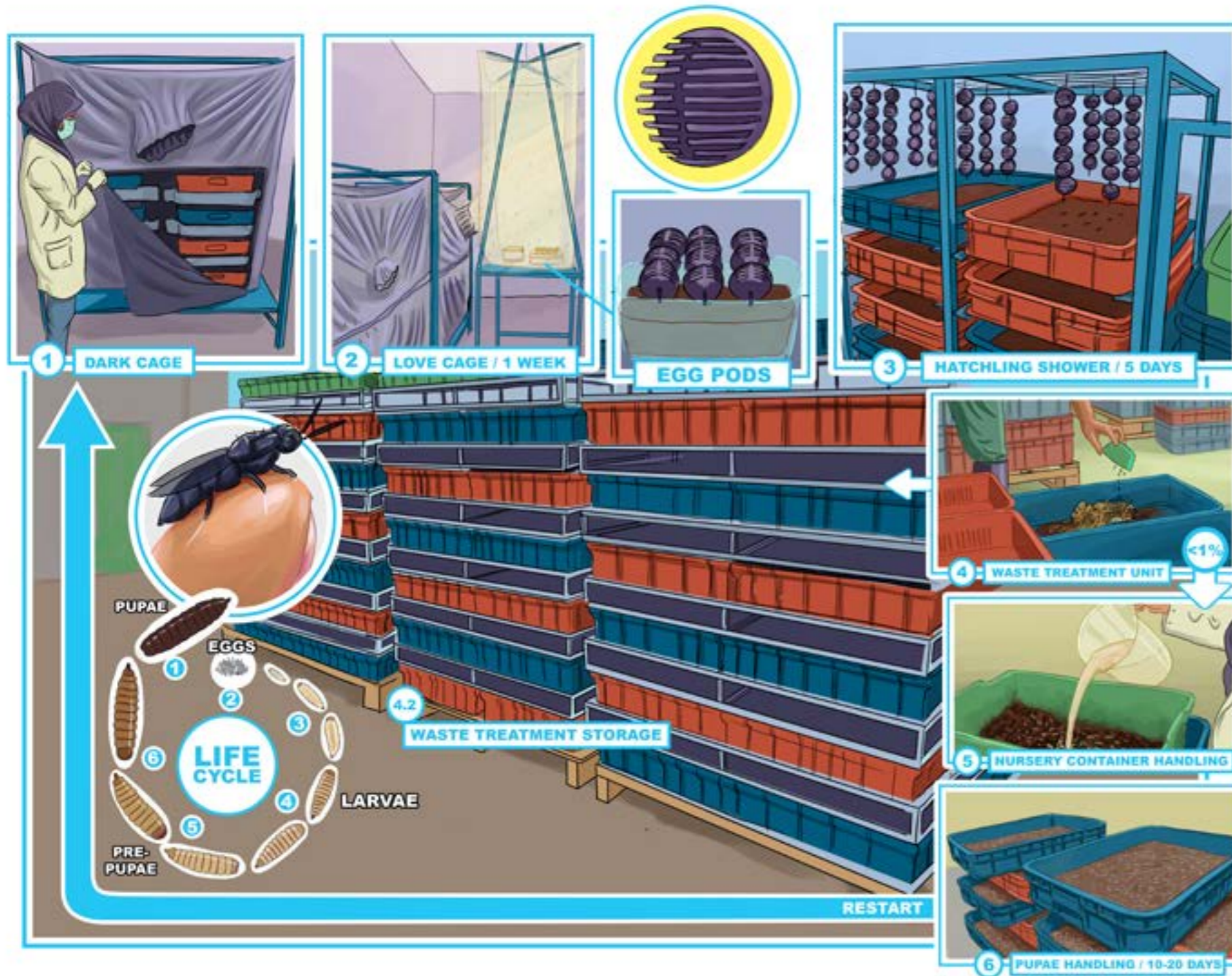


Description – Organic waste is pulverised and added into a digester in an airtight, anaerobic (oxygen free) environment. The bacteria present in the digester then breaks down the waste producing methane and other gases as well as other nutrient rich by-products that can be used as organic fertiliser. This biogas is then pulled from the digester with a vacuum and used for cooking or power needs.

Equipment – Shredder / Pulveriser, two biodigester one primary digester , main digester , storage tank for collecting sludge.

COMPOST TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
30 days	Usually part roofed and part unroofed	4.8 Tons/M ² // yr, 500m ² area to process 20 tons/day	High – capex of \$38,00/ton/day and opex of \$11/ton/day	High

2. BLACK SOLDIER FLY



Description – There are two primary black soldier fly activities - BSF nursery and BSF waste processing:

BLACK SOLDIER FLY NURSERY

Roughly 1% of harvested BSF can be set aside for the nursery. Fresh larvae who have graduated from the BSF waste processing are put into a crate and given water. The crate is then put into a dark cage for 10 days while larvae turns into pupae and then flies. The flies are then moved from the dark cage to the “love” cage using light where they stay for 7 days mating with only water to drink. Each female fly will produce approximately 350 eggs and lay them in hollow places. After 7 days, the flies lifespan is over. When the eggs hatch, the larvae fall down into a crate where they start the BSF waste processing development.

BLACK SOLDIER WASTE PROCESSING

BSF are fed a diet of household and restaurant kitchen food waste and market waste. First the waste needs to be checked for any contaminants and any inorganic materials removed. Waste is then shredded and blended to ensure a balanced diet and moisture content of 70-80%. Shredded waste is then placed in containers with new larvae. After four days, provide the second feeding and after day 8 give the third and final feeding. After 12 days (before turning to prepupae), the larvae are ready for harvesting. Using a sieve (manual or machine), place in sunshine. Larvae will then escape to shaded container through the screen to avoid sunlight.

Fresh, live larvae can be sold (IDR 5,000/kg in Indonesia) or larvae can be further processed into “popcorn larvae” in an oven at not more than 60°C for 15 minutes (temperatures higher than this decrease protein content). Dried “popcorn” larvae sell for IDR 30,000-50,000/kg.

Equipment – Shredder, sieve, containers, wracks, screens.

PROCESS TIME	ENVIRONMENT	LAND REQUIRED	COST	COMPLEXITY
12 days	Closed, ventilated room for rearing, sunlight for love cages and sheltered area without direct sunlight for treatment containers	350m ² for 2 ton/day -- 85m ² for nurseries, 180m ² for 1 tonne treatment, 35m ² for waste receiving, 35m ² for product harvesting, 20m ² for BSF lab and 20m ² for storage	Medium-high	Medium- high

6 Recommendations to Government and the Private Sector from the Frontline

INTRODUCTION

Governments, the private sector, and frontline waste organisations share many of the same priorities. Everyone wants to live in cities that are clean, beautiful, and modern—with robust economies, low GHG emissions, and safe, dignified employment opportunities for all citizens, including the most vulnerable.

While waste management rarely tops the list of government priorities—given pressing healthcare, education, and infrastructure needs—effective waste management is foundational to these goals. It is deeply embedded into every city's economy, sanitation, public health, and social fabric and is a powerful indicator of a government's effectiveness. It is also a powerful job creator in the green economy, improves tourism value, and helps nations reach their GHG national commitments.

Earlier, we explored how rare “best practice” organisations in four countries have managed to overcome five of the most difficult, universal constraints in waste management and have created effective, primarily sustainable enterprises. But what if these constraints didn't exist in the first place?

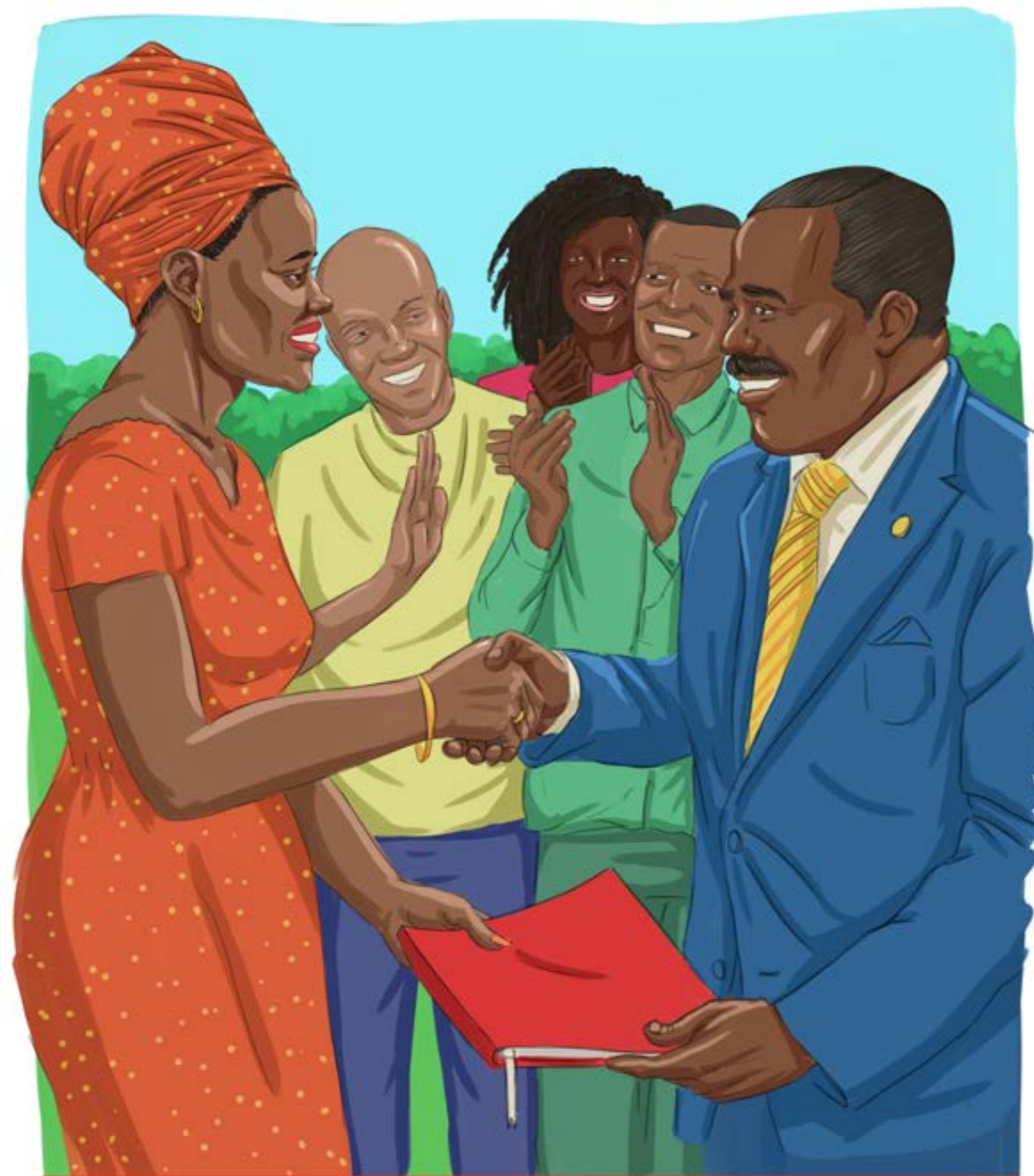
What if, instead, national governments and the private sector made decisions that fundamentally altered how waste systems work, removing the most prominent constraints and building the foundation needed to incentivise and lower the risk for entrepreneurs to invest in the waste system—while making sure market forces were balanced? This would attract investment, spur entrepreneurial solutions organically, and make it easier for existing and future waste organisations to be successful.

After years of working around waste system constraints, many stakeholders are jaded or agnostic about government regulation. Many feel there is a crisis that can't wait for new regulations to be enacted—and think that even with regulation, enforcement is often rare and therefore ineffective. They are also frustrated that private sector investment rarely reaches smaller organisations on the frontline. However, our research has shown that truly game-changing forces like the recognition of waste picker rights and sharing the responsibility of product and packaging end-of-life costs have only been achieved through thoughtful regulation. The difference in waste management outcomes between countries with and without such regulation and proper enforcement of that regulation is dramatic.

This chapter delves into proven systemic investment and regulatory policies that have the most significant impact on improving a nation's waste system and, ultimately, how much plastic leaks into the environment. Recommendations come from the frontline—a voice rarely brought to the debate, but one that is perhaps the most knowledgeable about what it truly takes to fix waste systems on the ground. The system constraints that need to be alleviated are broken into the overarching themes: greater funding levels, and game changing policy and other support.

GOVERNMENT AND PRIVATE SECTOR RECOMMENDATIONS

VITAL LESSONS FROM PIONEERING ORGANISATIONS ON THE FRONT LINE



I. GREATER FUNDING

To materially move towards a more circular resource economy, greater funding levels need to be available at key points along the waste value chain to accelerate change—especially on the frontlines where it is a struggle to access low-interest and philanthropic funding. This section explores the investment points that are the most strategically advantageous, as well as avenues that governments and organisations can investigate for accessing greater levels of funding.

INVESTMENT POINTS THAT WILL DRIVE THE MOST SYSTEM CHANGE

1. WASTE COLLECTION SYSTEMS

The United Nations Environment Programme (UNEP) and the International Solid Waste Association (ISWA) Global Waste Management Outlook estimates that the safe collection of waste and subsequent landfill disposal costs from \$40 to \$70 per tonne of waste in middle-income countries. They also recommend middle-income countries spend 1 percent of gross national income (GNI) in order to achieve 95 percent waste collection coverage¹²⁰.

A waste collection operation requires trucks (or other vehicles), fuel, vehicle maintenance, collection worker and management salaries, tools, facilities (to store vehicles and process waste), and tipping fees for landfill disposal. Many municipalities spend a significant portion of their budgets on waste services (40 to 70 percent) while others, especially in areas with the lowest collection and highest dumping and burning levels, spend less than 5 percent. Indonesia, for example, spends 0.01 percent of GNI (1 percent of the recommended amount)¹²¹ and most municipalities spend 3 percent or less of their annual budgets on waste management¹²² In such economies, there is a gap in understanding about the costs of effective waste management and/or waste management is not a national priority.

To rectify, governments can learn from spending committed towards waste management in best practice countries and set a per resident stipend dedicated to municipalities for waste services and/or mandate a certain portion of municipal and/or village funds to be spent on waste services until adequate funding is available.

When municipalities have adequate funding, they provide waste services for their full communities directly or hire private haulers to do so (fuelling entrepreneurial solutions to waste collection). But when waste services are left to the private sector, for economic viability, waste social enterprises generally collect waste from businesses and high-income households—who are willing to pay the fees required—leaving most of the population to dump, bury, or burn their waste where full-stream municipal collection services are not available. A system that only relies on collecting fees from businesses and high income households and recycling sales, often doesn't serve the rest.

2. CARBON CREDIT SUPPORT FOR ORGANIC PROCESSING

Finding ways to sustainably process organic waste—and thereby keep it separate from the non-organic waste stream—is pivotal to both waste collection and recycling. Organic waste is moist and heavy and therefore is a greater financial and physical burden to waste collection efforts. When organic waste is not separated from recyclable non-organic waste it contaminates that resource, ultimately undercutting its value by up to two-thirds¹²³. Additionally, once in landfill it releases harmful, fast-acting GHG, methane. But when separated, organic waste can be processed in ways that nourish soil, enhance the food chain, and/or provide low-cost energy.

Unfortunately, organic waste processing is rarely economically viable without financial support. The market value of products like compost is usually less than the cost of production. One reason is the products like chemical fertiliser they compete with are usually more effective for short term plant growth and subsidised.

3. RECYCLING INFRASTRUCTURE AND LOGISTICAL IMPROVEMENTS

Imagine a world where every product sold could be reused or recycled locally—or at least introduced into a (reverse) supply chain where it could be recycled economically. For such circular resource management to be possible, waste materials not only need to be technically recyclable, but doing so must be economically viable. This often hinges on whether materials are disposed of in close enough proximity to existing recycling processors, meaning recycling happens primarily in larger metropolitan areas (with capacity to serve surrounding areas). But the further one gets from a recycling hub, the more expensive it becomes to move waste materials—and the less likely recyclable materials will actually be recycled.

RECYCLING HUBS AND SPOKES

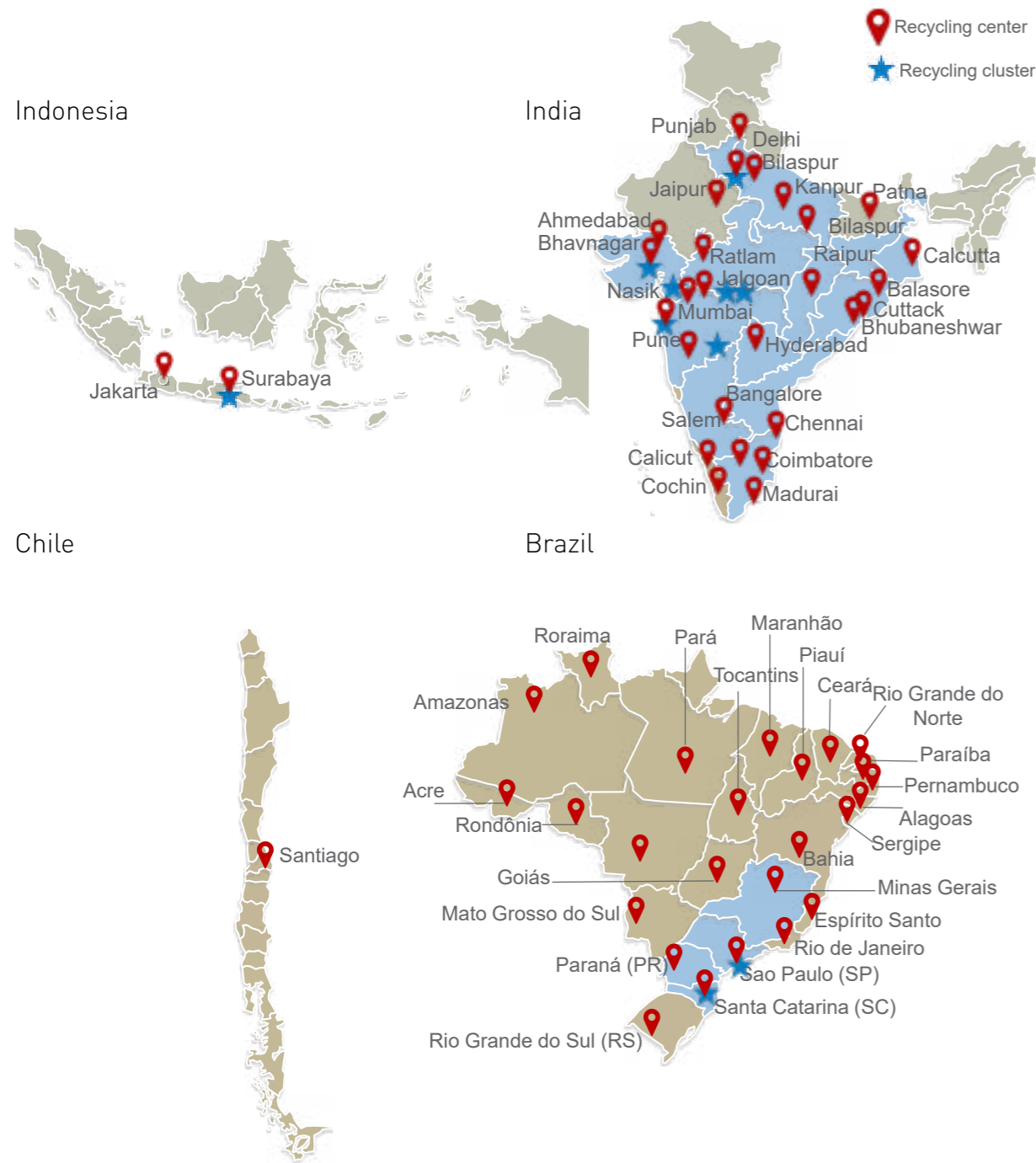
To solve this, governments and the private sector need to invest in a system of regional waste treatment “hubs” with efficient transportation “spokes” and with new hubs located in strategic recycling deserts. Currently, few hubs exist in either Indonesia or Chile, resulting in logistical costs too expensive to justify shipment in large parts of both countries. In Indonesia, most recycling is in either the greater Surabaya or Jakarta areas. In Chile, most recycling occurs in Santiago.

In contrast, India has an estimated 7,500 formal and informal recycling units nationwide. They work near one another, spurring a robust recycling market in virtually every corner of India. The recycling system is so effective for rigid packaging (although far less effective for lower value flexible packaging) that almost 100 percent of disposed rigid packaging and 90 percent of PET bottles are recycled¹²⁵, while in Chile only 17% are recycled¹²⁶. Brazil has more than 1,000 recycling plants spread across the nation.

Sponsoring Clean Development Mechanism (CDM) and voluntary carbon credit schemes — including the organisations that apply for them—is one of the most substantial opportunities for the private sector and governments to catalyse the viable processing of industrial amounts of organic waste. Defined in Article 12 of the Kyoto Protocol¹²⁴, CDMs and voluntary carbon credits allows a country with an emission-reduction or emission-limitation commitment to implement an emission-reduction project in developing countries. Each credit is equivalent to one tonne of carbon dioxide and can be traded and sold, stimulating emission reductions, while giving industrialised countries some flexibility in how they meet their emission reduction limitation targets. Organic waste and the methane released when it decomposes is a substantial source of GHG emissions (often more than 10 percent of a country's total emissions). Organic waste processing into compost, biogas or insect farming or other output, therefore, can be an important lever in reaching national GHG reduction targets.

An example is **Temesi Recycling**, the first organisation in Indonesia to apply for and receive carbon credits through the CDM. Temesi processes roughly 30 tons of organic waste per day and found their compost sales only covered one-third of their costs. To surmount this economic constraint, Temesi went through the CDM certification process (over 40 months at a cost of USD \$50,000). It now sells roughly 9,000 credits per year through the Switzerland-based myclimate foundation. This is enough to cover their operation costs, set aside a small profit, and repay the initial loans incurred to set up the program. CDM credits are an example of an additional revenue stream possible for organisations to capture.

Exhibit 1: Recycling hubs in focal countries^{127,128}



PLASTIC RECYCLING PARKS

One proven way to jumpstart “hub” recycling is through the establishment of special recycling economic zones (SEZs)—also known as Plastic Parks in India—to improve the efficiency and scale of recycling throughout a region. These are plastic recycling and production ecosystems built with state-of-the-art infrastructure, including common facilities that encourage entrepreneurial start-ups to form a cluster of plastic manufacturing and recycling that support one another.

In India, the National Policy on Petrochemicals—formulated by the Department of Chemicals and Petrochemicals (DCPC) and approved by the Ministry of Chemicals and Fertilisers in 2013—set out the terms for the co-investment of Plastic Parks between national and state governments and the private sector. The intention was to support environmentally sustainable growth and job creation for the country at large¹²⁹.

States apply to the national government to establish a Plastic Park. Upon approval, the Indian government provides grant funding of up to 50 percent of the project cost (with a cap of Rs.40 crore/Rs.400 million or USD\$ 5.75 million). At least 26 percent of the remaining funding must be secured from the state government or a state industrial development corporation. The private sector, financial institutions, and beneficiary industries provide the remaining funding.

Plastic Parks are currently under construction in the Indian states of Assam, Odisha, and Madhya Pradesh, and an additional seven states have one or more proposed parks currently under review. With this program, the national government aims to increase India’s domestic production of plastic, improve recycling competitiveness, and create employment for hundreds of thousands of people.

LOGISTICS INFRASTRUCTURE AND EFFICIENCY

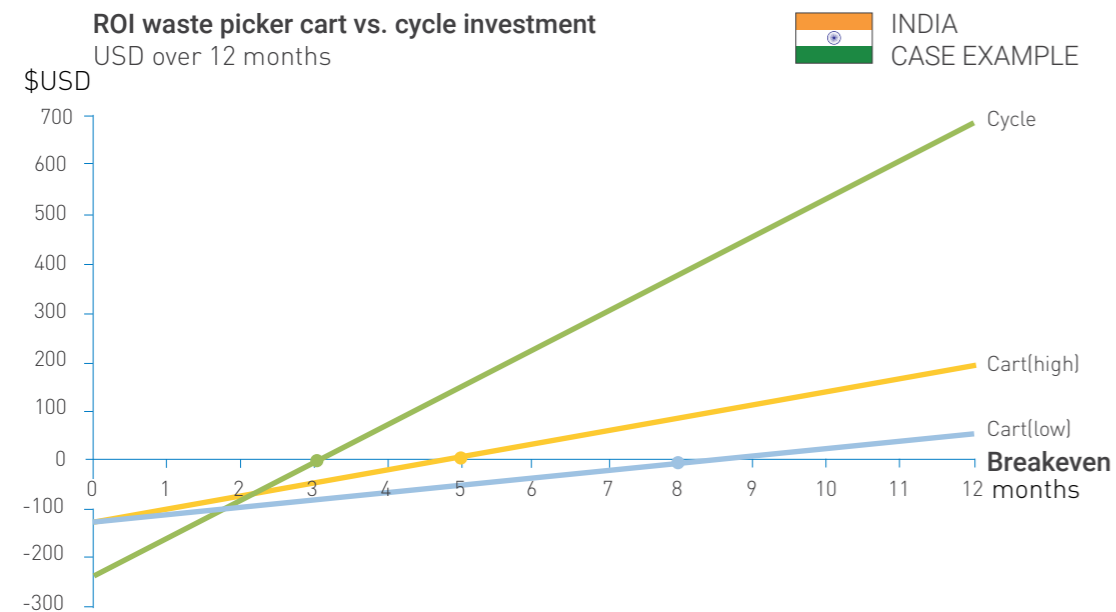
To transport materials to these recycling hubs, investment in infrastructure is needed. By lowering the cost of transport—whether by truck or ship—recyclable materials can travel further and fewer recycling hubs are required. This ultimately allows for greater aggregation of materials that capture economies of scale.

4. MICRO-FINANCING FOR WASTE PICKERS AND JUNKSHOPS

Few low-interest funding options are available to the informal market, yet access to micro-financing can dramatically change the lives of the foot soldiers in the recycling process. For example, a simple investment in bicycles or handcarts (rather than shoulder bags) can increase street waste picker productivity by more than 45 percent. Collecting with a sack on foot confines workers to a relatively small geographic area, forcing them to sell their waste to local junk shops at lower prices. However, carts and bicycles give street waste pickers far greater mobility. Carts allow them to collect and transport larger volumes, even if they are still on foot. With bicycles, they can cover far greater distances and have more options regarding buyers—including the ability to pool materials with other waste pickers and sell materials to aggregators for a higher price.

Hasiru Dala estimates that street waste collectors working on foot using carts collect marginally more than those with sacks by about 50 to 60 kilograms per day, while those with cycles can collect and haul 100 to 200 kilograms per day (depending on access to waste)¹³⁰. Investing in carts and cycles is a simple, inexpensive way to improve street waste picker efficiency. Assuming a cart costs between \$115 and \$145 and a cycle costs between \$215 and \$260, break even time for investment in carts is 5 to 8 months while it is only 3 months for cycles.

Exhibit 2: Return on investment (ROI) for waste picker carts and cycles



Micro-financing need not be limited to waste pickers. Junk shop productivity also increases substantially with expanded sorting facilities, including upgrading to conveyor belts from floor sortation and adding balers to improve transport efficiency. Depending on country and equipment specs, these investments are relatively minimal—between \$5,000 to \$20,000—and return dramatic gains.

Micro-financing can also help both waste pickers and junkshops weather sharp fluctuations in recycled plastics prices, improving their resilience and lessening their dependence on loan sharks with high interest rates.

5. MOONSHOT SEED-FINANCING FOR INNOVATION

While investing in today's recycling systems is important, investment in the technology of the future is critical to creating a new, higher-functioning circular resource economy. Several moonshot technologies are in development that might create a paradigm shift in how we recycle plastics. These innovations include the ability to remove material colour, separate individual layers from multilayer products, and break plastics down to their monomer level so they can be recombined into a virgin quality polymer that can compete with new plastic and be used in any manufacturing application.

However, these ventures struggle because they are forging new ground without precedent. In order to prove commercial viability, investors need to take risks not only in building the first commercial facilities, but also funding the experimental journey of testing, failing, and refining. Waste and recycling is generally a low-margin, high-risk business. Entrepreneurs need encouragement through competitive bids or grants, low-interest loans, and various incubation schemes.

SOURCES OF FUNDING

Nationally supported charge systems for household and business waste collection

An often overlooked but critically important factor in building affordable waste collection services is creating a mechanism to “collect” fees from households and businesses. Local authorities can rarely implement successful cost recovery without the guidance, and regulatory backing, of national and regional governments¹³¹. When forced to do it alone, they often resort to a direct collection system that charges each household and business that requires either fee collection door-to-door on a monthly basis or through a bill requiring payment at a local office. Direct collection systems are notoriously challenging, and rarely effective. It is difficult to reach all users and enforcement of non-payment is expensive, taking a great deal of resources and

is unpopular. Some governments tender out this process to private fee collectors who can achieve higher payment rates but still struggle with many of the same challenges (and given their fees, less revenue is available for the waste system).

Indirect collection fees are generally far more effective. These involve coupling waste collection charges with either utility fees (electricity or water), property or other taxes. The advantage of working with electricity or water utilities is that an effective fee collection system is already in place and piggybacking is less expensive than setting up a separate system, plus there is a much stronger disincentive for non-payment, since losing electricity and waste services for non-payment is a more serious disincentive than only losing waste services. Another advantage is that electricity and water usage rates tend to be strongly correlated with income, which is linked with consumption and disposal patterns. The disadvantage is that it requires an effective public-private partnership—often at the national or regional level—which takes time to negotiate with other departments and sometimes comes with high commission fees.

Property taxes can also work well and do not require paying a commission to a utility provider. However, property taxes are only paid yearly, while waste collection fees are generally paid monthly. Using property taxes requires an annual fee levied for waste services that may not be possible in some low-income communities.

Income for waste collection can also be leveraged through value-added tax (VAT), extended producer responsibility (EPR), tourist taxes, and other municipal and village governmental taxes. Most of these can only be established at the national or regional level, as opposed to the local level, and therefore need to be on the national agenda. For these to be used for waste services, they need to be regulated with guidance from national or regional governments. Otherwise, overarching budgets are often prioritised for other local needs like health care, education, and infrastructure.

Whatever revenue tariff structure is used, it is important that it be introduced to the community thoughtfully—ideally with their input and support. Factors found to be most important to smooth community adoption include realistic justification for the tax, alternatives to the waste system (composting, recycling), administrative simplicity,

gradual introduction, willingness to adapt, marketing campaigns, and community leadership support¹³².

Extended Producer Responsibility (EPR) programs

Governments do not need to solely carry the burden of waste system costs. There is a global movement to share the responsibility for the end-of-life costs of products and to build a more circular resource system. Leading multinational companies are committing millions of dollars for both voluntary and mandatory extended-producer-responsibility (EPR) programs.

EPR is a legislative policy that requires manufacturers and brands to take some financial responsibility for the environmental impact of their products. EPR can bring greater investment into waste collection and the recycling supply chain. Depending on how EPR legislation is structured, it can incentivise product design that emphasises recyclability and creates greater demand for recyclable feedstock, thereby strengthening the entire recycling industry. Of our focal countries, India and Brazil have both enacted EPR legislation, Indonesia has issued a precursor to EPR legislation, and Chile is set to release new EPR legislation in 2019 (see Exhibit 3).

INDIA

India's Plastic Waste Management Rules 2016 (amended in 2018) provide a regulatory framework for the country's management of plastic waste. The rules require that—within three months of publication—producers, importers, and manufacturers who put plastic products into the marketplace must register with the Central Pollution Control Board. Within six months, these producers must establish a waste-collection system to collect plastic products, especially with regards to harder to recycle plastic bags, small multi-layered sachets, and pouches. Their waste collection plan must then be submitted to the relevant State Pollution Control Boards as part of their business license renewal process (or as part of establishing a new business).

Collection can then be done individually by a producer or through waste collection agencies such as Producer Responsibility Organisations (PROs). Results are reported back to the relevant State Pollution Control Boards. However, except

in a few states, the regulation, does not specify the percentage of plastic products that must be collected or the timeframe in which collection must occur. States generally require 20 percent collection the first year increasing to 100 percent over five years. Producers are also required to phase out non-recyclable, multi-layered plastics, unless they can be used for energy recovery (effectively voiding the ban).

The new regulation has incentivised the formation of numerous PROs to help producers meet their legislative requirements. Local bodies and gram panchayats (village councils) are responsible for implementing the waste system in partnership with producers.

BRAZIL

Brazil's National Waste Policy Law (Act 12.305/2010) was its first federal law on waste management. One portion supports the EPR principle of shared responsibility between plastic manufacturers, importers, distributors, and retailers in order to deal with their post-consumer waste. It uses the principle of reverse logistics or "take back," where consumers return their plastic waste to retailers, who then transfer it back to the manufacturers or importers that are responsible for its final recycling or safe disposal. Producers can also pay for the direct collection and return of plastics through investments in central recyclable collection points (Ponto Limpo) or waste picker cooperatives.

The law enacts a voluntary sectoral agreement that contractually binds the private sector to "take back" products they put into the market. Signing the agreement is not mandatory however and the government has struggled to get manufacturers to participate, resulting in significant noncompliance.

To combat this, the state of São Paulo, the largest market in Brazil with 45 million people, now requires EPR compliance as a prerequisite to new and renewed environmental business permits. Manufacturers who don't comply can be fined or even shut down. It's expected that other Brazilian states will follow suit with similar legislation.

INDONESIA

Indonesia's Ministry of Environment and Forestry (MoEF) has issued Government Regulation No. 81, Year 2012, Management of Household Waste and Household-Like Waste—which is broad legislation with three articles (12, 13, and 14) concerning

producer responsibilities. Article 12 requires manufacturers to consciously limit waste generation or produce biodegradable products. Article 13 requires manufacturers to develop a recycling program, incorporate recycled materials into their products, and collect waste from products they market for recycling (either directly or by appointing another party, such as a PRO). Article 14 mandates that producers reuse waste as much as possible.

Article 15 states that more detailed regulation related to Articles 12–14 will be issued by related ministries, though this has not yet occurred. Since no further details have been issued, producers are not required to adjust their practices. Most are operating in a "wait and see" mode. Some environmentally-minded brands like Danone, Body Shop, Unilever, Nestlé, and Tetra Pak are setting an example for other companies and voluntarily practicing EPR, including take-back programs. MoEF has prepared a draft roadmap of plastic reduction by producers and is circulating it with other ministries.

CHILE

In 2016, Chile's government promulgated the Ley Marco para la Gestión de Residuos, la Responsabilidad Extendida del Productor y Fomento al Reciclaje Ley N°20.920 (Framework Law for Waste Management, Extended Producer Responsibility, and Promotion of Recycling; Law No. 20.920). It establishes the general framework for six priority products (PP) for EPR. The first was "out of use tires PP" and recently a "packaging PP" was added.

The government is set to release this decree in the second quarter of 2019. While the regulation is still under development, it seems clear that companies that put plastic packaging materials into the marketplace will be regulated. Producers will be required to create a non-profit organization that will contract services for collecting and recycling materials (including paying fees for this service) from across all regions of Chile. The law will also speak to the inclusion of waste pickers and how municipalities and consumers should play an active role. This framework law also considers eco-design principles, environmental education, and product

labelling.

Exhibit 3: EPR requirements for plastic producers

COUNTRY	REQUIREMENTS FOR PLASTIC PRODUCERS
India ¹³³ 	<ul style="list-style-type: none"> • Within 3 months, register with the relevant State Pollution Control Board. • Within 6 months, develop a plan to collect plastic waste generated from products put into the market. • Submit plan to the relevant State Pollution Control Board in order to renew business licence. • Within 2 years, phase out non-recyclable or non-energy recoverable plastic materials (e.g., multi-layered plastic) unless it can be used for energy recovery. • Maintain records of source of plastics used to manufacture plastic bags, sheeting, or multi-layer sachets. • Report results of collection plan to State Pollution Control Board on successive business licence renewals.
Brazil ¹³⁴ 	<ul style="list-style-type: none"> • Manufacturers, importers, distributors, retailers, consumers, and public solid waste management services share the responsibility for a product's life cycle. • Design, manufacture, and market products that can be reused, recycled, or disposed of in an environmentally positive way. • Collect products after use to ensure adequate disposal. • Frame and implement reverse-logistics systems, including: <ul style="list-style-type: none"> • Establish drop-off points for reused or recycled waste. • Work with waste picker cooperatives to collect reusable and recyclable materials. • Consumers return products to sellers or distributors who in turn return products to manufacturers or importers (who arrange for final adequate disposal). • Keep complete, current records of projects.
Indonesia 	(Framework issued but not yet required of producers) <ul style="list-style-type: none"> • Limit waste generation as routine part of business activities or produce packaging that is easily broken down in nature. • Recycle waste by creating a recycling program, use recycled materials in product production, and/or purchase recycled waste material. • Develop a program to use reusable materials in production and reuse product and packaging waste.
Chile 	(Regulation under development, with Packaging Decrees set to be released in 2019) <ul style="list-style-type: none"> • Create a non-profit mechanism to facilitate waste collection and recycling through Gestores (managers similar to PROs). • Pay fees for proper recycling or disposal of materials. • Ensures collection of materials from all regions of Chile

Extended Producer Responsibility can be a powerful mechanism to not only inject much-needed funding into the waste value chain, but also to encourage companies to transition into designing products that can be economically recycled (or at least collected) in the markets into which they are sold. It can also build demand for more recycled feedstock, thereby lifting the entire recycling market. Nations, both developed and rapidly developing, are at different points in their EPR journey, and much can be learned from the trade-offs they've made, and how individual companies have responded.

Impact investment, philanthropic and multi-donor trust funds

In addition, several nations and multinational companies have substantially increased investment in funds targeted towards reducing ocean plastic and broader waste management solutions.

The table below outlines some of the leading funds across three categories, including **impact investment funds** that require bankable investments and release capital at low interest rates (often using blended finance to attract investors), **philanthropic funds** that provide grants primarily to NGOs, select enterprises, and academic institutions that meet funding guidelines, and **multi-donor trust funds** available to countries that often contract out work to local organisations through tender. Please note that fund details change. Please check fund websites for latest information.

Exhibit 4: External-funding sources for ocean plastic and circular waste management

FUND NAME (REGIONS FUNDED)	FUND HOLDER	SIZE	DESCRIPTION	MAJOR INVESTORS
Impact investment				
The Circulate Initiative (South and Southeast Asia) ¹³⁵	Circulate Capital	→USD\$ 100m	Impact investment fund to identify, incubate, and invest in circular recycling solutions to combat ocean plastic	PepsiCo, Procter & Gamble, Dow, Danone, Unilever, Coca Cola, ExxonMobil Partners (Ocean Conservancy)
Sustainable Oceans Fund (Latin America, Caribbean, Africa, Asia) ¹³⁶	Althelia	→USD\$ 100m	Impact investment fund investing in businesses that harness the ocean's natural capital to generate real assets, build resilience in coastal ecosystems, and create sustainable economic growth and livelihoods. Risk sharing guarantee by USAID which protects 50 percent of any loss from default or market risk.	AXA, Caprock Group, FMO, EIB, IDB, Ecosphere Capital Partners (Conservation International and Environmental Defence Fund)
Sky Ocean Rescue (Europe) ¹³⁷	Sky Ocean Ventures	€25m (€100m planned)	Impact investment vehicle and incubator project supporting entrepreneurs with products and technologies to reduce ocean plastic (e.g., plastic packaging alternatives, new tech to improve recycling rates, efficiency improvements in recycling).	Sky TV Partners (Premier League, National Geographic, WWF, Clean Seas, Project O)
Multi-donor trust funds				
PROBLUE Trust Fund on Sustainable Oceans (Global) ¹³⁸	World Bank	More than USD\$ 100m	Multi-donor trust fund focused on fisheries and aquaculture, marine pollution, development of ocean sectors, and building capacity of governments to manage marine and coastal resources. Governments must request support.	Norway, Canada, Iceland, Germany, Sweden, Portugal, Denmark, France, and the European Union
The GEF Marine Plastics ¹³⁹	Global Environmental Facility	TBD	Multi-donor grant funding focused on system-level ocean plastic reduction through circular design, investment into waste management, and developing country roadmaps.	Thirty-nine countries Partners (UNEP, New Plastics Economy, Ocean Conservancy, GRID-Arendal) ¹⁴⁰

FUND NAME (REGIONS FUNDED)	FUND HOLDER	SIZE	DESCRIPTION	MAJOR INVESTORS
Philanthropic and impact investment				
Global Alliance to End Plastic Waste Both philanthropic and impact investment (Global) ¹⁴¹	Alliance to End Plastic Waste	\$USD 1b (\$1.5b if more members join)	Aim to eliminate plastic waste in the environment, particularly in the oceans through the deployment of plastic waste reduction and management solutions, as well as promoting recycling with four main investment themes—infrastructure, innovation, education, and clean-up.	→25 private sector companies including ExxonMobil, Dow, P&G, NOVA Chem, Shell, and Veolia
Philanthropic funding				
Commonwealth Clean Oceans Alliance (Commonwealth countries: Ghana, Sri Lanka, New Zealand, Vanuatu, Australia, Fiji, Kenya, St. Lucia) ¹⁴²	World Bank	£61m	Grant funding alliance for research, and projects to curb plastic and environmental pollution, improve waste management, and stop plastics from entering waterways at the city-level.	UK Partners (World Economic Forum, Sky, Coca-Cola Company, Plastic Bank, Fauna and Flora International, WWF)
The Incubator Network ¹⁴³	Circulate Capital and Second-Muse	Target of \$20m	Initiative to accelerate solutions concerning ocean plastic waste by partnering with existing incubators to build waste management ecosystems and recycling innovation.	U.S. State Department, Australian Government Department of Foreign Affairs and Trade Partners (McKinsey.org, WeWork Labs India)
Municipal Waste Recycling Program ¹⁴⁴ (Indonesia, Philippines, Sri Lanka, and Vietnam)	USAID via Development Innovations Group (DIG)	\$3.5m	Grant funding of up to \$250,000 to NGOs, private sector companies, associations, cooperatives, and academic institutions to implement municipal waste recycling solutions (with a focus on reducing plastics pollution of the marine environment).	USAID
Plastic Solutions Fund ¹⁴⁵ (Southeast Asia, Europe, USA)	Rocker-feller Philanthropy Advisors	~\$5m	Grant funding of projects aimed at reducing production of single-use plastic and packaging with a focus on how companies deliver products to consumers and how Asian cities manage plastic waste.	Foundations: Leonardo DiCaprio, Overbrook, Oak, Marisla, Oceans 5
P4G Partnerships Fund ¹⁴⁶ (Chile, Columbia, Denmark, Ethiopia, Indonesia, Kenya, Mexico, the Netherlands, the Republic of Korea, Vietnam)	Partnering for Green Growth and the Global Goals 2030 (P4G)	USD \$38.7m over five years	New initiative with the ambition of becoming the world's leading forum for developing public-private partnerships at scale to deliver on SDGs, the Paris Climate Agreement, and advance agriculture, water, energy, and the circular economy.	Denmark, the Netherlands Partners (Global Green Growth Institute, C40 Cities, International Finance Corporation, World Economic Forum, World Resources Institute)
Start-up Chile ¹⁴⁷ (Companies in Chile, but founders can be from anywhere)	Start-Up Chile	Grant size USD \$25,000–80,000	Start-up accelerator in LATAM to ensure Chile remains world hub for technical innovation and to hasten growth of customer-validated, scalable companies that will leave a lasting impact in the Latin American ecosystem.	Chilean government
SWITCH-Asia II ¹⁴⁸ (Funds waste programs in 21 countries including China, India, Indonesia, Mongolia, Philippines)	European Commission	EUR 45.7m Grant size of EUR 1–3m	Initiative to promote inclusive sustainable growth, economic prosperity, poverty reduction, development of a green economy, and transition towards a low-carbon, resource-efficient, and circular economy in Asia.	European Union member states

In addition, Addeesium, Schmidt, Overbrook, the Oak Foundation, and the DRK Foundation regularly fund waste and ocean plastic efforts.

SUMMARY

Countries have options. More government funds can be dedicated towards waste collection, recycling and waste management, sometimes leveraging end-of-life VAT taxes, property, or tourism taxes, or making it easier to do indirect fee collection for households and businesses. The burden can be shared with the private sector through EPR programs or they might reach out to multi-donor trust funds or philanthropic and debt-based funding. Fortunately, more funding is beginning to be earmarked for waste management and ocean plastic curtailment. Governments and investors need to be thoughtful about how to make appropriate funding available across the entire waste value chain in order to reach as many stakeholders as possible.

II. GAME CHANGING POLICY AND OTHER SUPPORT

Along with increased funding, several policies and other innovative programs have proven effective in curtailing pollution and creating more effective waste management systems.

The areas where best practices can have the most impact include:

1. Organic waste support
2. Waste picker inclusion
3. Waste collection support
4. Additional recycling support

1. ORGANIC WASTE SUPPORT

One of the most important actions national governments and local municipalities can take to reduce waste management costs is to incentivise local communities to manage their own organic waste. Collection services can then be provided for only the much lighter and less abundant non-organic waste, reducing what goes to landfill by more than half.

Governments need to use thoughtful regulations to encourage source separation, localised processing of organic waste, and adoption of organic waste products into markets. Only then will organic waste processing become economically viable. This will increase organic waste value and create additional revenue streams, which will ultimately cover more of the processing costs. Focal organisations recommended four government and private



sector actions:

- Legally mandate separation of organic and non-organic material at source.
- Certify the safety and quality of organic products.
- Create a fair market for organic waste processing.
- Subsidise the nascent organics processing industry.

LEGALLY MANDATE SEPARATION OF ORGANIC AND INORGANIC MATERIAL AT SOURCE

While waste organisations sensitise communities to be more responsible with their organic waste, without government mandates these efforts will be confined to environmentally-minded households and businesses and not a city's entire population. However, when governments legislate source separation and support programs to both incentivise and enforce such mandates there is a substantial improvement in the region's waste management performance.

India's Union Ministry of Environment, Forests, and Climate Change (MoEF&CC) issued the Solid Waste Management Rules (SWM) 2016 that served as the foundation for many progressive changes in India's waste management. These rules stipulate a series of requirements, but give municipalities the freedom to choose how their waste systems will be managed—including who will collect waste and how it will be processed. Critically, these rules require all households, businesses, and institutions to separate their waste into three categories before collection—biodegradable (organics), dry waste (non-organic recyclables like plastic, paper, and metal), and domestic hazardous waste (residuals, especially bio materials like diapers, sanitary napkins, and cleaning agents).

While India's SWM Rules (2016) generally supported local, decentralised organic processing, it went further by requiring all hotels and restaurants to not only separate organic waste, but to also set-up composting or bio-methanation processing on-site. Some municipalities in regions like Bengaluru and Pune wrote bylaws that took this ruling one step further and required bulk waste generators (residential complexes with more than 50 households or commercial establishments generating more than 50 kilograms of waste per day) to also provide on-site organics processing. Tax incentives or subsidies to individuals who compost at home or within their communities were also introduced. In Kerala, India, the

municipal government provided households with free composters through a cash subsidy in order to encourage home composting. In this way, community-level composting is not only legally required but incentivised through tax reductions. This resulted in widespread community adoption and thousands of community-run organic waste processing systems across India.

CERTIFY THE SAFETY AND QUALITY OF ORGANIC PRODUCTS

Farmers fear compost may have chemical or heavy metal contamination that will harm their land, plants, and people who buy their products. To build confidence in compost and other organic waste-derived products—such as black soldier fly larvae, worms, and animal feed—governments can establish organic testing centres that offer quality certifications. Ideally, these would also offer training programs to improve quality when contamination is detected. Agriculture or environment ministries can also offer certification. For example, India's Ministry of Agriculture set up laboratories to test and guarantee the quality of compost processed by municipalities and helped compost gain greater traction with farmers.

CREATE A FAIR MARKET FOR ORGANIC WASTE PROCESSING

The market value of compost is usually below its production cost. To build local organic processing that is economically viable for the long-term, compost and chemical fertilisers need to be on level playing fields. Chemical fertilisers are often substantially subsidised, creating an unfair competitive environment. In Indonesia, for example, chemical fertiliser subsidies reduce fertiliser prices by 70 to 90 percent, effectively closing the largest agricultural markets like rice production. Compost producers must then rely on the smaller landscaping market based on hotels, government grounds, and other properties. Governments can change this dynamic by giving composters access to the same subsidies or by removing/lowering subsidies for both in order to create a fair playing field.

Recognising the need to support the nascent composting industry, the SWM Rules (2016), the Indian Department of Fertilisers within the Ministry of Chemicals and Fertilisers co-marketed compost with chemical fertilisers. Farmers received a ratio of 3–4 bags of compost for every 6–7 bags of fertiliser. The Ministry also provided market development assistance for city

compost producers. The Ministry of Agriculture further supported the agricultural adoption of compost by relaxing restrictions in the Fertiliser Control Order to include processing and sales of compost as well as fertilisers. They also ran several compost education campaigns across India.

After these efforts, the average price for organic compost in India ranges between INR 7–16 per kilogram (USD \$0.10–0.23), which is similar to the Brazilian market, whereas in Indonesia, where there is no support, the price ranges from IDR 500–1,000 per kilogram (USD \$0.03–0.07), with suppliers struggling to find any market at all.

SUBSIDISE THE NASCENT ORGANICS PROCESSING INDUSTRY

Consider supporting local organic programs by subsidising equipment or entering into purchase agreements. Indonesia's Ministry of Environment and Environmental Agencies subsidise composting equipment like shredders and sieves for village-run composting programs. These outlays reduce the start-up capital needed. Also, in some Indonesian municipalities, governments agree to long-term compost purchase contracts for government grounds, thereby providing some market stability.

SUMMARY

Without government regulation and enforcement, wide-scale organic processing is unlikely in most countries. However, with regulation, governments can create substantial savings for municipal waste collection programs, materially reduce landfill usage, make progress on emission-reduction targets, and achieve circular resource use of organic waste. Mandating separation of organic from non-organic material at source and supporting CDM and voluntary carbon credits are substantial measures to catalyse industrial-scale organic processing. India has proven that, with regulation and the support of ministries and passionate organisations, whole cities can dramatically change their waste practices. This has resulted in lower government costs, lower emission levels, and healthier soil.

2. WASTE PICKER INCLUSION

Waste picking is an important source of income for the poorest citizens of many developing nations. It touches upon many sustainable development issues: poverty, hunger, health, education, and inequality.

Most stakeholders recognise the importance of protecting waste picker livelihoods. Yet governments also want cities free of standing piles of waste and families living and working in landfills in unsafe conditions. Many celebrated municipal waste efforts—like single-use plastic bans, clean-city programs, and supporting tech-enabled waste start-ups—lead to cleaner, more modern cities. But such successes also reduce the amount of material for waste pickers to collect—which reduces their ability to earn an income.

Ultimately, it does not need to be a choice between supporting waste pickers and professionalising a city's waste system. When these two goals are thoughtfully integrated, municipalities can save considerable costs and transition thousands of waste pickers into healthier, safer, more stable employment while bettering the prospects for their children. By giving waste pickers the opportunity to participate in formal waste collection and sortation, costs can be lower than establishing municipal-led or private-hauler systems—and often more effective because waste pickers can travel on foot and reach otherwise inaccessible areas. But getting to this point requires effort.

True waste picker empowerment necessitates a systemic change regarding their rights, including recognition of their valuable contributions to society and real economic opportunities to participate in a city's formal waste management efforts—the kind of change only governments have the authority to create. When governments recognise waste picking as an officially sanctioned occupation and include them in waste management systems, it heightens their economic and social opportunities. This starts by first sanctioning their current roles and then proactively including them into the formal economy. Much can be learned from the governments of India and Brazil, arguably the two nations that have best-supported waste pickers, having taken strikingly similar steps to move waste pickers from subsistence living to greater opportunity.

In every best practice example, government legislation has been a vital component in improving conditions for waste pickers. Instead of seeing programs that aid waste pickers as charity, what is needed are legitimate mandates that give them the legal rights that will reduce

their economic insecurity. Key legislative actions for protecting waste pickers include:

- Recognise waste picking as a genuine profession within established labour categories.
- Provide occupational identification cards that formally afford the right to access, collect, and sell waste within their region or country, where waste pickers are unidentified persons.
- Task a unit within the national government to secure the rights and welfare of waste pickers.
- Provide protective safety equipment such as shoes, gloves, vests, and sorting tools to waste pickers.
- Promote cooperatives or other types of member-based organisations (MBOs) that will give waste pickers collective agency to advocate for their rights.
- Develop cooperative funding entities that can provide access to low-interest capitalization.
- Provide access to health care, housing, and education.

Both India and Brazil recognised the importance of creating legal bodies to aid in transitioning the lives of waste pickers. Both recognised waste picking as a legal profession, and promoted cooperatives as an important force in fulfilling EPR requirements.

India went a step further and gave waste pickers access to social security benefits and mandated local governments to issue them official occupation identification cards. Waste pickers were also given legal right to access and sell the materials they collected and allowed to participate in municipal collection schemes (but allowed localities to define how this would be implemented).

Brazil, on the other hand, not only gave waste picker cooperatives the opportunity to provide municipal waste collection (and other services) but to make the transition easier they exempted them from having to participate in public tenders. Citizens were also mandated to separate their recyclable waste before donating it to cooperatives (which made the work of waste pickers more efficient) and gave tax cuts to recyclers who procured their materials through cooperatives.

Exhibit 5: Waste picker inclusion strategies in India and Brazil

STEPS TOWARDS WASTE PICKER INCLUSION	INDIA	BRAZIL
Creates legal bodies to support waste picker transition	Second National Labour Commission, 1999 -Encourages formation of waste picker worker boards and social security measures	Decree Pró Catador, No. 7,405 of 2010 -Establishes the Pro-Catador Program, creating the Inter-Ministerial Committee of Social and Economic Inclusion of Waste Pickers
Recognises waste picking as a legal occupation	National Environmental Policy Act (NEPA), 2006 -Legally recognises informal sector collection and recycling -CAG Audit on Municipal Solid Waste in India, 2008 -Encouraged legal recognition for waste pickers, more organised recycling, and better working conditions Unorganised Workers' Social Security Act, 2008 -Gives waste pickers access to social security benefits Solid Waste Management Rules, 2016 -Mandates local governments to issue waste management occupational identity cards	Brazilian Classification of Occupation (CBO), No. 5192 of 2015 -Formerly recognises waste picking as an official occupation
Gives waste pickers legal right to own and sell collected waste	Government of India Urban Development Department Guidelines, 2010 -Waste pickers given legal right to access and sell recyclable materials	
Entitles cooperatives to collect municipal waste and serve other parts of the waste value chain	Maharashtra Government Resolution, 2006 -Empowered waste pickers to become formally integrated into waste management, though left it to states to determine which roles they would play and how the integration would take place	National Policy for Basic Sanitation, No. 11.445 of 2007 -Encourages waste picker cooperatives to collect, process, and commercialise waste while exempting them from public bidding processes to support their transition into formal waste management Law of Policy of Solid Waste, No. 12.305 of 2010 -Includes waste picker cooperatives as waste service collection providers
Promotes waste pickers to provide service meeting company EPR requirements	Plastic Waste Management Rules, 2016 -Includes registered waste pickers in official waste collectors list companies can use	Law of Policy of Solid Waste, No. 12.305 of 2010 -Includes cooperatives as reverse-logistics operators for companies fulfilling EPR mandates
Reduces recycling industry tax when buying from waste pickers		Law of IPI Reduction on Recyclables, No. 12.375 of 2010 -Reduces IPI (industrialised product tax) of recycling industry when buying materials from cooperatives
Requires households to donate recyclable waste to cooperatives		Law of Selective Collection in State Public Agencies, No. 14.470 of 2015 -Directs separation and donation of recyclable materials to cooperatives

While India's national regulations recognised waste picker rights in unprecedented ways, they have generally been written in broad terms and with specific implementation guidelines left to individual states. Some, like the Maharashtra state—home to the **Kagad Kach Patra Kashtakari Panchayat (KKPKP)** and **SWaCH Pune**—have provided exemplary legislation for other states to follow:

- Maharashtra Government Resolution, 1999: Establishes photo identity card system for waste pickers.
- Maharashtra Government Resolution, 2002: Allocates household and office door-to-door waste collection to cooperatives, NGOs, and other organised waste pickers.
- Maharashtra Non-Biodegradable Control Ordinance, 2006: Requires segregation of household and business waste and provides sorting sheds for waste pickers.
- Maharashtra Government Resolution, 2006: Set a 2007 deadline for 100 percent door-to-door collection, with preference given to female waste picking cooperatives.

In contrast, despite Indonesia's high number of active waste pickers (2 to 3.7 million), the nation has not progressed as far as Brazil or India in formally recognising their role. The primary waste management laws of the Ministry of Environment and Forestry do not mention waste pickers. The Ministry of Public Works and Housing does mention them in their regulations (Permen PU 3/2013), requiring that waste pickers be relocated to stop them roaming landfills and city streets. It directs them to find work at sorting centres, known as TPS3Rs and MRFs¹⁴⁹. Waste pickers are also mentioned in a 2017 presidential decree directing the Ministry of Environment and Forestry to create guidelines for waste pickers. The city of Jakarta also has a loosely enforced regulation stating that only registered waste pickers and junk shops can operate within city limits.

Finally, Chile's EPR laws designate certification of waste pickers with cooperation from the Chilean Waste Picker's Movement. A model is being built to internalise the service waste pickers provide to society with fair payment for this service, though Chile's legislation is far behind that of both India and Brazil.

Private companies can also support legislative

steps. Their willingness to enter into fair, legal contracts that sustain the work of waste pickers will help build a better waste management system for all.

SUMMARY

Waste pickers are an asset in creating better waste management systems and ultimately a more circular plastics supply chain. There is a great deal of "informal" institutional understanding and entrepreneurial spirit that can be vital aspects of new paradigms of success—if waste pickers are empowered in the new systems that are created. Legislative mandates and private sector investment are both key to tapping into this potential.

3. WASTE COLLECTION SUPPORT

Collection is the foundation of the entire waste management system and the single most important lever for keeping plastics and other waste out of the ocean. In most countries, each municipality is responsible for its own waste management. In fact, a city's cleanliness and waste management effectiveness indicate the strength of its overall governance. Running an effective waste management system has many interdependent parts, from effective city ordinances to cost recovery through an effective tax collection and/or fee system, diligent and reliable operations, community behaviour change, procurement of vehicles and parts, and—if using private haulers or community groups to provide service—effective public-private partnerships. If any one of these pieces fails, it reduces the efficacy of the entire system.

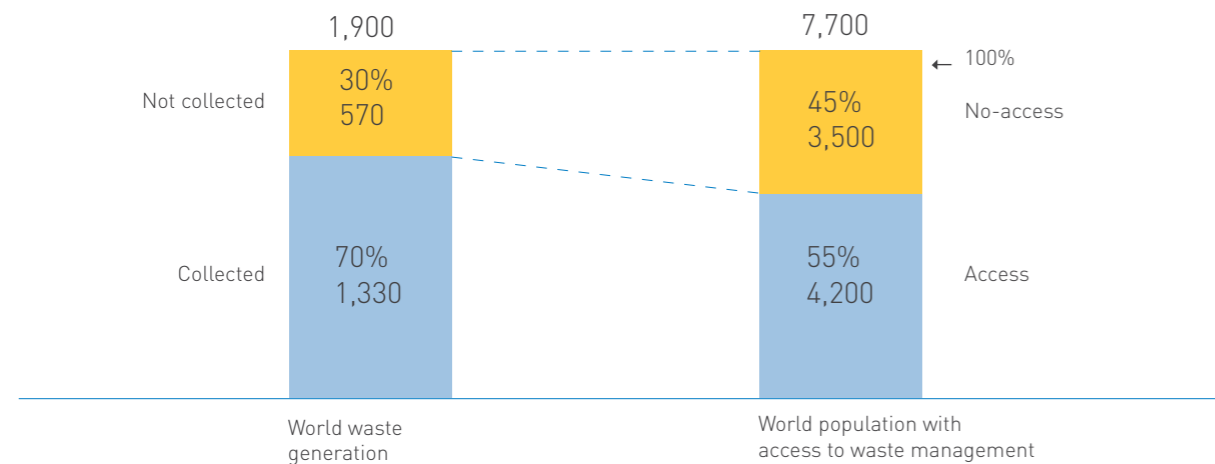
Municipalities often struggle with limited financial resources, lack of skilled and trained workers, embedded corruption, and other administrative setbacks. These make managing waste both an expensive and challenging proposition. Further, waste collection runs at a net cost. The value of the collected mixed waste stream—especially when the majority of high-value recyclables are removed by waste pickers—is too low to offset the cost required to collect, process, or otherwise dispose of the waste. The gap between cost and value results in a disincentive for cities to collect waste—the more they collect, the more they spend on transportation, vehicle maintenance, and landfill tipping fees—and the shorter their landfill lifespan. In addition, many regions lack essential waste management infrastructure, including proper landfills and established recycling processors.

Every year, nearly 2 billion tons of municipal solid waste is generated globally, and of that, an estimated 30 percent is not collected. This results in 570 million tons entering the environment annually from either dumping or burning, a portion of which eventually ends up in the ocean. An estimated 3.5 billion people, 45 percent of the global population, do not have access to waste management services¹⁵⁰.

Exhibit 6: Global waste generation, collection and waste management access levels

Global access to waste management and resulting global waste collection levels

Million tons waste generated globally per year, % collected vs. not collected
No. of people with waste management access, % of total global population



In regions with poor waste management, there are five actions recommended to radically improve collection levels and reduce environmental pollution (especially in countries with the highest ocean plastic leakage):

- Centralise non-organic waste collection responsibility at municipal level (or higher).
- Collect all non-organic waste, not just high-value recyclable waste.
- Support collection programs in rural areas and small- and medium-sized cities.
- Consider hiring waste pickers to provide door-to-door waste collection.
- Leverage waste organisations to help improve waste collection.

CENTRALISE NON-ORGANIC WASTE COLLECTION RESPONSIBILITY AT MUNICIPAL LEVEL (OR HIGHER)

One of the most important actions national governments can take to increase country waste collection levels is to give full responsibility for door-to-door waste collection to municipalities. Economies with the highest waste collection levels generally have more centrally managed waste systems rooted at the municipal level. Examples include the Philippines, Chile, and most developed-market economies. It is easier to provide and control technical training, fund disbursement, and regulation enforcement when waste collection is more centralised. In addition, national governments rarely understand the cost of decentralised systems and seldom allocate enough funding¹⁵¹.

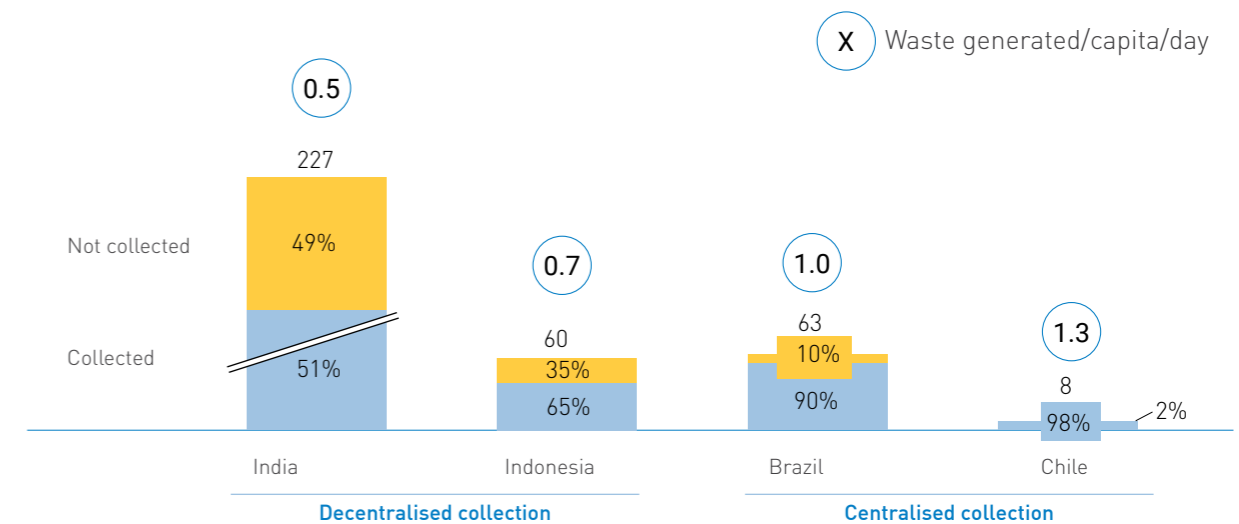
On the other hand, economies with the lowest collection levels generally have more decentralised approaches that are managed on the small community or village level. Both Indonesia and India have decentralised waste collection and low waste collection rates (50 and 51 percent respectively) when compared to Brazil and Chile, whose centralised approaches achieve 90 percent collection (Brazil) and 98 percent (Chile)¹⁵².

In Indonesia, for example, waste collection from public spaces and larger thoroughways is the responsibility of the Regency Environmental Agency (i.e., DLH), while door-to-door household collection is the responsibility of villages of around 2,000-10,000 citizens. There are more than 80,000 villages across Indonesia—expecting each one to have the technical knowledge and ability to set-up and fund its own local collection system has not worked. The result has been less than half of the waste being collected across Indonesia, compared to over 90 percent in neighbouring Philippines.

Exhibit 7: Waste collection levels by country

Waste collection levels by country

Million tons waste generated, % collected and not collected, waste generation per capita per day



Centralised collection though, normally leads to a linear waste system where waste is collected and disposed of at a landfill—destroying value. Some argue for more decentralised waste systems, with intermediary neighbourhood facilities set up for non-organic recycling and organic processing (i.e., MRFs or transfer stations). These can be effective, though it can prove difficult to achieve enough scale to be sustainable. The best approach is a mix of centralised collection and decentralised waste processing, with a broad enough geographic scope that minimum economies of scale are met.

COLLECT ALL NON-ORGANIC WASTE, NOT JUST HIGH-VALUE RECYCLABLE WASTE

Today, investment primarily focuses on high-value recyclable materials like PET, HDPE, and PP. These have value in the recycling market and are therefore collected wherever recycling infrastructure exists. For this reason, less than 20 percent of ocean plastic is composed of these items¹⁵³. The remaining 80 percent is plastics and other waste materials with low if any market value.

But governments and the private sector have options to tackle plastics and other non-organic materials that are not commonly recycled. The most commonly mentioned by frontline organisations include improving the collection levels for the entire waste stream so that all types of plastics are safely disposed of, redesigning materials so they are easier to sort, replacing packaging with more bio-benign materials, setting-up new business models (e.g. refillable alternatives), and implementing new technology that enables more effective processing (e.g. Creasolv for sachets)¹⁵⁴. If these options are not feasible, it leaves cities little choice other than to ban the most problematic packaging formats and materials.

SUPPORT COLLECTION PROGRAMS IN RURAL AREAS AND SMALL- AND MEDIUM-SIZED CITIES

Many small, medium-sized cities (and islands) in rural areas are geographically isolated from recycling markets. They do not produce enough valuable waste to justify the capital costs of developing local recycling infrastructure or transportation over great distances. They also generally have lower tax bases, given population density and the often-lower income of agricultural and fishing economies. Given these constraints, isolated areas generally have the lowest waste collection levels and the highest per capita leakage levels. For this reason, rural areas and small- and medium-sized cities can greatly benefit from increased waste collection support.

CONSIDER HIRING WASTE PICKERS TO PROVIDE DOOR-TO-DOOR WASTE COLLECTION SERVICE

Governments need to solve waste collection issues in rapidly developing economies, yet they do not have the tax base other developed markets have to fund the most modern collection infrastructure¹⁵⁵. What they do have is a vital form of human capital in waste pickers. By giving waste pickers the opportunity to work in formal waste collection and non-organic waste sortation, governments can support their move from dangerous and unhealthy work in landfills to more dignified, healthier work at the front of the waste value chain. Not only is the initial cost lower, but also waste pickers are often more effective because they are able to reach otherwise inaccessible areas on foot (and with an added bonus of creating a smaller environmental footprint). Waste pickers get reliable and legitimate employment while governments tap into a resource that is already there. Governments also support hundreds to thousands of people begin to climb the economic ladder.

The city of Pune, in India, instituted regulations allowing door-to-door collection to be serviced by waste pickers. The **SWaCH** cooperative, comprised of 3,100 workers, was contracted by the Pune Municipality to do door-to-door collection services for 625,000 households (representing about 60 percent of the city's population). The municipality pays for administrative overhead, collection equipment, and safety gear. The waste collection service fee is paid directly by households to waste pickers,

who can keep all recyclables collected. **KKPKP** argues that the municipality cost for the program is considerably less than direct municipal door-to-door collection (e.g., covering minimum wage salaries and benefits, administrative costs, etc.). Still, waste pickers struggle to get some households to pay and there is no recourse if municipalities don't force them to. This contract has elevated the status of waste pickers and legitimised their role within the waste system.

In response to Brazil's national policy on solid waste (PNRS), the local government of **Londrina** in 2008 wanted to formally incorporate waste pickers into the city's waste management system. To recover from the global economic crisis, the waste pickers had already established 32 groups after realising they needed to work together to survive. Rather than employing individual workers, the mayor hired a social worker to liaison directly with waste pickers, helping them form a larger cooperative over a two-year period.

In the early stages, the work was more administrative, but nonetheless important. The majority of waste pickers at the time were undocumented. In order to become formally accepted into a cooperative, they needed to be registered with the government. During regular meetings, waste pickers were taught about the nature of cooperatives, as well as learning valuable self-management skills.

The negotiation of the contract between the city of Londrina and the cooperative of **CooperRegião** took time, with a series of amendments expanding the responsibilities of the cooperative. The first contract was signed in 2010; it was the first of its kind between the Brazilian government and a waste picker cooperative.

The government wanted to exercise caution with its first contract, which clearly stipulated every detail and only covered a small area of the city. Goals were defined that the cooperative had to meet in order to gain more responsibility—and thus a better income. Most of these goals in the early stages revolved around the number of members, service level, and coverage area. Every two months they met to review KPIs and set the next goals. Only after achieving them was the contract expanded and more households covered. As the cooperative matured, they slowly added additional opportunities further outside of the waste pickers' comfort zone of recyclables. The contract started with separating waste materials,

then expanded to municipal waste collection. From 180 houses it has now grown to cover 88,000 households.

The government pays a fixed fee per household served, covers facility rent, the social security tax of each member, and all waste collection operating costs. The cost of recyclable segregation is not covered, but waste pickers keep all income from recyclable sales. Today, their contract covers the employment of 127 waste pickers who enjoy a much higher level of freedom and responsibility. Additionally, there is an enforcement of fines (ranging from 2-6 percent of the contract fees) if contract terms are not met. The self-esteem of waste pickers—now documented citizens and employees of the government—has grown immensely. They have legitimate jobs and a place in society.

Employing waste pickers to collect city waste does come with some risk. If waste pickers do not have access to dedicated spaces where they can sort and store their recyclables, then they will do this in plain sight in the streets. If they are not trained in certain practices and standards, they may not be as professional as formal waste collection workers (wearing matching uniforms, etc.). It has also been found that customers lose sympathy for waste pickers very quickly when they show up late or leave a mess. Therefore, ensuring quality customer service is vital and solid governance and performance management need to be in place.

LEVERAGE WASTE ORGANISATIONS TO HELP IMPROVE WASTE COLLECTION

The focal countries in this study have thoughtful waste legislation and ambitious waste diversion targets, yet implementation can be slow or non-existent. Often municipalities want to comply but lack technical knowledge and funding. Some organisations are trying to fill this gap by supporting local governments with knowledge sharing, funding, and implementation.

The **Mother Earth Foundation** (Philippines) and other zero waste organisations have created outreach programs to help organisations and government in Indonesia implement low-cost collection programs. Their efforts are part of the **Asia Pacific Action Against Plastic Pollution: Reducing Land-Based Leakage of Plastic Waste** in Philippines and Indonesia Through Zero Waste Systems and Product Redesign, which aims to

prevent 14,000 tons of plastic from leaking into the ocean each year while reducing landfill waste by at least 30 percent. To achieve these goals, they've created and tested a 10-step training program for building zero-waste, community-run waste systems (with central government support). Two such programs are being piloted in Indonesia, including **YPBB** (Yayasan Pengembangan Biosains dan Bloteknologi) in Bandung and Cimahi and **Cibunut Berwarna** in Bandung. The Cibunut program has been so successful that residents have reduced their waste generation to 0.08 kilograms per day, far less than the Indonesian average of 0.5 to 0.7 kilograms per day.

Indonesia's **Project STOP** creates partnerships with Indonesian government entities, including the National Ministry of Environment and Forestry and local regencies, and private sector companies and countries like the government of Norway who want to unequivocally reduce ocean plastic. Project STOP uses a "system enabler" approach. A team of experts in waste management, plastic recycling, village governance, business development, and behaviour change help sub-districts and villages design and implement low-cost, circular waste management systems. The new waste systems collect sorted waste from every household and business, transport it to a sorting facility, and capture as much value from it as possible, with any residual waste safely disposed of. Existing local initiatives (and informal waste collectors) are supported and integrated into the new system, with all profits from the sale of recyclables or the processing of organic waste kept in the local community to support collection costs, salaries, and operating expenses.

The Project STOP team is embedded within the local government for multiple years to provide sustained implementation support across every facet of a city's waste system. They also provide catalytic funding for collection and sorting equipment, community behaviour change campaigns, clean-ups, and transitional operating costs. After the new system is institutionalised, the team hands over all assets while remaining available for light-touch support as needed.

SUMMARY

The starting point of any waste management system is collection. Without an economically stable method of gathering household and business waste—including ensuring it is not

contaminated with organic matter—everything further along the processing chain breaks down and is, ultimately, superfluous.

Effective waste collection demands a level of resources and technical knowledge that, generally, requires oversight by governmental units of a certain size. This usually is best handled by municipal governments, as opposed to village or rural entities that do not have the necessary resources. National governments can institute requirements—especially regarding collection of waste that is not high-value—and provide budgetary support, but day-to-day management should be focussed on larger municipalities that can act as hubs in a national system.

There are several ways to support affordable waste collection models, including using waste pickers to do door-to-door collection and tapping into the resources provided by private organisations that can bring technical knowledge to bear on local challenges.

4. ADDITIONAL RECYCLING SUPPORT

In earlier sections, we explored multiple ways government and the private sector can support the recycling industry, including building additional recycling hubs in waste deserts; providing access to low interest, philanthropic, and equity funding at key points in the recycling value chain (i.e. recycling and logistics infrastructure, micro-financing, moonshot innovation seed financing); and launching EPR to support waste collection, recycling, and accelerating circular manufacturing decisions. In addition to the levers already explored, frontline waste organisations express a need for:

- Regulation to exempt recyclers from paying VAT
- Thoughtful product design
- Greater market demand for recycled feedstock
- Waste and ocean plastic business incubation
- Ban on oxo-degradable additives for plastics

REGULATION TO EXEMPT RECYCLERS FROM PAYING VAT

Value-added tax (VAT) is an important mechanism for governments to gather funding from economic activity in order to support their budgetary needs.

While variations exist between nations, generally sellers charge VAT to buyers on items purchased and then forward it to the government. If buyers are not the end users, but rather middlemen in a longer production process, they can deduct the VAT from the next set of buyers, thereby treating VAT as a deductible cost of their business operation.

But this process breaks down in the recycling sector. First, products have already been taxed when purchased. When they are thrown away and collected for recycling, governments often leverage a new VAT on the recycler of the materials. However, waste pickers and many others in the early stages of the recycling chain are not tax registered. They sell materials for cash, without leveraging a VAT, then recyclers higher in the chain must pay it without being able to make a deduction.

This has several ramifications. Many recyclers try to operate under the radar to avoid VAT payment. Without knowing of their existence, governments cannot monitor their social and environmental conditions, such as child labour and lack of treatment for wastewater. For those recyclers that do pay VAT, the price being paid for recyclable material at every stage of the value chain is thereby lowered. Recycling is a commodity market with stiff competition from virgin materials. Recyclers cannot charge their buyers more to make up for the additional VAT, so they need to decrease their costs to deal with the difference. When recyclers lower the price paid to distributors by 10 percent for VAT, it ripples down the value chain, resulting in a price reduction of 30 to 50 percent paid for materials collected by waste pickers (who are often living hand to mouth). This not only affects their livelihoods but ultimately the overall national recycling rate.

Brazil has thoughtfully addressed this issue with its Law of IPI Reduction on Recyclables, No. 12.375 (2010), regulated by Decree 7,619/2011, which requires recyclers who buy waste materials from cooperatives of at least 20 individuals to be exempt from paying IPI (industrialised product tax, Brazil's version of VAT)¹⁵⁶. The tax credit applies to materials made from plastic, paper, glass, iron, steel, copper, nickel, aluminium, lead, and zinc. This regulation both encourages the formation

of waste picker cooperatives and incentivises recyclers to work with them.

Frontline organisations request that governments in other nations enact similar regulations exempting the recycling sector from VAT. This protects the prices paid at the lowest levels of the value chain and sets the foundation for better transparency in the usually opaque informal recycling industry.

THOUGHTFUL PRODUCT DESIGN

Frontline organisations struggle to sell waste materials made of multiple components or with designs that are too small or unique. Currently, only 14 percent of plastic is recycled worldwide¹⁵⁷. But the Ellen MacArthur Foundation estimates that 70 percent of existing plastic packaging could be viably reused or recycled. They believe the remaining 30 percent could be thoughtfully redesigned or replaced with bio-benign materials¹⁵⁸.

One of the focal organisations, TriCiclos, has developed a tool that helps consumer packaged goods companies (CPGs) redesign their products for easier recyclability. Their Recyclability Index (Índice de Reciclabilidad, RI) provides the probability of an item being recycled in a particular region. Working with the Sustainable Packaging Coalition, the New Plastics Economy, and McDonough Innovation, they've mapped local product recyclability and product materials for more than 14,250 stock keeping units (SKUs) in Chile, Brazil, Peru, and Colombia. This gives the approximate percentage of products sold into a market that will be recycled. The RI considers materials used, how easy it is to identify and prepare them for recycling (e.g., washability, compressibility, oil permeability, ease of disassembly, etc.), and the existing recycling infrastructure and supply chain of a particular region.

A product's RI is a fast, intuitive metric for both CPGs and consumers to evaluate product options, thereby leading to more sustainable consumer choices. When people and businesses are given intuitive tools to evaluate options, they generally make more sustainable choices. Many

multinational CPGs operating in South America are now using it to prioritise which packaging formats to redesign and identify characteristics necessary for more recyclable packaging (TriCiclos also offers a redesign service). These companies also use the RI to report their progress on recycling their products, as required by the new EPR legislation.

TriCiclos is also designing a consumer app that lets users scan a barcode and view the RI of products while shopping. So, if one yogurt brand has an RI of 10 (i.e., 10 percent of packaging will be recycled), while another brand has an RI of 80 (i.e., 80 percent of packaging will be recycled), it's an easy choice. The app also offers the opportunity to shop for products with the highest recyclability index and record sustainability choices for further analysis. Perhaps one day all products—at least in large metropolitan areas—will have an RI score printed alongside their ingredients label, making for quick and easy product evaluation.

The RI index incentivises manufacturers to design more recyclable products while helping governmental officials, development banks, and investment funds make decisions about locating new recycling infrastructure. It can also be used to help governments evaluate various policy options, such as product design standards, product bans, and EPR legislation.

Another important and powerful tool for designing more easily recyclable products is material-type labelling. While U.S. consumers and recycling stakeholders are familiar with the plastic types 1 through 7 being clearly stamped on packaging, this system is not commonplace in developing economies. Instead, waste workers have to identify plastic by familiarity with the product, feel, and sound.

GREATER MARKET DEMAND FOR RECYCLED FEEDSTOCK

When waste has enough value in the market it will be collected. High market demand creates incentives within the economic system that entrepreneurial forces will respond to, sometimes

in ways never imagined. It is critically important that recycling markets be built for not just today's higher value plastic materials but also flexible, multi-layer, polystyrene and other "low" value materials or they will continue to leak into the environment. This may require premiums to be paid on collected materials beyond commonly recycled materials like PET, PP and HDPE rigids.

While replacing virgin plastics with recycled ones can be complex, many leading multinational producers of consumer packaged goods feel up to the challenge. In fact, many companies like Danone¹⁵⁹, Unilever¹⁶⁰, and Nestle¹⁶¹ have made strong public commitments to develop products that can be easily recycled while incorporating ever-greater quantities of recycled materials into their products and packaging.

WASTE AND OCEAN PLASTIC BUSINESS INCUBATION

Many waste businesses struggle to gain access to low-interest loans and philanthropic funding, and low profit margins and limited cash flow makes it a struggle to scale up quickly. Even if they have viable business models, often their financial needs are below the minimum funding thresholds that social impact funds and development banks prefer. They can also struggle to communicate their business models in ways that are credible to potential investors.

On the other side, investors often complain that there are not enough "fundable" projects. To get around this dilemma, government and the private sector can help waste entrepreneurs develop fundable, sustainable businesses and gain access to interested investors. Several waste and ocean plastic incubation programs have emerged in the last few years; some launched by government and others supported through a mix of private sector, donor, and government funding.

Designed to position Chile as the hub of innovation in Latin America, **Start-Up Chile** sponsors over 1,600 start-ups (between 200–250 per year). Companies are not only given access to training, mentors, potential investors, and a rich entrepreneurial network, they are also granted equity-free financial support. Seed funding of up to USD \$25,000 is available to women entrepreneurs, while up to USD \$80,000 for companies with a functional product and early validation. In addition, already successful companies with expansion plans in other parts of Latin America (or globally) are eligible for

funding of up to USD \$60,000. Start-Up Chile even encourages foreign entrepreneurs to consider starting businesses in Chile with a free one-year visa and access to funding. Two innovative Chilean focal organisations interviewed, **Bureo** and **Fecunda Patagonia**, began as part of Start-Up Chile.

Today, more than 4,500 entrepreneurs from over 1,600 start-ups have gone through the program as Chile pursues its goal of becoming the hub of Latin American innovation. Since the program's start in 2010, similar programs have launched in over 50 countries around the world.

There are a number of international incubation programs that can be accessed by those driven to create better waste management systems. For example, **Think Beyond Plastic** accelerates the circular economy for plastics by harnessing the forces of innovation and entrepreneurship¹⁶². It leads a multidisciplinary effort to identify and commercialise innovations from each segment of the plastics value chain and to connect industry and investors to the innovation ecosystem. Innovators come from all around the world. Of particular focus are bio-benign materials, green chemistry, and innovative product delivery systems. It operates an innovation centre and network of regional user facilities. The flagship facility is in California, with satellite locations in Germany, Southern Europe, and elsewhere in the United States.

Circulate Capital and **SecondMuse** launched the Incubator Network by Circulate Capital and SecondMuse in October of 2018. It is a multi-million dollar entrepreneur incubation program funded by the U.S. State Department, the Australian government, international consumer-packaged goods companies, and resin producers. Their goal is to help businesses in countries with the highest leakage issues to reduce ocean plastic¹⁶³. Starting in India and Indonesia—and then expanding to Vietnam, Thailand, and the Philippines—the scheme will join forces with existing incubation programs to quickly bring greater levels of funding to local entrepreneurs.

Also in October 2018, **Enviu** joined forces with **Greenpeace**, **gaia**, **#breakfreefromplastic**, and **Impact HUB Jakarta** to start the Zero Waste Living Lab, a venture creation program aimed at building disruptive business models in Indonesia to curtail single-use plastic and reduce pollution¹⁶⁴. The three-year program, initially

focused on the Indonesian cities of Surabaya and Bandung, Indonesia, employs three main strategies—incubating existing early-stage businesses, replicating successful international business models, and creating innovative new models.

These incubation programs can serve as a bridge between frontline organisations and investors. They can also help organisations think bigger and amplify their impact in the areas of greatest need.

BAN ON OXO-DEGRADABLE ADDITIVES FOR PLASTICS

While oxo-degradable plastics are lauded as an environmental solution to today's plastic challenges, studies have found they take longer than claimed to degrade in the environment, fragment and contribute to microplastics and can disrupt recycling systems. Such materials go against two of the Ellen MacArthur Foundation's core principles of the circular economy - "designing out waste and pollution, and keeping products and materials in high-value use"¹⁶⁵. Through the Ellen MacArthur Foundation, 150 global organisations endorse banning oxo-degradable plastic materials and many smaller frontline organisation share this motivation.

SUMMARY

There are a number of private and governmental schemes being developed to provide additional support to the development of better recycling systems. These include focusing on design issues to improve efficiency throughout the waste stream chain, developing incentives that create greater economic demand for recycled feedstock, and ways to provide support to new and expanding businesses in the waste-processing sector. Both national governments and private foundations are recognizing the need to support and expand recycling in the face of global pollution issues, including curtailing the accumulation of plastics in the oceans.

III. CONCLUSION

National governments and the private sector have the power to holistically solve the most difficult problems facing low-funded waste systems. They can make decisions that will fundamentally

alter how waste systems work, removing the most prominent constraints and building the foundation for entrepreneurial investment. This will make it easier for all frontline organisations to be successful, regardless of where they are located, and enhance the possibility of more circular waste systems.

Supporting collection, recycling, and organic waste systems will lead to greater amounts of material being collected, processed, and not dumped into the world's oceans. Governments and businesses play an integral role in this transition. They need to act to support waste pickers, entrepreneurs, and the organisations that are leading the way in transforming the marketplace.

Waste management is one of several priorities that face governments and societies as a whole. Education, healthcare, infrastructure, climate change mitigation, and a host of other priorities demand attention. But investing in waste management is not only a powerful good in and of itself— it is one that will increase the quality of life for citizens. Building more robust waste systems will also have a number of positive spin offs for governments, including acting as a job creator in the green economy, improving the tourism value of a locale, serving as an indicator of government effectiveness, increasing the liveability of cities, and helping nations reach their GHG national commitments.

For the private sector, supporting better waste systems can improve bottom-line operations by curtailing waste in the production process and capturing value from materials that would otherwise be lost. Strong public support can also build a company's reputation, underpinning its advertising and brand building.

For these reasons—as well as bettering the environment and saving the oceans from the toxic accumulation of plastics—governments and private entities can and should invest in building better waste management systems all around the world.



7 Appendix

ORGANISATIONAL PROFILES

SELECTING BEST PRACTICE ORGANISATIONS

Featured organisations were initially chosen based on their proven ability to solve one or more of the five “base” challenges studied - changing behaviour at scale, waste picker inclusion, affordable collection, recycling plastics economically and/or processing organics without a loss. Organisations were then visited and further prioritised based on field observations. The criteria we used are outlined below:

Changing behaviour at scale	<ul style="list-style-type: none"> • More than 75% of the community served separates its waste • Measurable change in societal views • Measurable change in private sector choices • Measurable change in government legislation
Waste picker inclusion	<ul style="list-style-type: none"> • Waste pickers are part of the waste system (i.e., not only scavenging high-value waste from trash and selling to junk shops) • Waste picker livelihoods have been improved
Affordable collection	<ul style="list-style-type: none"> • Waste collection system that is economically sustainable (this could be through municipal or other subsidy-style support) and ideally in operation three or more years
Recycling plastics economically	<ul style="list-style-type: none"> • 80% diversion from landfill • Sell or process low-value plastics (e.g., thin film or multilayer plastics, fishing lines) • Able to build economically sustainable businesses with strong environmental and social safeguards (and sometimes influence others to)
Processing organics without a loss	<ul style="list-style-type: none"> • Valorising organic waste sustainably

What follows are organisational profiles from most organisations featured in the paper, accompanied by a business canvas outlining their core business design, key activities, revenue model, primary partners, customer base, and unique value propositions.



QUICK FACTS

Name: Bureo, Proyecto Net Positiva
Organisation type: B-company
Location: Chile
Founded: 2013
Operation: Fishing net collection, sortation, processing, re-purposing
Quantity handled: 300 tons
Communities involved: 26
Website: <https://bureo.co/pages/net-positiva>

BUREO'S NET POSITIVA PROGRAM

The company **Bureo** started an end-of-life fishnet collection and recycling program, **Net Positiva**, with community fishermen in Chile. Paying for used fishing nets (or pieces of nets) from commercial and artisanal fishermen, the scheme keeps netting out of the ocean (where it is the most destructive form of ocean plastic to marine life). The nets, generally made of Nylon 6, are transformed into high-value items like skateboards, sunglasses, and Frisbees—or sold to other manufactures interested in using “materials of purpose” (waste that is both traceable and has a story of hope). One of their signature products, the Minnow, is the first skateboard made from recycled ocean plastic.

The company was formed in 2013 by three American engineers who shared a passion for the ocean and wanted to find a way to help save it from plastic pollution. When they realised the severity of the problem of fishing nets being disposed of directly into the ocean, they decided to look for a solution. By realizing that the nets were an abundant resource—rather than a problem—their goal became to collect them

before they reached the open water in order to turn them into something valuable.

Net Positiva works directly with the fishing communities and the industry. Fishermen learn about the harm done by discarded fishing nets and are offered the option to sell or donate their worn gear. There are now agreements with 15 commercial fishing groups and 12 artisanal fishing communities (representing more than 300 tons of nets per year). Money saved due to donated nets is reinvested in the local community or given to environmental organisations. Used nets are sent to Santiago, where they are recycled into pellets (with each step of the process being fully traceable). Final manufactured items can be traced back to the fishing village from which the nets were collected.

Bureo currently has partnerships with more than six companies throughout the United States and South America. Their goal is to collect more than 1,000 tons per year of plastic nets by the year 2020 through expansion into Argentina and Peru.



BUSINESS CANVAS: BUREO – PROYECTO NET POSITIVA

ORGANISATION	Bureo – Proyecto Net Positiva	ORGANISATION TYPE	Benefit (B) Company						
Key partners	<ul style="list-style-type: none"> Fishing community (commercial and artisanal) Companies purchasing recycled social plastic Social impact investors 	Key activities	<ul style="list-style-type: none"> Negotiate with commercial and artisanal fishermen Collect nets at end of life from fishing community Collect, clean, process nets (generally outsourced locally) Sell products through online platform (purchase them at cost from the producers) Sell “social plastic” recycled material to partnering companies in the form of pellets 	Value proposition	<p>Aim: To collect end-of-life fishing nets (the most harmful form of ocean plastic) and create something valuable instead of ocean waste</p> <p>Value proposition: provide fishermen an outlet for their used nets other than disposal in the sea (which ultimately hurts their own livelihood)</p> <p>Provide consumers with products that have been made from recycled materials and can be traced back to source</p>	Waste output	<p>Recycled materials: Plastic pellets</p> <p>Retail products: Skateboards, Frisbees, sunglasses, clothing, games, surf items</p>	Customers served	<p>Fishing community: outlet for nets</p> <p>Consumer product companies: recycled material</p> <p>Consumers: final products (skateboards, frisbees, sunglasses)</p>
Key Resources	<ul style="list-style-type: none"> Online platform Local partners/ managers of outsourced tasks Fisherman community 	Key legislation	<p>REP: Extended user responsibility increasing requirements for end of life certification</p>						
Cost structure	<ul style="list-style-type: none"> Staff salaries Administration costs Purchase of nets and/or donation to local environmental programs Production outsourcing costs in each community, paying local partners to manage production process and supply chain 		Revenue structure						
			<ul style="list-style-type: none"> Retail sale of fishing net-derived products (skateboards, etc.) Sale of recycled fishing net material in pellet form 						



QUICK FACTS

Name: Chintan Environmental Research and Action Group
Organisation type: nongovernment organisation (NGO)
Location: Delhi, India
Founded: 1999
Operation: Quantity Handled: Over 60,000 residences, shops, and estates (and New Delhi railway Station)
Waste pickers inclusion: Over 15,000 through Safai Sena
Website: <https://www.chintan-india.org/index.htm>, <http://www.safaisena.net/>



workers to upgrade their work via the concept of green jobs. Safai Sena offers a range of services, including doorstep collection of waste and training to all members.

Chintan is also working on breaking negative attitudes about composting by investing in composters with improved aesthetics and behaviour change targeted at middle- and upper-class communities. Eighteen learning centres impart training to over 2,300 children of waste workers. Their program **No Child In Trash** is premised on the importance of waste workers' children having decent childhoods.



CHINTAN ENVIRONMENTAL RESEARCH AND ACTION GROUP

Chintan was launched in 1999 to address issues of sustainable consumption and social and environmental justice. Bharati Chaturvedi, Chintan's founder, aimed to address issues of waste picker exclusion and marginalization through a new kind partnership with the informal sector that provides essential services in managing waste to move towards an environmentally and socially just world.

Chintan's main approach involves research and advocacy, environmental governance, addressing issues faced by the children of waste pickers, and building out the capacity of informal waste workers.

In 2001, Chintan mobilised waste pickers, doorstep waste collectors, small junk dealers, itinerant and other small buyers, and other recyclers to form **Safai Sena**, which translates as "an army of cleaners" (formerly named Rashtriya Safai Seva Sangathan). It was officially registered in 2009 with a vision to enable adult waste

BUSINESS CANVAS: CHINTAN ENVIRONMENTAL RESEARCH AND ACTION GROUP

ORGANISATION	CHINTAN	ORGANISATION TYPE	NGO	
Key partners	Key activities	Value proposition	Waste output	Customers served
<ul style="list-style-type: none"> Waste pickers and scrap dealers Safai Sena Foundations National government State governments Media Alliance of Indian Waste Pickers Like-minded organizations Police 	<ul style="list-style-type: none"> Facilitating and Organizing: training workers in the informal waste economy, including waste pickers and junk dealers Collaborative advocacy Campaign for environmental causes Developing micro entrepreneurs Waste collection from households Promote composting Facilitated MRFs, membership organizations, e waste groups etc. 	<p>Aim: Create responsible waste management</p> <p>Value proposition: Use data for advocacy and providing responsible, transparent management services for the entire waste stream</p>	<ul style="list-style-type: none"> Organic: Windrow composting and black soldier fly Recyclables: Handled by waste picker entrepreneurs 	<ul style="list-style-type: none"> Households: collection Private companies: collection and consulting services
Key Resources			Impact	
<ul style="list-style-type: none"> MRFs Published research books 			<ul style="list-style-type: none"> Promoted Safai Sena, which has over 10,000 members Research studies in waste, air pollution, and other environmental issues 	
Key legislation				
<ul style="list-style-type: none"> Solid waste management Rules, 2016 Plastic Waste Management Rules, 2016 Amendment to Plastic Waste Rules, 2018 				
Cost structure	Revenue structure			
<ul style="list-style-type: none"> Staff salaries Facility operational costs (electricity, maintenance) Vehicle costs (maintenance, fuel) Safety equipment Administration costs 	<ul style="list-style-type: none"> Foundations Grants, donations Consulting 			



QUICK FACTS

Name: Cibunut Berwarna (Coloured Cibunut)
Organisation type: Local government, supported by foundations
Location: Bandung, Jawa Barat, Indonesia
Founded: 2015
Operation: Education, collection, separation, composting
Quantity handled: Under 2 tons/day
Households served: Under 300 (less than 1% of city)

CIBUNUT BERWARNA

In 2015, the municipal government of Bandung started a program called **Kawasan Bebas Sampah** (Zero Waste Area). This program aims to provide training and advice to sub-districts in Bandung to reduce their waste in order to decrease the burden on the city landfill. Six sub-districts were selected to implement this program, with Cibunut being one of them.

Cibunut is characterised by its narrow streets, which cars cannot enter. It's also highly populated with significant social and environmental issues. Under a new leader of the sub-district, Om Ibo, things have changed significantly, including the implementing of zero-waste programs.

Many stakeholders were brought into the process, including Tini Martini Tapran, a passionate environmental activist who, at the Mother Earth Foundation in the Philippines, received training in community organizing. Because people in Bandung appreciate creative activities, an awareness program where citizens painted their homes—with neighbourhoods having their own colour and theme—was used to increase citizen awareness of environmental issues and programmes and build community pride.

The program is the inspiration for the name **Cibunut Berwarna** (Coloured Cibunut). The program also implements methods for people to recycle both organic waste and recyclables. Currently the total amount of waste generated in Cibunut is about 161 kilograms per day (from about 2,000 residents). This is an average of 0.08 kilograms per day per citizen, far less than the average for Indonesia (0.5–0.7 kilograms per day per citizen).



BUSINESS CANVAS: CIBUNUT BERWARNA

ORGANISATION	Cibunut Berwarna	ORGANISATION TYPE	Local government	
Key partners	Key activities	Value proposition	Waste output	Customers served
<ul style="list-style-type: none"> • Sub-district leadership • Bandung municipality government • Bandung Cleanliness Corporation • Donors and partners such as local university alumni, companies, etc. 	<ul style="list-style-type: none"> • Promoting behaviour change to reduce waste • Door-to-door waste collection by Mamang Sampah (Waste Guy) • Community and household organic composting • Recycling through waste bank 	<p>Aim: : Reduce waste at sub-district level to decrease burden on city landfill</p> <p>Value proposition: Provide ways to reduce waste locally while increasing social life quality</p>	<ul style="list-style-type: none"> • Recyclables through waste bank (555 kg/month) • Waste collection (832 kg/month) • Compost (225 kg/month) 	<ul style="list-style-type: none"> • Residents of Cibunut subdistrict
Key Resources			Impact	
<ul style="list-style-type: none"> • Private waste collector • Waste bank operators • Organic processing assets 			<ul style="list-style-type: none"> • Reduce waste to landfill to 0.08 kg/day per capita 	
Key legislation	Bandung Local Regulation 9, 2011: Waste Management			
Cost structure			Revenue structure	
<ul style="list-style-type: none"> • Collection worker salary (Waste Guy, 4 workers at Rp 500k/month) • Waste Guy carts • All other costs paid on voluntary basis by community 			<ul style="list-style-type: none"> • Donations from foundations and partners to fund door-to-door education, training, and procuring technology • Primarily volunteer driven without salary 	



QUICK FACTS

Name: Ciclo Organico
Organization type: Company
Location: Rio de Janeiro, Brazil
Founded: 2017
Operation: Collection, composting
Quantity handled: 25 tons/month
Households served: 900
Website: <https://cicloorganico.com.br/>

CICLO ORGANICO

The slogan of **Ciclo Orgânico** is “the destiny of your trash can change the destiny of the planet.” It is a self-sustainable business model providing a unique solution to the processing of household organic waste in Rio de Janeiro, Brazil. Its founder, Luke Chiabi, had been studying different composting methods during his time in university. After several years of perfecting his technique—and with the help of the Shell Iniciativa Jovem program—he decided to launch a business in the Botafogo neighbourhood, using an aerobic composting technique based on microorganisms to divert organic waste from landfill.

Clients of Ciclo Organico pay a monthly fee for the service. For this fee, they get a compost bin, biodegradable collection bag, weekly pick-up service, and two kilograms of compost per month (along with garden seeds and other surprise gifts). Pick-up is done by waste pickers using bicycles; routes have been carefully planned for

optimisation. The organics are accumulated in a common area of the city which serves not only as the composting site, but also as a green space open to the public. The composting process takes approximately 3 to 4 months and compost is bagged, then picked up by clients or sold for a profit.

To date, Ciclo Organico has 900 household subscribers and processes approximately 25 tons per month. Because of its rapid growth—from 300 to 850 households in less than a year—they are currently developing a new location where they will be able to process more than 100 tons per month, with space to eventually process up to 500 tons.



BUSINESS CANVAS: CICLO ORGANICO

ORGANISATION	Ciclo Orgânico	ORGANISATION TYPE	Social enterprise		
Key partners	<ul style="list-style-type: none"> Shell Iniciativa Jovem (start-up phase) 	Key activities	Value proposition	Waste output	Customers served
Key Resources	<ul style="list-style-type: none"> Land Bicycles Composting methodology 	<ul style="list-style-type: none"> Deliver compost bins and biodegradable sacks to clients while providing education on proper separation of organic waste Weekly collection via bicycle Process organics using aerobic micro organisms to produce compost Conduct community days at the composting space, which results in: <ul style="list-style-type: none"> general environmental education demonstration of composting techniques volunteer labour publicity 	<p>Aim: : Help create a community in which trash is a solution rather than a problem</p> <p>Value proposition: Provide an alternative outlet for organic waste, then provide compost, gifts, and community beautification</p>	<ul style="list-style-type: none"> Compost: Aerobic microorganism process, with dry leaves mixed with waste in rotated pyramid-like mounds (also sifted to eliminate plastics) 	<ul style="list-style-type: none"> Households: door-to-door collection and 2 kg of compost monthly (along with seeds and a monthly gift) Businesses/ Condominiums: Collection services
Key legislation	<ul style="list-style-type: none"> National Law of Solid Waste, 12.305\10 			Impact	
		Cost structure	Revenue structure		
		<ul style="list-style-type: none"> Staff salaries (compost processors and bicycle collectors) Operational costs Composting equipment Land Administration costs 	<ul style="list-style-type: none"> Membership fees (monthly fees based on service requested, i.e. frequency of pick-ups and size of buckets) Sale of compost 		



QUICK FACTS

Name: CooperRegião Cooperative
Organisation type: Waste picker cooperative
Location: Londrina, Brazil
Founded: 2009
Members: 127
Operation: Full waste stream collection, sortation, baling
Quantity handled: 350 tons/month
Households served: 78,000 households, 14 public and private contracts
Website: <http://www.cooperregiao.com/site/>

COOPERREGIÃO COOPERATIVE

CooperRegião Cooperative, located in Londrina, was the first waste picker cooperative to hold a contract with the Brazilian government. It gave them formal responsibility for collecting waste from every local household and sorting out recyclables.

Beginning in 2008, the 32 associations of waste pickers in Londrina began discussing the possibility of uniting to form a cooperative. A year later the municipality, acting under the recently approved national policy on solid waste (PNRS), appointed a social worker to work with the associations in forming a cooperative. After providing the necessary training, the cooperative came into being with 20 members from 7 associations. Their goal was to dignify the work of waste pickers, promoting social inclusion and society-wide improvement in proper waste management.

A first contract was signed in 2010. Under it the task of separating and selling materials was laid out. As time progressed, expanded goals and responsibilities were shared by the government, which provided a better income and more room for growth for the coop. Today, CooperRegião performs waste collection, sortation, and sales for more than 78,000 households and holds 14 additional contracts with private and public entities, resulting in nearly 350 tons collected and processed per month, allowing them to provide training and salaries to their current 127 members.



BUSINESS CANVAS: COOPERREGIÃO COOPERATIVE

ORGANISATION	CooperRegião Cooperative	ORGANISATION TYPE	Waste picker cooperative	
Key partners	<ul style="list-style-type: none"> Government University: students perform quality control as part of their studies 	Value proposition Aim: Dignify the work of waste pickers and promote social inclusion for them in their work to improve society through proper waste management Value proposition to government: Provide an integrated and reliable waste management solution for the community, including recyclable waste pick-up and sortation services	Waste output	Customers served
Key Resources	<ul style="list-style-type: none"> Trucks Sorting facilities with conveyor belt, compactor 		<ul style="list-style-type: none"> Sorted and baled recyclables 	<ul style="list-style-type: none"> Government (outsourcing of waste services) Private citizens Private companies and organizations
Key legislation	<ul style="list-style-type: none"> PNRS: national solid waste policy that specifically directs waste pickers to do collection work 		Impact	
Cost structure	<ul style="list-style-type: none"> Staff salaries Facility operational costs (electricity, maintenance, rent) Vehicle costs (maintenance, fuel) Administration costs 		Revenue structure <ul style="list-style-type: none"> Government contract (fee per household served and payment of facility rent and social security taxes of members) Business waste collection fees Recyclable material sales 	



QUICK FACTS

Name: Dois Irmãos Cooperative
Organisation type: Waste picker cooperative
Location: Dois Irmãos, Brazil
Founded: 1994
Operation: Full waste stream collection, sortation, washing, shredding, pelletizing
Quantity handled: 110 Tons/month
Website: <https://www.facebook.com/cooperativarecicladoresdoisirmaos/>

DOIS IRMÃOS COOPERATIVE

The **Dois Irmãos** waste picker cooperative is located 60 kilometres from Porto Alegre, Brazil. It currently employs 38 waste pickers and provides 100 percent of the city’s waste collection. It’s roots date back to 1994, when a local couple with a background in waste management established a waste services entity. In order to obtain an expanded contract that included collection it was reclassified in 2009 into a cooperative.

The goal is to find the right destination for the city’s waste while providing gainful employment for members. With nearly 25 years of ever-evolving contracts with the government and industry partners, Dois Irmãos has come to work not only as a collector and sorter of recyclables, but also a purchaser, processor, and environmental educator.

The primary service is daily collection of source-separated waste produced by the city’s 31,000 inhabitants. This includes organics, recyclable, and non-recyclable material. It is then sorted

at their facility and processed before being sold. The cooperative adds significant value by washing, shredding, and pelletizing waste plastics. The equipment was purchased in part through partnerships with private companies such as Braskem, Ambev, Funasa, and Abipek. By vertically integrating plastics recycling, the coop not only increases the value of their waste materials enough to operate an economically sustainable waste organisation, but also to pay members more than double the minimum wage (very uncommon for these types of jobs in a remote area).

The extra margin also gives them the ability to support their sister cooperatives. In addition to 100 percent collection of their city’s waste, they purchase approximately 15 tons per month of otherwise low-value materials from nearby cooperatives. This provides a market for certain materials that would not otherwise exist. They can also pay above market rates, thereby sharing their prosperity with sister organisations.



BUSINESS CANVAS: DOIS IRMÃOS COOPERATIVE

ORGANISATION	Dois Irmãos Cooperative	ORGANISATION TYPE	Waste picker cooperative						
Key partners	<ul style="list-style-type: none"> Government Industry (Braskem, Ambev, Funasa, and Abipek) 	Key activities	<ul style="list-style-type: none"> Educate community on how to properly clean and separate materials with door-to-door training Collect waste from clients at pre-arranged times Collect, sort, and process materials 	Value proposition	<p>Aim: To find the correct destination for waste produced by the city’s residents while also providing gainful employment for the cooperative’s members</p> <p>Value proposition to government: Provide an integrated and reliable waste management solution for 100% of the community, including full stream pick-up and sortation services</p> <p>Value proposition to other cooperatives: Provide a market for hard to recycle materials and pay above market prices</p>	Waste output	<ul style="list-style-type: none"> Sorted and baled non-plastic recyclables Recycled plastic pellets 	Customers served	<ul style="list-style-type: none"> Government Private citizens Industry partners as purchasers
Key Resources	<ul style="list-style-type: none"> Trucks Sorting facilities with conveyor, washer, shredder, pelletiser, compactor 	Impact		<ul style="list-style-type: none"> Collection of 110 tons per month Stable living for 38 waste pickers Collection services for 30,470 people 					
Key legislation	<ul style="list-style-type: none"> National Law of Solid Waste, 12.305\10: Gives waste pickers the right to carry out collection work 	Cost structure		Revenue structure					
	<ul style="list-style-type: none"> Staff salaries Facility operational costs (electricity, maintenance, rent for compactor, washer, shredder, pelletiser) Vehicle costs (maintenance, fuel) Administration costs 	<ul style="list-style-type: none"> Government contract paying facility rent and utilities directly, in addition to salaries of truck drivers and vehicle fuel expenses (i.e., most operating costs) Collection service fees Non-plastic recyclable Recycled plastic pellet 							



QUICK FACTS

Name: ecoBali Recycling
Organisation type: Company
Location: Bali, Indonesia
Founded: 2006
Operation: Non-organic collection, recyclable sales, teaching, consulting
Quantity handled: 60–70 tons/month
Website: <https://eco-bali.com/>



ECOBALI RECYCLING

ecoBali was founded in 2006 by a group of environmentalists who wanted to do something positive about Bali’s growing waste issues. Their initial goal was to change how people thought about, and dealt with, waste.

Eco Bali provides responsible waste management that leads to a more sustainable lifestyle. They try to empower people to live zero-waste lifestyles by teaching waste reduction strategies, providing tools like reusable bags, and ensuring that what’s left is recycled or properly disposed of in legal landfills. With eco-Bali services, customers are guaranteed their waste will be managed responsibly.

Eco Bali distributes colourful bags to households and businesses (as opposed to plastic bins). Green bags are used for paper and cardboard, red are for glass, metal, plastic, and other non-organic waste. Organic material is not collected, though home composting kits are available for purchase. When bags are collected—roughly once a week—they are brought to a manual sorting station where recyclables are further sorted, cleaned, and baled.

Their certified waste bank program—**Ini Bukan**



Sampah (“This is not waste”)—involves the purchase of recyclable materials from schools and homes. This is in partnership with Tetra Pak, the Body Shop, AQUA, and other brands as part of a voluntary EPR program.

Eco Bali has enjoyed a great deal of success to date, having processed more than 5,000 tons of primarily non-organic waste (reducing landfill loads by 70 to 80 percent through recycling and composting programs). They’ve co-founded **Waste4Change** with **Greeneration Indonesia** in order to scale their model to Java, held more than 2,500 eco-training sessions with households and businesses, and conducted over 300 education training sessions.

BUSINESS CANVAS: ECOBALI RECYCLING

ORGANISATION	ecoBali	ORGANISATION TYPE	Company						
Key partners	<ul style="list-style-type: none"> TetraPak Danone Aqua Body Shop Bali Buda Waste4Change / Greeneration 	Key activities	<ul style="list-style-type: none"> Behaviour change to teach source separation Weekly non-organic waste collection services Sorting, cleaning (e.g., remove labels), and baling of recyclables Waste bank buying of recyclables Guaranteeing safe disposal of residual (only in legal facilities) 	Value proposition	<p>Aim: Enable zero-waste lifestyles</p> <p>Value proposition: Responsible waste management and a sustainable lifestyle on the Island of Bali</p>	Waste output	<ul style="list-style-type: none"> Sorted and baled recyclables Composters (from recycled TetraPak containers) 	Customers served	<ul style="list-style-type: none"> Households: collection and composting Private companies: collection and event management Schools: waste bank NGOs, government: consulting services
Key Resources	<ul style="list-style-type: none"> Trucks Balers Bag system Sorting facility 	Key legislation	<ul style="list-style-type: none"> None specified Tetrapak distribution centre Event waste management Teaching children the three Rs Consulting services 	Impact	<ul style="list-style-type: none"> Collected and processed 5,000 tons of waste Waste reduction of 70–80% Over 300 education sessions Over 2,500 training sessions to households and businesses Over 350 composting units sold Over 18 tons of plastic bags recycled 				
Cost structure	<ul style="list-style-type: none"> Staff salaries Facility operational costs (electricity, maintenance) Vehicle costs (maintenance, petrol) Waste bank recyclable purchases Administration costs 		Revenue structure						
			<ul style="list-style-type: none"> Collection fees from households and businesses Recyclable material sales (from household/business collection, waste bank purchases, and Tetra Pak wholesaler) Retail store (Eco store) with reusable bags, composting units, wine-bottle glasses, bins, recycled roofing tiles Consulting service fees Event waste management 						



QUICK FACTS

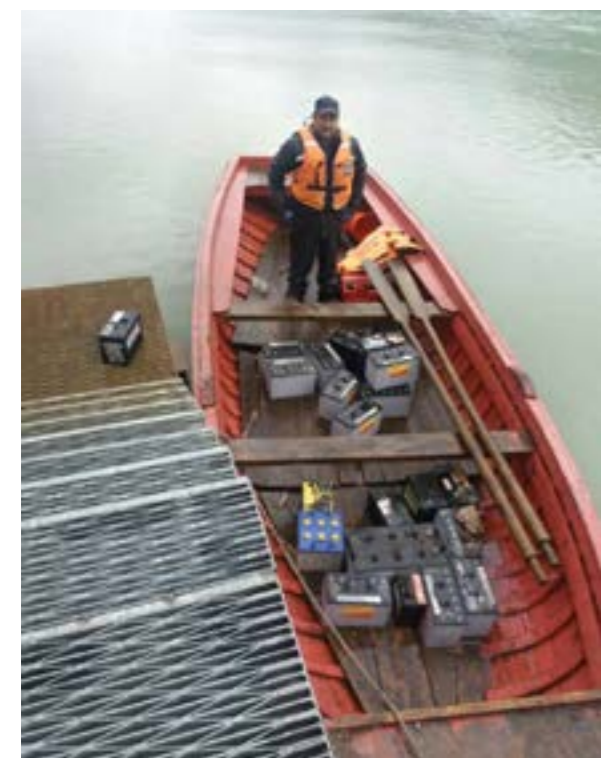
Name: Fecunda Patagonia
Organisation type: Company
Location: Coyhaique, Patagonia, Chile
Founded: 2016
Operation: Education, collection, sorting
Quantity handled: 10–15 tons/month
Website: <https://www.facebook.com/fecundapatagonia/>



FECUNDA PATAGONIA

Fecunda Patagonia is focused on both community education and the collection and sortation of recyclables in southern Chile’s remote Patagonia region. It began when a group of school children were learning about recycling and came to the gloomy realization that no recycling facilities existed in their region. Their mothers decided to take action and open the first recycling collection and sortation point in Coyhaique, Chile, in 2016. Fecunda Patagonia operates the clean point, accepting and sorting high-value recyclable materials from local citizens. They then handle the logistics of sending it to Santiago, over 1,600 kilometres away, for processing.

The goal is to “realise concrete and significant contributions to their community—from technical and human knowledge—in future actions that reflect our seal with environmental and social awareness [by] generating, developing, and executing projects, initiatives, and innovative answers oriented to solve current social problems and environmental issues in the Aysén region of Chile.”



In addition to recyclable drop-offs, they provide recyclable collection services at local businesses and operate a small store where bins, home composters, and environmentally sustainable products like reusable diapers are sold. They emphasise community education about the importance of material separation and cleaning and have reached more than 3,000 students and adults in their two years of operation. Recently a contract with Servicio Natural de Turismo of Chile (SERNATUR) was signed covering environmental education at 14 establishments within the region of Aysén. They have also been heavily involved in several local campaigns, such as the Recycling of Batteries in Aysén, in which 23 tons of used batteries were collected in five days. A campaign to build a supply chain to properly recycle glass is underway.

Because Patagonia, a geographically challenging region with two million people spanning Chile and Argentina, does not have any material processing plants (and is approximately a 30-hour drive from Santiago), logistics is a constant challenge. To overcome this, creative ways are being developed to secure low-cost logistical support from companies who would otherwise be making the trip back to Santiago with empty trucks.

BUSINESS CANVAS: FECUNDA PATAGONIA

ORGANISATION	Fecunda Patagonia	ORGANISATION TYPE	Company		
Key partners	<ul style="list-style-type: none"> Government Cristalerías Chile 	Key activities	Value proposition	Waste output	Customers served
Key Resources	<ul style="list-style-type: none"> Vehicle for material collection Aggregation/ sortation facility with baler 	<ul style="list-style-type: none"> Educate business, schools, and organizations on how to properly clean and separate materials Collect pre-sorted and cleaned recyclable materials from local business and organizations Hold special campaigns to collect specific materials, such as batteries (23 tons thus far) Collect, sort, and bail materials Organise transportation of recyclables back to Santiago Facilitate visits from schools and other organizations to the sorting facilities 	<p>Aim: Increase recycling rate in the Aysén region of Patagonia and decrease landfill volume</p> <p>Value proposition: Offer the community reliable recycling services and environmentally sustainable products</p>	<ul style="list-style-type: none"> Sorted and baled materials 	<ul style="list-style-type: none"> Members: 100 who recycle using clean point Local businesses/ collection services Students: 3,000 educated on environmental responsibility Material purchasers: provided with a new source of material
Key legislation	<ul style="list-style-type: none"> REP: Extended user responsibility law of Chile (waiting to see the effects) 			Impact	
Cost structure	<ul style="list-style-type: none"> Logistics fees to deliver materials to Santiago Staff salaries Operational costs (electricity) Facility rent Administrative fees Leasing costs (vehicle, compactor) Vehicle cost (maintenance, petrol) 		Revenue structure		
			<ul style="list-style-type: none"> Business collection fee (fixed model varying by the number of collection trips per month) Recycling material sales to buyers in Santiago Funds raised from government sponsored contests Contract with agencies to conduct environmental trainings Sales of environmental products at retail store 		



QUICK FACTS

Name: Fundación Basura
Organisation type: Non-profit
Location: Santiago, Chile
Formed: 2015
Operations: Waste consulting, education, public policy, event waste management
Community reached: Over 15,000
Website: <https://www.fundacionbasura.org/>

FUNDACIÓN BASURA

Fundación Basura is a non-profit founded in 2015 in Santiago, Chile. It focuses on raising community awareness that that trash does not exist—that in nature there’s no such thing as trash. Founder Macarena Guajardo, while living in Germany, was inspired by the cultural movement happening there towards the revalorization—rather than simple disposal—of waste.

She created a website dedicated to ways trash can be reused in architectural design and art. Upon returning to Chile, she took her passion one step further and began urban interventions to raise awareness about waste issues. Eventually, the idea was transformed into a more comprehensive organisational model with the aim of addressing and promoting the zero-waste concept.

The organization uses a diverse set of tactics, all built around the zero-waste lifestyle. Revenue mostly comes from contracting their Zero Waste Challenge waste management services to local events. But they don’t simply collect waste for recycling and composting. Instead, they offer advice and consulting on how to run a waste-free

event. To date, Fundación Basura has worked for 42 events, preventing the production of 24 tons of waste. Their most successful effort to date saw recovery of 99 percent of waste generated.

They also offer a Zero Waste Academy, where 20 people are selected to complete a series of eight experiential courses teaching how to implement a zero-waste lifestyle. The Academy has been attended by 230 people and an impressive 11,000 have taken courses online. Fundación Basura also offers a Zero-Waste Stamp to organizations who prove their operations are waste neutral. Finally, they host massive zero-waste events where influential members of society come together to discuss different viewpoints around waste management principles and legislation, thereby promoting active dialog and supporting the transition to a zero-waste culture.

Most importantly, Fundación Basura has found success teaching the benefits of living a waste-free life—and that this should be a common desire (rather than obligation). It is emphasised that humans are part of nature, needing to take care of both ourselves and our home—and that this can start at any level of society.



BUSINESS CANVAS: FUNDACIÓN BASURA

ORGANISATION	Fundación Basura	ORGANISATION TYPE	Non-profit organisation	
Key partners	<ul style="list-style-type: none"> Government Zero-waste alliance Private sector Universities (infrastructure, support, and access to student volunteers) 	Value proposition	Waste output	Customers served
Key Resources	<ul style="list-style-type: none"> Social network (social media and website) Online platform (UDEMY) 	<p>Aim: Generate opportunities to connect and share zero-waste culture through an integral and flexible vision</p> <p>Value proposition: Provide a holistic point of view while comprehensively addressing waste via prevention, product longevity, and sustainable end-of life management</p>	<ul style="list-style-type: none"> Some recyclables Organics to compost (from events) 	<ul style="list-style-type: none"> Event organisers: event guidance and waste services Government decision makers: legislation advice Private sector: zero-waste certification scheme Community: environmental training and social activities
Key legislation	<ul style="list-style-type: none"> REP: Extended user responsibility law of Chile 			
Cost structure	<ul style="list-style-type: none"> Staff salaries Administrative costs Event operational costs (logistics, staff, food for workers and volunteers) Materials (training and green point materials, merchandising) 			
Revenue structure	<ul style="list-style-type: none"> Donations – government (zero waste academies), private sector, individual Zero-waste product sales Zero-waste challenge event fees (based on event length and expected attendance) 			



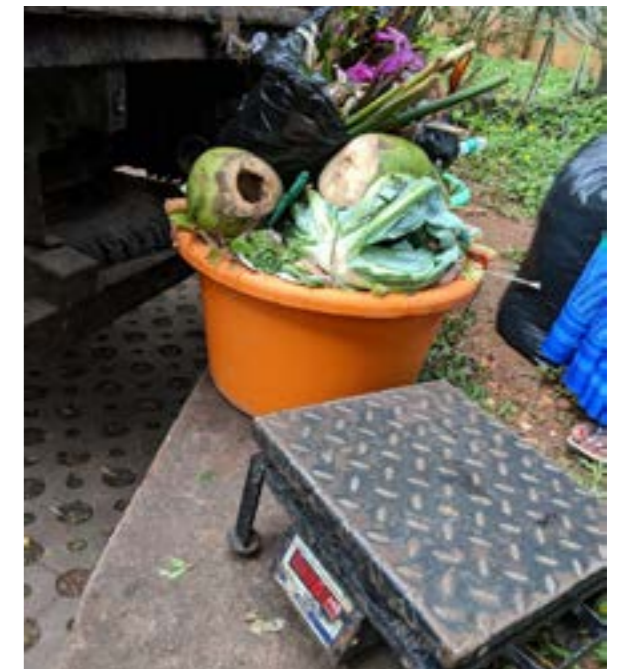
HASIRUDALA INNOVATIONS

Hasiru Dala Innovations (HDI)—meaning Green (Hasira) Force/Army (Dala)—is a for-benefit, not-for-loss company based in Bangalore, India. It is a partner of NGO **HasiruDala**, which focuses on social justice and policy advocacy for waste pickers. They aim to create better livelihoods for waste pickers by enabling them to build viable businesses that have a positive social and environmental impact. They've inspired 28,000 households to sort their waste, resulting in 90 percent being recycled or processed (and thereby diverting more than 700 tons per month from landfill), while providing employment for nearly 200 waste pickers.

In Bangalore, legislation requires municipalities to provide collection services for single households—but leaves the market open for bulk waste generators (i.e., residential complexes with more than 50 households or commercial establishments generating more than 50 kilograms of organic waste per day). For these, HDI waste picker entrepreneurs provide total waste management services.

QUICK FACTS

Name: Hasiru Dala Innovations
Location: Bangalore, India
Organisation type: Section 8 company
Founded: 2016
Operation: Collection, event waste management
Quantity handled: 800 tons/month
Households served: 30,000
Website: <https://hasirudalainnovations.com/>



Entrepreneur waste pickers are trained on service delivery and given a unique collection route and truck (which they gain full ownership of after four years). They then recruit a driver, two collection workers, and sorters in order to build their own waste business. Collection workers gather organics daily and non-organics once per week, selling recyclables to wholesalers and delivering organic waste to composters. They earn money from their recyclable sales and a collection service fee from each household.

This model empowers waste pickers to become entrepreneurs who can in turn gainfully employ other waste pickers and gain assets for themselves (e.g., coming to own a collection truck). They also develop stable earnings and enjoy safer working conditions.

BUSINESS CANVAS: HASIRU DALA INNOVATION

ORGANISATION	HasiruDala	ORGANISATION TYPE	Section 8 for-benefit, not-for-loss company	
Key partners	Key activities	Value proposition	Waste output	Customers served
<ul style="list-style-type: none"> Hasiru Dala NGO Waste pickers 	<ul style="list-style-type: none"> Sign-up bulk waste service customers (B2B) and manage contractual relationships Recruit entrepreneurial waste pickers and train them for service delivery, KPIs, etc. Give each entrepreneurial waste picker a collection route, a truck, and a standardised process for service delivery Provide quality control (one HDI supervisor supports three truck routes every day with customer care helpline and issue log system) Waste management services, including 80 events a year (employing 250 waste pickers) Managing aggregation facility 	<p>Aim: Create better livelihoods for waste pickers through viable businesses that provide positive social and environmental impact</p> <p>Value proposition: Offer households and businesses reliable, full waste collection services by empowering waste pickers to become entrepreneurs</p>	<ul style="list-style-type: none"> Handled by waste picker entrepreneurs 	<ul style="list-style-type: none"> Bulk service clients: encompassing 30,000 households and 120 commercial businesses Waste picker entrepreneurs: including 184 waste picker jobs
Key Resources			Impact	
<ul style="list-style-type: none"> Hasiru Dala legacy 			<ul style="list-style-type: none"> Waste is diverted from landfill Waste managed responsibly (800 tons/month) Achieved over 90% source separation Materially changed the lives of waste pickers with sustainable livelihoods, confidence, and marketable skills 	
Key legislation				
<ul style="list-style-type: none"> BBMP: regulation ensuring bulk waste services would not be provided by municipalities, opening up 40% of Bangalore's waste to private collection services 				
Cost structure	Revenue structure			
<ul style="list-style-type: none"> Staff salaries Truck purchases for entrepreneurs Landfill tipping fee Customer service Safety gear Wet waste transfer 	<ul style="list-style-type: none"> Collection service fees (fixed fee per household/month), variable fee per kilogram of wet waste and residual waste (dry waste is free) Waste event management fees Aggregation facility recyclable sales 			

BUSINESS CANVAS: HASIRU DALA INNOVATION (WASTE PICKER ENTREPRENEURIAL MODEL EMBEDDED IN COMPANY MODEL)

ORGANISATION	Hasiru Dala Innovation	ORGANISATION TYPE	Section 8 for-benefit, not-for-loss company	
Key partners	Key activities	Value proposition	Waste output	Customers served
<ul style="list-style-type: none"> HasiruDala Innovations (HDI) 	<ul style="list-style-type: none"> Recruit entrepreneurs and workers (driver, collection workers, sorters) Train clients on how to separate waste Collect household waste Sort non-organic waste and sell to wholesalers Deliver organic waste to composter Deliver residual waste to landfill 	<p>Aim: Create better livelihoods for waste pickers through viable businesses that provide a positive social and environmental impact</p> <p>Value proposition: Offer households and businesses reliable, full waste collection services by empowering waste pickers to become waste system entrepreneurs</p>	<ul style="list-style-type: none"> Recyclables Compost 	<ul style="list-style-type: none"> Households and businesses
Key Resources			Impact	
<ul style="list-style-type: none"> Collection trucks Sorting stations Assigned routes Household relationships 			<ul style="list-style-type: none"> Supported 184 waste pickers to be gainfully employed 	
Key legislation				
<p>BBMP: regulation ensuring bulk waste services would not be provide by municipalities, opening up 40% of Bangalore's waste to private collection services</p>				
Cost structure	Revenue structure			
<ul style="list-style-type: none"> Staff salaries (driver, collection workers, sorters) Truck maintenance and fuel Vehicle rent 	<ul style="list-style-type: none"> Recyclable sales Franchise fee per household served 			



QUICK FACTS

Name: Municipality of La Pintana
Organization type: Municipality
Location: Santiago, Chile
Founded: 2005
Operation: Collection, composting
Materials: Organic
Quantity handled: 15 tons/day
Households served: 10,000
Website: <http://www.pintana.cl/>

MUNICIPALITY OF LA PINTANA

The **municipality of La Pintana**, part of Santiago, Chile, prides itself on the proper management of its waste. This begins with source separation and collection. To process the 56% of its waste that is organic, they implemented a compost system. This was first inspired by budgetary pressures, then made possible by strong municipal leadership after a deficit developed in the waste disposal budget. Realising that a composting program would not only better utilise organic waste but also save up to 50 percent of the municipality's waste disposal budget, they started the **DIGA initiative**. Organics are selectively collected from residents and transformed into useable compost and fertiliser. To garner support, an environmental education team goes door-to-door speaking to residents an average of four times each.

Residents can register for the service free of charge. They are then given a compost bin, collection bags, and taught how to properly separate organics. The municipality uses trucks painted with the slogan, "If you don't want the world to stop ... ¡Stop and Sort!" The trucks collect three times a week. At a processing site

material undergoes either windrow (to produce compost) or a trench method with vermiculture (to produce hummus fertiliser). The final products are considered property of the community itself and are available for free to any residents. The compost is also used as part of the municipality's nursery program, which plants 150 trees a month. Currently, the municipality is processing up to 15 tons of organics per day, allowing it to produce compost and fertiliser at a rate of approximately 4 tons per month.

La Pintana also started a reading program, with a travelling library called Ecolubi focused on environmental education. Adults are engaged through a community-learning program focused on courses in composting, gardening, and medicinal herbs that enhance appreciation for working with organic materials. The program has also experimented with collecting used cooking oil and converting it into biofuel, which then powers the waste collection trucks and a wood chipper used in the composting process. Mushrooms are also being produced as part of the program.



BUSINESS CANVAS: MUNICIPALITY OF LA PINTANA

ORGANISATION	Municipality of La Pintana	ORGANISATION TYPE	Municipality		
Key partners	<ul style="list-style-type: none"> Government Community of La Pintana 	Key activities	Value proposition	Waste output	Customers served
Key Resources	<ul style="list-style-type: none"> Land Trucks 	<ul style="list-style-type: none"> Educate households on how to properly clean and separate materials Collect pre-sorted organics from households Perform windrow processing of organics into compost Perform vermiculture processing to capture excess organics (to keep out of landfill) and produce fertiliser 	<p>Aim: Selectively collect organic waste from residents and transform it into a useable compost and fertiliser</p> <p>Value proposition: Offer free service and bring benefits to the community by providing an alternative to organic waste management going to landfill</p>	<ul style="list-style-type: none"> Compost (windrow, vermiculture) Fertiliser Plant nursery 	<ul style="list-style-type: none"> Households: 10,000 provided with sustainable outlet for organic waste and access to free compost Other community programs provided with compost to use for planting, etc.
Key legislation	La Comisión Nacional del Medio Ambiente (CONAMA): former state agency that granted original permission to operate plant			Impact	
	Cost structure	Revenue structure			
	<ul style="list-style-type: none"> Staff salaries Facility/land rent Vehicle cost (maintenance, fuel) Operational costs Administrative fees 	<ul style="list-style-type: none"> Municipal funding Credit with other municipal departments, i.e. compost or nursery plants 			



MUNICIPALITY OF PEÑALOLÉN

More than 400 waste pickers reside in the municipality of Peñalolén. To protect their livelihoods, the municipality started **Reciclaje Inclusivo Comunal**, which formally integrates waste pickers into the city's waste collection services. The program aims to dignify and professionalise their work with training, workshops, certification, awareness, and regular environmental education for both the general populace and waste pickers. The program is in the social entrepreneurship sphere of sustainable development, incorporating environmental, social, and economic issues.

Backed by strong support from government and industry, as well as the impact of Chile's 2016 Law 20,920 (which stipulated a five-year goal for the economic role of waste pickers to be formalised), currently, 30 door-to-door waste pickers collect recyclable materials on predetermined routes. Workers are guaranteed fair payment (ranging from 1.3 to 2.5 times the minimum wage). Materials collected include white paper, newspaper, cardboard, magazines, PET 1, plastic bottles, and aluminium cans. When markets develop, the program plans to add other types of materials in the future.

Materials are taken to one of six stations where they are sorted, compacted, and sold. Each sorting station was financed by private companies, while operating expenses are covered by the municipality. Currently around 6,000 households are served and approximately 40 to 50 tons of material is sold a month. Some of the key adjustments over the course of the project include recyclers being given clearly assigned routes, formal agreements with households served, individual feedback, and increasing autonomy.

QUICK FACTS

Name: Municipality of Peñalolén
Location: Santiago, Chile
Organisation type: Municipality
Founded: 2010
Operation: Collection, sortation
Quantity handled: 40–50 tons/month
Households served: 6,000
Website: <https://www.penalolen.cl/medio-ambiente/centro-de-reciclaje-en-penalolen/>



The program plans to build a larger recycling centre in Peñalolén. It is expected to deliver recycling services to more than 15,000 homes, increase the number of waste pickers employed from 30 to 100, and further diversify materials collected. A business management model will make the program a pioneer in formalising the role of recyclers and collection systems with regards to Law 20,920 (Extended Producer Responsibility).

BUSINESS CANVAS: MUNICIPALITY OF PEÑALOLÉN
(1 OF 2: MUNICIPALITY MODEL)

ORGANISATION	Municipality of Peñalolén	ORGANISATION TYPE	Government municipality run program	
Key partners	Key activities	Value proposition	Waste output	Customers served
<ul style="list-style-type: none"> Partner companies (Coca Cola Foundation, Fundación Casa de la Paz) Waste pickers 	<ul style="list-style-type: none"> Sign-up households for recyclable waste services Recruit entrepreneurial waste pickers to join the program Assign routes based on equipment at each waste picker's disposal Introduce waste pickers to households, establishing mutual relationship and commitment Provide clean points (from sponsoring companies) for sortation and aggregation Provide quality control with random surveys of households and providing individual feedback to each waste picker Train waste pickers 	<p>Aim: Dignify and professionalise work of waste pickers</p> <p>Value proposition: Offer households reliable recyclable waste collection by empowering waste pickers to become waste system entrepreneurs</p> <p>Value proposition to waste pickers: Offer stable, safe entrepreneurial opportunity</p>	<ul style="list-style-type: none"> Handled by waste picker entrepreneurs 	<ul style="list-style-type: none"> Households (6,000, mostly condominiums) provided with reliable door-to-door recyclable waste service Reliable income for 30 waste pickers
Key Resources	<ul style="list-style-type: none"> Municipality routes 		Impact	
Key legislation	<ul style="list-style-type: none"> Law 20,920 of Chile of 2016 (REP: Framework Law for Waste Management, Extended Producer Responsibility, and Recycling Promotion): Stipulates five-year period for waste pickers to be formalised 		<ul style="list-style-type: none"> Entrepreneurial opportunity provided to 30 waste pickers 	
Cost structure	Revenue structure			
<ul style="list-style-type: none"> Staff salaries Sorting station (rent, electricity, materials, compactor, etc.) Administration fees Door-to-door training of communitys 	<ul style="list-style-type: none"> Collection service fees (fixed model based on collections per month) Municipal support Industry partners (who provide capital investment for sorting stations) 			

BUSINESS CANVAS: MUNICIPALITY OF PEÑALOLÉN (2 OF 2: WASTE PICKER ENTREPRENEURIAL MODEL EMBEDDED IN MUNICIPALITY MODEL)

ORGANISATION	Municipality of Peñalolén	ORGANISATION TYPE	Government municipality run program	
Key partners	Key activities	Value proposition	Waste output	Customers served
<ul style="list-style-type: none"> Municipality 	<ul style="list-style-type: none"> Collect specific categories of household recyclable waste (white paper, newspaper, cardboard, magazines, PET 1, plastic bottles, and aluminium cans) Aggregate materials at assigned sorting stations Sort and bail material Sell material to chosen buyers at market price 	<p>Aim: Dignify and professionalise work of waste pickers</p> <p>Value proposition: Offer stable, safe entrepreneurial opportunities</p>	<ul style="list-style-type: none"> Baled recyclable materials 	<ul style="list-style-type: none"> Households provided with recyclable material service Municipality landfill burden lessened condominiums) provided with reliable door-to-door recyclable waste service Reliable income for 30 waste pickers
Key Resources	<ul style="list-style-type: none"> Collection equipment Sorting stations Assigned routes Household relationships 		Impact	
Key legislation	<ul style="list-style-type: none"> Law 20,920 of Chile of 2016 (REP: Framework Law for Waste Management, Extended Producer Responsibility, and Recycling Promotion): Stipulates five year-period for waste pickers to be formalised 		<ul style="list-style-type: none"> Entrepreneurial opportunity provided to 30 waste pickers 	
Cost structure	Revenue structure			
<ul style="list-style-type: none"> Collection vehicles (capital and operating costs) 	<ul style="list-style-type: none"> Recyclable sales 			



QUICK FACTS

Name: Pimp My Carroça

Organization type: Non-governmental (NGO)

Location: São Paulo, Brazil

Founded: 2012

Operation: Art, education, public intervention

Website: <http://pimpmycarroca.com/>

PIMP MY CARROÇA

Pimp My Carroça is a non-governmental organization (NGO) whose mission is to bring visibility to the street-level waste pickers by engaging society at large. The initiative was created by Brazilian graffiti artist Mundano, who while engaging in social and environmental causes realised that art could be a path of social inclusion.

His interactions with waste pickers culminated in the creation of Pimp My Carroça—a day of public intervention at a central point of the city (to ensure waste pickers with different schedules could attend). The focus was to promote the welfare and health of waste pickers by bringing doctors, ophthalmologists, psychologists, and masseurs to them—in addition to repairing and painting carts. Carried out by volunteers, the Pimpex methodology is available on their website, which outlines eight basic steps that those who want to help waste pickers can follow, including with equipment, repairs, and painting carts.

The initiative won hearts and minds in cities in Brazil. In addition to performing interventions in public spaces, Pimp My Carroça now holds events at cooperatives and collection points. It offers companies and those interested the opportunity to experience the work and lives of waste pickers.

Cataki is an app developed by Pimp My Carroça that allows citizens to schedule collection from a street waste picker. Pimp My Carroça is funded by businesses and foundations (for example, OAK Foundation sponsored the development of the Cataki app).





QUICK FACTS

Name: Plastics for Change

Organisation type: For-profit social enterprise

Location: Bangalore, India

Formed: 2015

Operations: Recycled plastic feedstock, App platform

Website: <http://www.plasticsforchange.org/>



Responsibility legislation, which requires companies to prove they collect the same amount of waste they sell into the market. By hedging prices in advance, the program stabilises material costs for brands while lowering the risk of price fluctuations, giving aggregators and recyclers the surety they need to accumulate plastic in bulk. This creates more stable livelihoods for waste pickers.

Using an IT-enabled, ethical-sourcing platform and a skilled team, Plastic for Change builds a traceable, Fairtrade supply chain. Waste pickers use the platform to compare junk shop pricing and receive immediate payment through the app, ensuring fair prices and quick payment. Materials sold are also given a unique ID. Buyers then aggregate like materials and sell through the app to wholesalers, also receiving near real-time payment. Wholesalers and recyclers then process materials in batches to keep tracking integrity, getting priority access to premium pricing only if they comply with a social, environmental, and transparency code of conduct (as well as certain quality production standards meeting buyer requirements).

PLASTICS FOR CHANGE

Plastics for Change has a mission to change the social and environmental impact of plastic. Their high-touch, high-tech model materially increases brand demand for recycled plastic. It also improves recycler transparency and environmental and social practices by providing access to working capital to recyclers and guaranteeing fair, stable wages for waste workers.

Fewer than 5 percent of Indian manufacturers source recycled plastic. Plastics for Change aims to make it profitable and easy for companies to transition away from virgin plastic and begin sourcing recycled material. To this end, they provide training to companies on how to work with recycled plastic materials effectively and help them meet the quality specifications needed for their production process.

After negotiating long-term contracts at a price premium for fully traceable, Fairtrade plastic feedstock, brands gain access to a consistent supply of high-quality recycled material. This enables them to improve recycling rates and meet or exceed India's new Extended Producer



BUSINESS CANVAS: PLASTICS FOR CHANGE

ORGANISATION	Plastics for Change	ORGANISATION TYPE	For-profit entity registered in Canada with a subsidiary in India						
Key partners	<ul style="list-style-type: none"> Small Scale Infrastructure Development Fund (S3IDF) Non-profit Hasira Dala Recycling stakeholders (waste pickers, aggregators, wholesalers, recyclers) 	Key activities	<ul style="list-style-type: none"> Train companies on how to work with recycled materials Negotiate long-term contracts with companies at a price premium for ethically-sourced, traceable, Fairtrade, recycled plastic Develop an ethical-sourcing platform that brings transparent, fair pricing and near real-time payment to each part of the recycling value chain Build traceable supply chains and improve processing efficiency of aggregators, wholesalers, and recyclers Negotiate with wholesalers and recyclers to comply with a social, environmental, and transparency code of conduct and material-quality production standards Partner with S3IDF to support access to small-scale loans 	Value proposition	<p>Aim: Change the social and environmental impact of plastic, including fighting climate change, creating livelihoods, and reducing plastic pollution</p> <p>Value proposition: Use mobile technology to reduce plastic pollution and create resilient livelihoods for the urban poor in developing countries</p> <p>Value proposition to companies: Make profitable the transition from virgin plastic to recycled plastic</p>	Waste output	<ul style="list-style-type: none"> Ethically-sourced, recycled plastic feedstock that meets manufacturer quality requirements 	Customers served	<ul style="list-style-type: none"> Consumer packaged goods companies and manufacturers Waste pickers, recycling aggregators, wholesalers, and recyclers NGO partners
Key Resources	<ul style="list-style-type: none"> Ethical-sourcing platform Brand relationships NGO and recycling industry relationships 	Impact		<ul style="list-style-type: none"> Create sustainable livelihoods for urban poor Shift companies from virgin to recycled plastics (reducing CO2) Accelerate development of recycling infrastructure Prevent unmanaged disposal of plastic 					
Key legislation	<ul style="list-style-type: none"> India's EPR legislation: Makes business licences subject to the requirement that waste sold into a market is fully recovered 	Cost structure		Revenue structure					
		<ul style="list-style-type: none"> Staff salaries Administrative costs Platform development 	<ul style="list-style-type: none"> Management fee on app platform Management fee on buyer contracts Selling a consistent supply of high quality recycled plastic 						



PROJECT STOP

Borealis and SYSTEMIQ joined forces to start **Project STOP**, which partners with cities and government to create effective waste management systems. The goal is to collect waste from every household and business in order to eliminate leakage of plastics into the ocean. STOP builds circular systems where the majority of waste, even that which is hard to recycle, is recycled or processed into new products. The resulting created value lowers the financial burden of the waste system on the city and its residents.

Primary objectives of Project STOP include: zero leakage of waste into the environment; increased recycling and valorisation of waste; socio-economic benefits to the local community; and scaling by communicating frontline insights to inform policy, product designs, and support others working on ocean plastic and waste management issues.

Project STOP uses a “system enabler” approach. A team of experts in waste management, recycling, business development, and behaviour change—financed by the private sector and the

QUICK FACTS

Name: Project STOP

Locations: Muncar, Pasuruan, Jembrana, Indonesia

Organisation type: B-Corp (SYSTEMIQ)

Founded: 2017

Operation: Collection, sortation, baling, Organics processing (compost and black soldier fly)

Households served: 9,000 growing to 45,000

Website: <https://stopoceanplastics.com/>

Norway Ministry of Foreign Affairs—help sub-districts and villages design and implement integrated, low-cost waste management systems. Then sorted waste is collected from every household and business, transported to a waste-sorting facility, and as much value is captured as possible (with residual waste disposed of safely). Existing local initiatives (and informal waste collectors) are supported and integrated into the new waste system. All profits from the sale of recyclables and processing of organics are kept by the local community, used to support worker salaries and other system operating costs.

The team is embedded with local governments for the long-term, providing sustained implementation support across every facet of the waste system until a new one is institutionalised across an entire city. They also provide catalytic funding for the purchase of collection and processing equipment, community behaviour change campaigns, clean-ups, and transitional operating costs.

Today they are working in Muncar—a fishing village in Eastern Java—with plans to scale into two additional cities and an entire region in 2019.



BUSINESS CANVAS: PROJECT STOP (1 OF 2: SYSTEM ENABLER MODEL)

ORGANISATION	Project STOP	ORGANISATION TYPE	B-corp (SYSTEMIQ project)	
Key partners	Key activities	Value proposition	Waste output	Customers served
<ul style="list-style-type: none"> Borealis (co-founder) Indonesia Ministry of Environment and Forestry Technical partners Veolia and Sustainable Waste Indonesia (SWI) PKK Women's groups Fishermen Strategic Partners Norway Ministry of Foreign Affairs, NOVA Chemicals, Nestle, Alliance to End Plastic Waste, Borouge 	<ul style="list-style-type: none"> Perform city assessments, including waste characterisation study, ocean leakage assessment, and socio-economic surveys Provide expert waste management and recycling advice Skills transfer Prepare and implement city waste management project plan, including design of transfer station, waste collection system, behaviour change campaign, and beach clean-ups Build municipal governance and financial transparency Provide funding for waste processing assets, household behaviour change campaigns, and clean-ups Find markets for waste output, including normally hard to recycle plastics Inter-village regulations 	<p>Aim: On-the-ground, tangible solutions to ocean plastics in Southeast Asia</p> <p>Value proposition: Permanent, measurable ocean plastic reduction in highest leakage cities</p> <p>Value proposition to cities: Funding and expert support to help meet a city's waste management targets</p>	<ul style="list-style-type: none"> N/A: waste output produced by village business (BUMDES) 	<ul style="list-style-type: none"> National government: Ministry of Environment and Forestry, Coordinating Ministry of Maritime Affairs Provincial/Regency government: Banyuwangi Mayor Local government: Camat, Village heads, BUMDES leaders Private sector: Resin producers and consumer packaged goods companies
Key Resources			Impact	
<ul style="list-style-type: none"> Team of experts Relationships with resin producers and consumer packaged goods companies 			<ul style="list-style-type: none"> Empower local government to build low-cost waste system that is economically sustainable Valorise organics using black soldier fly Found markets for normally non-recyclable plastics Socio-economic benefits for communities supported 	
Key legislation				
<ul style="list-style-type: none"> Internal Affairs Minister Regulation 33, 2012: required villages to be responsible for waste collection 				
Cost structure	Revenue structure			
<ul style="list-style-type: none"> Staff salaries Office (rent, utilities) Travel Expert consultant fees 	<ul style="list-style-type: none"> Program funding from development finance and the private sector, especially resin producers and consumer packaged goods companies 			

BUSINESS CANVAS: PROJECT STOP (2 OF 2: VILLAGE BUMDES MODEL EMBEDDED IN PROJECT STOP MODEL)

ORGANISATION	Project STOP	ORGANISATION TYPE	Village business (BUMDES)	
Key partners	Key activities	Value proposition	Waste output	Customers served
<ul style="list-style-type: none"> Project STOP Environmental Agency (DLH) 	<ul style="list-style-type: none"> Door-to-door household and business collection Recyclable sortation and baling Black soldier fly and compost processing Waste bank (in development) 	<p>Aim: Build a clean, healthy Muncar</p> <p>Value proposition: Provide regular, inexpensive waste collection services to the community and minimise the amount of waste going to landfill</p>	<ul style="list-style-type: none"> Recyclables Black soldier fly larvae Compost 	<ul style="list-style-type: none"> Households and businesses
Key Resources			Impact	
<ul style="list-style-type: none"> Collection vehicles (trucks, tricycles) Conveyor belt Baler TPST facility 			<ul style="list-style-type: none"> Providing waste collection to 30,000 people, most for the 1st time Cleaned 5000m2 beach surface Created 60 full time jobs 	
Key legislation				
<ul style="list-style-type: none"> Internal Affairs Minister Regulation No. 33, 2012: required villages to be responsible for household waste collection Law No. 32, 2004: about Local Government including BUMDES regulation 				
Cost structure	Revenue structure			
<ul style="list-style-type: none"> Staff salaries (driver, collection workers, sorters) Facility operational costs (electricity, materials, compactor, etc.) Vehicle costs (maintenance, fuel, etc.) Administrative costs Black soldier fly materials 	<p>Waste valorisation</p> <ul style="list-style-type: none"> Recyclable sales Black soldier fly larvae sales to fish and chicken farmers Organic compost for agriculture and government facilities (minimal) <p>Collection fees</p> <ul style="list-style-type: none"> Households collection services Business collection services <p>Government funding</p> <ul style="list-style-type: none"> Environmental Agency Village funds 			



QUICK FACTS

Name: Projeto Relix
Organisation type: Company (sponsored by Sesi)
Location: Pernambuco, Brazil
Formed: 2011
Operation: Environmental education and behaviour change
Community directly reached: Over 100,000
Website: <https://www.facebook.com/projetorelix/>



PROJETO RELIX

Projeto Relix started as an environmental education project formed by the company Agência de Comunicação e Cultura. When Brazil enacted the National Policy of Solid Waste in 2010, local governments were called upon to take action. The state of Pernambuco—and more specifically the city of Recife—took this responsibility very seriously. The principal aim of Projeto Relix was to promote environmental education and communication, especially with regards to minimising the negative stigma of waste pickers and seeking solutions for handling the waste stream.

Theatre has been an integral part of Relix' activities since its inception. Performances are customised to audiences and are offered free to the public (with typical attendance of 200). These focus on the importance of recycling while keeping waste pickers as central characters to promote community acceptance of their work.

The program also donates specially designed bikes and equipment to waste pickers, who are usually featured in expositions that promote the



acceptance of waste pickers into society.

Finally, a wide range of educational and general reading materials (such as comic books) are available for use in schools and by other educational organizations. These promote environmental education as part of the ordinary curriculum, reinforcing recycling as an everyday habit.

Since its inception—currently in its fourth version—the project has developed success metrics and is committed to feedback. Current efforts include speaking directly with waste pickers about their “before and after picture” of recycling and their level of community acceptance. To date there have been over 600 performances in 3 different Brazilian states, over 3,000 students and adults receiving environmental education, 3 expositions, and 73,000 copies of materials (including 35,000 comic books) distributed.

BUSINESS CANVAS: PROJETO RELIX

ORGANISATION	Projeto Relix	ORGANISATION TYPE	Company (but the Project Relix is financed by Sesi)		
Key partners	<ul style="list-style-type: none"> Municipality of Recife Social Service of Industry (SESI) Schools Waste picker cooperatives 	Key activities	<ul style="list-style-type: none"> Perform free theatrical productions based on local culture that promote environmentally sustainable actions and waste picker inclusion, including in schools Promote communication with waste pickers Donate ergonomically designed bicycles to waste pickers Photograph waste pickers to promote and dignify their work, creating booklets and public expositions Produce and sell educational materials (comic books, scholastic curriculum materials) 	Value proposition	<p>Aim: Promote environmental education and seek solutions to improve the conditions of waste pickers</p> <p>Value proposition: Provide education in communities to promote environmentally sustainable behaviours and inclusion of the waste picker community</p>
Key Resources	<ul style="list-style-type: none"> Communication outlets (web, publications, videos, books) Bicycles to waste pickers Theatre scripts 	Waste output	<ul style="list-style-type: none"> N/A 	Customers served	<ul style="list-style-type: none"> Government Community Schools Waste pickers
Key legislation	<ul style="list-style-type: none"> National Law Of Solid Waste, 12.305\10 	Impact	<ul style="list-style-type: none"> Improved social standing of waste pickers Over 600 performances Over 73,000 copies of material distributed, including 35,000 comic books 		
Cost structure	<ul style="list-style-type: none"> Staff salaries Cost of donated bicycles Cost to produce theatrical events Cost to create and promote expositions Administrative costs Cost of publication/printing 		Revenue structure	<ul style="list-style-type: none"> Project fee from Sesi to implement the project (financed by Sesi, with the Aliança Comunicação Cultura having different projects in other sectors) 	



QUICK FACTS

Name: Rumah Kompos Padangtegal
Organisation type: Village-led organisation
Location: Padangtegal, Gianyar, Bali, Indonesia
Founded: 2015
Operation: Full waste stream collection (pre-sorted), composting
Quantity handled: 15 tons/day
Households served: 723 (100% of Padangtegal)
Website: <https://www.facebook.com/rumahkompospad>



Bins are also placed every 60 meters along the tourist streets. These tools and training are supported by an awig-awig (cultural regulation) enacted in 2017 requiring Padangtegal households to separate their waste as part of Bali's Tri Hita Karana philosophy that promotes harmony between man, the environment, and God. This regulation also enables Padangtegal to not collect trash if it is not sorted.

Rumah Kompos collects waste nightly, keeping vehicles off the heavily trafficked, tourist-orientated Ubud streets during the day. Door-to-door collection with handcarts is synced with truck collection so that holding stations (depots) are not required. Trash is quickly sorted, with most organics delivered to Temesi (see Temesi organisational profile). A small portion is composted in Rumah Kompos's own Compost Learning Centre, which helps teach the importance of recycling.

Collection service fees are paid by the Monkey Forest tourist fund (about 4,500 visitors per day pay about US \$3.40 for entry). There is already an agreement with the Ministry of Public Works and Housing to construct a larger facility for processing waste.

RUMAH KOM POS PADANGTEGAL

Padangtegal is a village in Ubud, Gianyar, that is home one of Bali's most important tourist destinations, the Sacred Monkey Forest, with more than 500 monkeys and a number of important Hindu temples.

Unfortunately, the soil supporting the many large trees in the forest has been eroding. Monkey Forest managers realised they needed compost to address the issue, while also being concerned about waste dumping by many residents into local rivers. In large part because of these issues, **Rumah Kompos** was born in 2012.

It is now a community run, village-owned facility—led by Pak Supardi—collecting waste from every household and business within the village. According to Supardi, the goal is to make sure all waste from Padangtegal is managed so that little of it is transported to landfill and the Gianyar region is made clean and free of trash. Currently 67 percent of waste is being diverted from landfill.

Their unique approach of community organizing has inspired 90 percent of residents to separate their waste into organic and non-organic. Families are given multiple bins with the their name on it and taught how to properly separate.



BUSINESS CANVAS: RUMAH KOMPOS PADANGTEGAL

ORGANISATION	Rumah Kompos Padangtegal	ORGANISATION TYPE	Village organisation						
Key partners	<ul style="list-style-type: none"> Gianyar Environmental Agency Government of Panitia Pembangunan Desa Bendesa (chief) of Padangtegal Ubud Monkey Forest JICA 	Key activities	<ul style="list-style-type: none"> Behaviour change to teach source separation Daily organic and non-organic waste collection services Sorting of recyclable materials and subsequent sale Onsite composting at Compost Learning Centre Environmental education 	Value proposition	<p>Aim: Padangtegal village is clean and minimal waste is transported to landfill</p> <p>Value proposition: Provide a complete and responsible waste management system for residents and businesses of Padangtegal village in Ubud</p>	Waste output	<ul style="list-style-type: none"> Recyclables Some compost using windrow method 	Customers served	<ul style="list-style-type: none"> More than 700 households Private companies Sacred Monkey Forest temple tourist destination
Key Resources	<ul style="list-style-type: none"> Loyal team Trucks Facility 	Key legislation	<ul style="list-style-type: none"> Traditional awig-awig regulation honouring Tri Hita Kerana and requiring all residents to sort waste 	Impact	<ul style="list-style-type: none"> About 70% of waste diverted from landfill Household sortation levels of 90% achieved 				
Cost structure		Revenue structure							
<ul style="list-style-type: none"> Staff salaries (Rp85,000/day) Facility operational costs (electricity, maintenance) Vehicle costs (maintenance, fuel) Administration costs 		<ul style="list-style-type: none"> Waste collection fee of Monkey Forest resident fund Collection fees from households and businesses Recyclable material sales 							



QUICK FACTS

Name: Stree Mukti Sanghatana
Organisation type: Cooperative
Location: Mumbai, India
Founded: 1975
Waste picker inclusion: 5,000
Website: stremuktisanghatana.org



of waste pickers (in the form of issuance of occupational identity cards by the municipality), support of children's education, formation of SHGs, health check-ups and access to medical facilities, providing training in alternative waste technologies (composting, bimethanation, gardening), and facilitating the formation of cooperatives for work opportunities.

SMS represents over 1,700 women who work on zero-waste efforts, biogas operations, gardening, composting, e-waste collection, waste audits, and running school-based and public-awareness programmes. It is affiliated with over 10 cooperatives.

STREE MUKTI SANGHATANA

Stree Mukti Sanghatana (SMS) was founded in 1975 as a women's liberation organisation, focused on the social ills that plagued society. These include dowry, rape, women's illiteracy, and female feticide. In 1983, SMS launched the famous play *Mulagi Zali Ho* (A Girl is Born) that ran for more than 300 performances across Maharashtra. They then established a family counselling centre, the childcare centre *Aamche Ghar* (Our House), and an adult literacy campaign. In 1998 SMS launched their famed *Parisar Vikas* (Neighbourhood Development Programme).

Jyothi Mhapsekar, founder of SMS, voluntarily retired from being a librarian to devote herself to organizing over 5,000 waste pickers into self-help groups under the *Parisar Vikas* programme. In 2001, SMS organised a residential training program for 500 self-help groups (SHGs) of waste pickers, focused on leadership and vocational skills, and in 2003 partnered in construction of the first biogas plant with Greater Mumbai. A year later SMS founded the Federation of Self-Help Groups of Waste Pickers. It also launched education promotion programs for 500 children of waste pickers.

Current interventions include recognition



QUICK FACTS

Name: SWaCH
Organisation type: Workers cooperative
Location: Pune and Pimpri Chinchwad, India
Founded: 2008
Households served: 643,000
Waste pickers inclusion: SWaCH: 3,060; KKKPK: 9,000
Quantity handled: 50,000 tons
Website: swachcoop.com

SWACH PUNE

The genesis of **SWaCH** can be traced to 1993. In Pune and Pimpri Chinchwad, the trade union of waste pickers and itinerant buyers *Kagad Kach Patra Kastakari* (KKPKP), was formed, its aim to assert their members' role in the city's solid waste management system. Lakshmi Narayanan, the founding member of KKKPKP (which has over 9000 members), says that the main goal was to become a successful, self-sustaining social enterprise protecting livelihoods and dignity through fair wages and paving the way for a sustainable solid waste management system throughout the region.

In 2000, when the government announced its Municipal Solid Waste Management and Handling Rules, KKKPKP launched a pilot program in collaboration with the Department of Adult Education, SNDT Women's University, and the local municipality. The aim was integrating waste pickers into the door-to-door collection of the city's waste, enabling 1,500 waste pickers to become service providers for hundreds of thousands of households. This paved the way for SWaCH—a wholly owned workers cooperative registered in 2008.

Presently SWaCH organises 3,060 waste pickers in providing door-to-door waste collection services to over 643,000 households. It has saved the municipality more than 510 million rupees (USD \$7 million) in labour, transportation, and processing expenses. The program has also helped waste pickers have access to sorting areas provided by the municipality.



In Pimpri and Chinchwad, SWaCH has a scrap shop where waste pickers can sell materials at market rates. It is a modelled credit cooperative, started in 1997 after a group of waste pickers realised the dishonesty of existing scrap shops. Members are guaranteed fair pricing and receive a yearly bonus based on their receipts. The shop also provides members with loans and advocates against child marriages.

SWaCH is also involved in making disposal bags for sanitary pads, composting, biogas generation, and e-waste collection. They run a program called *V-Collect* for unused household items and *V-Collect Clothes* for still wearable clothes.



QUICK FACTS

Name: Swachha Eco Solutions
Organisation Type: Private Limited
Location: Bangalore, India
Founded: 2008
Operation: Waste collection, recycling, making agricultural piping, organics
Household served: 6,000
Website: www.swachhaecosolutions.com



Swachha operates 12 Dry Waste Collection Centres (DWCC) owned by the local municipality. In 2012 they started employing waste pickers and scrap dealers at these centres. In 2014, in collaboration with the local municipality and other partners, they started a plastic processing centre that vertically integrated the recycling process. The centre deals with both high- and low-density polyethylene and has a capacity to recycle five tons of plastic waste daily. Initially they processed packaging into granules to be sold, but they went one step further—building their own pipe extrusion machine to produce agricultural piping (what many of their original PE granule customers were using it for). Later they invested in aggregation centres at two strategic locations in their city in order to minimise travel time and cut down their carbon footprint. They are also heavily invested in the concept of community composting, having partnered with 24 farmers to process segregated biodegradable waste from their operations.

SWACHHA ECO SOLUTIONS

Swachha Eco Solutions was launched in 2008 by three innovators—Victoria, Vinay, and Rajesh—with the goal of gifting a zero-waste legacy to future generations. Initially launched as Indus Waste Management, the company aims to be a one-stop solution for waste management and recycling—across waste streams from all sectors. They believe strongly in the importance of route optimisation, research, and the development of new prototypes. Underlying their approach is an emphasis on the importance of constant experimentation.

The company’s founders have experimented with various on-the-ground models as part of their decade-long journey. Currently they provide recycling services and organic waste management for residual layouts, gated communities, apartments, restaurants, hotels, sports facilities, offices, and farms. In addition, they also offer pickup for bulky items, household hazardous waste, and landscape materials.



BUSINESS CANVAS

ORGANISATION	Swachha Eco Solutions	ORGANISATION TYPE	Private Limited						
Key partners	<ul style="list-style-type: none"> Bruhat Bengaluru Mahanagara Palike (BBMP), Bangalore local government Apartments and other clients Karnataka State Pollution Control Board Citizens Investors Farmers (24) Cement factory 	Key activities	<ul style="list-style-type: none"> Collect waste from households and commercial clients Dry Waste Collection Centre management Research and development Transforming collected waste into recycled materials and responsible residual disposal through co-processing Environmental education to households, schools, and community through training and social media 	Value proposition	<p>Aim: To be a one-stop solution for waste management consulting services and recycling streams from all sectors</p> <p>Value proposition:</p> <ul style="list-style-type: none"> Route optimization for collection Provide responsible waste management services Provide added value to the plastic waste stream through R & D and recycling 	Waste output	<ul style="list-style-type: none"> Wet waste for composting to farmers Recycle waste that is collected 	Customers served	<ul style="list-style-type: none"> Households: collection Private companies: collection and consulting services
Key Resources	<ul style="list-style-type: none"> Trucks Facility sorting centre Facility for recycling Composting space 	Impact		<ul style="list-style-type: none"> Daily wet waste collection of 3–4 tons for compost processing Total of 1.8–2.0 tons of daily waste recycled 					
Key legislation	<ul style="list-style-type: none"> Solid Waste Management Rules, 2016 Plastic Waste Management Rules, 2016 Amendment to Plastic Waste Rules, 2018 	Cost structure		<ul style="list-style-type: none"> Staff salaries Facility operational costs (electricity, maint.) Vehicle costs (maintenance, petrol) Safety gear Administration costs Customer care Compost inputs and maintenance Research and development 					
Revenue structure		<ul style="list-style-type: none"> Collection fees from households and businesses Recyclable material sales Compost sales 							



QUICK FACTS

Name: Temesi Recycling
Organisation type: Community foundation
Location: Temesi, Gianyar, Bali, Indonesia
Founded: 2004
Operation: Composting, organic waste processing to liquid fertilizer and liquid smoke, sortation of recyclables and residues
Quantity handled: 28–32 tons/day
Households served: unknown
Website: <http://temesirecycling.com>



TEMESI RECYCLING

Temesi Recycling is a partnership of the Gianyar Waste Recovery Project, the Rotary Club of Bali Ubud (now disbanded), the Yayasan Bali Fokus Foundation, and Yayasan Gelombang Udara Segar (GUS) Foundation. In 2004 they sought to develop an environmentally friendly, safe, and economically viable waste recovery solution. A facility for daily processing of 4 tons of waste, located next to the Temesi landfill on land owned by the Gianyar Regency local government, was built in 2004. After optimizing collection processes, expansion to 25 tons per day occurred in 2007 and it became one of the first Indonesian organisations to successfully complete the Kyoto Protocol’s Clean Development Mechanism (CDM) process to sell carbon offsets (from composting). Given the stringent CDM requirements, an ISO 9000 quality assurance system and compost testing protocol were also adopted. Today, roughly 30 tons are processed per day, focused primarily on compost. This allows them to restore soil fertility across Bali and divert close to 90 percent of waste from landfills.

Waste is brought by waste collection partners selected on the quality of their material separation. If too much residue is still mixed in the waste it is rejected. Current output is 7 to 8 tons per day of processed compost, 2 tons of recyclables, and about 5 tons of residues. Most of the processed organic waste results in compost sold to the local government at Rp 1.000/kg. Small quantities of liquid fertiliser are also produced (sold at Rp 15.000/litre) and liquid smoke (a pesticide sold at Rp30.000/litre). The facility employs 25 permanent staff and around 80 per diem staff.

Temesi Recycling has an education centre which has served more than 50,000 people (the facility attracts about 5,000 visitors annually). Temesi Recycling is under supervision of the community-based Temesi Foundation.



BUSINESS CANVAS: TEMESI RECYCLING

ORGANISATION	Temesi Recycling	ORGANISATION TYPE	Community foundation		
Key partners	<ul style="list-style-type: none"> BaliFokus GUS Carbon project developers Carbon project validators 	Key activities	Value proposition	Waste output	Customers served
Key Resources	<ul style="list-style-type: none"> Composting facility Laboratory 	<ul style="list-style-type: none"> Industrial-scale quality composting Carbon reduction and carbon management Research on organic processing methods (e.g., natural liquid fertilisers and pesticides) Sorting of recyclable materials Sales of recyclables Environmental education 	<p>Aim: Develop environmentally friendly, safe, and economical waste recovery solutions that restore the Bali ecosystem by diverting 90% of waste from landfill</p> <p>Value proposition:</p> <ul style="list-style-type: none"> Economically sustainable, quality composting facility and recyclable recovery centre 	<ul style="list-style-type: none"> Compost: Aerated table top method 	<ul style="list-style-type: none"> Waste collection service providers: EcoBali, Padangtegal Compost House Organic buyers: villas, resorts, government facilities
Key legislation	<ul style="list-style-type: none"> Gianyar Local Regulation 11, 2013 			Impact	
Cost structure	<ul style="list-style-type: none"> Manpower (contracted and non-contracted) Facility operational costs (electricity, maintenance) Quality-testing laboratory R&D of organic processing methods Administration costs CDM credit certification and audits 		Revenue structure	<ul style="list-style-type: none"> Compost sold to government and resorts (Rp 1,000/kg) Liquid fertiliser (Rp 15,000/litre) Liquid smoke pesticide (Rp 30,000/litre) Recyclable materials kept by waste sorters Carbon credits from CDM market 	



QUICK FACTS

Name: TriCiclos
Organisation type: B corp
Location: Santiago, Chile; São Paulo, Brazil
 Founded: 2009
Operation: Collection, sortation, education, consulting
Quantity handled: Over 5 million visits to clean points
 Website: <http://triciclos.net/>

TRICICLOS

TriCiclos, founded in 2009, was not only the first Certified B Corp in Chile, but also the first outside of North America.

It is a circular economy engineering company specialising in the creation and implementation of product and process solutions. The mission is to design, implement, and promote solutions that correct generations of flawed waste management. Their main expertise is centred on helping the consumer goods industry move towards a circular business model. Solutions are both upstream (with design approaches for products and business models) and downstream (closing the loop on different types of products and materials).

Downstream, TriCiclos has the largest network in Latin America of pre-recycling stations (Puntos Limpios or “Clean points”) that work as collection centres and material recovery plants. Up to 22 types of material are recovered. Citizens can bring recyclables and learn how their efforts generate a positive impact on the environment. TriCiclos Chile and Brazil have recovered more than 36,354 tons of material from more than 5 million residents. These pre-recycling stations are managed by operators who oversee material separation, compacting, and

environmental education. Some Puntos Limpios (mostly in Brazil) are operated in partnership with waste pickers that TriCiclos hires through cooperatives as service providers, supporting their empowerment.

After learning the complexities of packaging and recycling, TriCiclos decided to go upstream in search of solutions to the problems of waste management. With a circular economy consultancy, TriCiclos advises both companies and public bodies on projects that promote sustainability and facilitating the transition towards sustainable development.

TriCiclos has developed a tool showing consumer packaged goods companies (CPGs) how they can redesign their products for easier recyclability. The Recyclability Index Tool (RI, Índice de Reciclabilidad) gives the probability that an item will be recycled in a particular region. Working with the Sustainable Packaging Coalition, the New Plastics Economy, and McDonough Innovation, they’ve done material analysis mapping for more than 14,256 stock keeping units (SKUs) in Chile, Brazil, Peru, and Colombia.



BUSINESS CANVAS: TRICICLOS

ORGANISATION	TriCiclos	ORGANISATION TYPE	B Corp		
Key partners	<ul style="list-style-type: none"> Corporations Waste picker cooperatives Recyclers 	Key activities	Value proposition	Waste output	Customers served
Key Resources	<ul style="list-style-type: none"> Sorting facilities, including specialised knowledge of recyclable materials (Ponto Limpo collection points) Compactor, weight machine Trucks (Chile) 	<ul style="list-style-type: none"> Industry (extraction): Increase efficiency of processes and services Industry (consumer goods): Apply concepts of circular economy and cradle-to cradle business Retail: Promote integrated waste management through the operation of collection points and consumer awareness Transformers and recyclers: Solutions for materials with low recyclability Cooperatives: Inclusion and strengthening position of waste pickers 	<p>Aim: Circularise current linear chain of extraction, production, consumption, and disposal</p> <p>Value proposition:</p> <ul style="list-style-type: none"> Design customised solutions for each link in the chain—production, consumption, and disposal—in Latin America 	<ul style="list-style-type: none"> Sorted, cleaned, and baled recyclables 	<ul style="list-style-type: none"> Industry Consumer goods manufacturers Retailers Universities and schools Government
Key legislation	<ul style="list-style-type: none"> Chile: REP, Law of Solid Waste Brazil: National Law of Solid Waste, 12.305\10 			Impact	
				<ul style="list-style-type: none"> Over 6,346 tons of recyclable material recovered (Chile and Brazil) Over 1,542,859 people in Brazil impacted by environmental education at collection points 	
Cost structure	<ul style="list-style-type: none"> Staff salaries Administration costs Facility (Pontos Limpos) operational costs (equipment maintenance, collection fees) 		Revenue structure	<ul style="list-style-type: none"> Custom consulting Fees at collection points Business collection service fees (Chile) Sorted recyclable material (Chile) 	



QUICK FACTS

Name: vRecycle Waste Management Services

Organisation type: Proprietorship

Location: Goa, India

Founded: 2009

Households served: 10,000

Others served: Set up over 2000 composters and 150 community recycling points

Website: vrecycle.in/about_us

vRecycle operates out of a warehouse located at the Margao Industrial Estate. It services over 45 community sites, 60 individual sites, and 2 village panchayats.

Clinton Vaz, founder of vRecycle, started operations with an initial investment of Rs10,000. With his father's borrowed car he did pick-ups once a week. Today, he has two vehicles of his own and is completely self-sustaining. He believes that it is important to offer flexible solutions to make his model work. The company's gross is about 80 lakhs a year with a decent profit margin of Rs 1 lakh a month. The company's waste recovery (i.e. diversion from landfill) is about 80 percent. Expansion plans include offering a franchisee model.



VRECYCLE WASTE MANAGEMENT SERVICES

Launched in 2009, **vRecycle Waste Management Services** is based in Goa, India. Its premise is that not everyone has the time or interest to manage their waste and that vRecycle can do it for them.

vRecycle has five different product and service offerings:

- Waste pickup services for individuals, communities, and Panchayats (units of local government)
- Setting up and managing recycling bins and composters in homes, community recycling stations, composting stations for institutions and communities, and composters for garden waste (including chippers and shredders)
- Buying recyclables, both unsorted and sorted, either picked up from homes (for a fee) or deposited at a central facility (no fee)
- Design and consultancy
- Education programmes, including a basic and advanced waste awareness presentation (45 minutes), film screening (90–120 minutes), awareness session and activities (90 minutes), field visit (60–180 minutes), and field activity for a village dry waste collection system (60–120 minutes).





QUICK FACTS
Name: Waste4Change (originally joint venture with EcoBali)
Organisation type: Social enterprise
Location: Jakarta and Bekasi, Indonesia
Founded: 2013
Operation: Education, training, collection, recycling, disposal
Quantity handled: 9–11 tons/day
Households served: 1,600
Other clients served: 12 offices, 3 cafes, 5 embassies
Website: waste4change.com

WASTE4CHANGE

Greeneration Indonesia is an environmental organisation based in Bandung focused on sustainable consumption and production. To accomplish their mission they opened a waste management division in 2012. A year later, they met with EcoBali Recycling (see EcoBali) and founded **Waste4Change**, now headquartered in Bekasi, Indonesia.

Waste4Change aims to be a provider of responsible waste management in Indonesia. Currently it provides four distinct services, abbreviated as 4C: campaign, consult, collect, and create.

Campaign aims to educate on why and how waste should be managed, while consult provides training and consulting service to organisations ready to be more responsible.

Collect is the primary waste collection service, providing responsible waste management to households and businesses, including initial training on separating waste pre-collection. Waste statistics are tracked so companies can monitor and report their progress.

All collected waste undergoes any required post-collection separation, then is recycled, composted, or safely disposed of as part of the last service type—Create.



Revenue streams for Waste4Change come primarily from business waste collection fees, management fees, and consulting fees. For example, PRAISE (an association of consumer packaged goods companies in Indonesia including Danone, Unilever, Nestle, Coca Cola, IndoFoods, and TetraPak) is receiving services for their packaging recyclability campaign.

Waste4Change currently operates two sites. The first is in Bekasi, where they receive about 4 tons daily, including 1 tonne of compost and 500 kilograms of recyclables. Their other site in Jakarta receives 5 to 7 tons per day from commercial clients, who have joined the Zero Waste to Landfill (ZWTL) programme to minimise waste disposed in landfills. This includes collaboration with a cement factory that uses residues as fuel.



BUSINESS CANVAS: WASTE4CHANGE

ORGANISATION	Waste4change	ORGANISATION TYPE				
Key partners	<ul style="list-style-type: none"> Ministry of Environment and Forestry Dinas Lingkungan Hidup Provinsi DKI Jakarta Kementerian Lingkungan Hidup Bergerak Indonesia Bebas Sampah Cement factory 	Key activities	Their 4 C's <ul style="list-style-type: none"> Consulting: training and feasibility studies Campaign: environmental education to companies, households, schools, and the community Collect: waste from households and commercial clients, waste separation training Create: transform collected waste into either recycled materials or responsible residual disposal to landfill 	Value proposition Aim: Creating responsible waste management Value proposition: Provide responsible, transparent waste management services from upstream to downstream	Waste output <ul style="list-style-type: none"> Organic: windrow composting and black soldier fly Recyclables: handled by waste picker entrepreneurs 	Customers served <ul style="list-style-type: none"> Households: collection Private companies: collection and consulting services Government: consulting services
Key Resources	<ul style="list-style-type: none"> Waste4Change brand Trucks Facility sorting centre Composting site 				Impact <ul style="list-style-type: none"> Less than 25% of collected waste disposed in landfill 	
Key legislation	<ul style="list-style-type: none"> DKI Jakarta Local Regulation, 3/2013: Waste Management 					
Cost structure	<ul style="list-style-type: none"> Staff salaries Facility operational costs (electricity, maintenance) Vehicle costs (maintenance, petrol) Landfill tipping fee Safety gear Administration costs Customer care 					Revenue structure <ul style="list-style-type: none"> Collection fees from households and businesses Recyclable material sales Sale of black soldier larvae Compost sales Management fee for education campaigns Management fee for consulting services



QUICK FACTS

Name: YouGreen Cooperativa
Organisation type: Waste picker cooperative
Location: São Paulo, Brazil
Founded: 2011
Operation: Full waste stream collection, sortation, bundling with traceability, material consultancy services
Quantity handled: 100 tons/month
Corporate clients served: 45
Website: <http://www.yougreen.com.br/>



YOUGREEN COOPERATIVA

The **YouGreen Cooperativa**, located in São Paulo, Brazil, currently employs 35 waste pickers. The fundamental tenant of cooperatives is to seek shared, as opposed to individual, prosperity. This guides their work and socioeconomic model.

The cooperative was formed independently in 2011 after attempts to partner with the government were unsuccessful. It is led by a former waste picker with a background in logistics and engineering who saw an opportunity to improve waste management efficiency after a weekend spent volunteering for the Red Cross in Rio de Janeiro. The aim of the cooperative is to improve the quality of life of waste pickers, both financially and otherwise, while also providing waste collection, sortation, awareness, diagnostics, and reverse logistics services to environmentally like-minded businesses. YouGreen also aims to develop and provide opportunities for other groups of waste pickers.

Currently material collection services are provided to approximately 45 corporate clients throughout São Paulo. Collected waste is brought to YouGreen’s efficient central facility, where it is sorted, cleaned, and sold to recyclers. Sophisticated tracking software details monthly waste generation and recycling levels for each client by material, allowing clients to fulfil EPR mandate requirements. This data is also used to continually improve each client’s waste management process. What’s more, YouGreen’s pricing is transparent and their recycling services are less expensive than landfill tipping fees, making it easy for businesses to act in environmentally responsible ways. Education services for the community, as well as self-improvement courses for members and other cooperatives, are also part of the programming.

YouGreen is currently managing 100 tons of waste a month. As part of expansion plans—and to improve the level of service provided to current clients—they are considering employing a social franchising model that would see them partner with cooperatives around Brazil in order to provide the same level of service, traceability, and data over a broader area.

BUSINESS CANVAS: YOUGREEN COOPERATIVA

ORGANISATION	YouGreen	ORGANISATION TYPE	Waste picker cooperative							
Key partners	<ul style="list-style-type: none"> Cooperatives of waste pickers Retalhar (company working on reverse logistics of clothing) Cicla Brasil (company focused on social inclusion) 	Key activities	<ul style="list-style-type: none"> Diagnose client waste practices Teach clients to sort and separate waste Collect entire waste streams Sort and bail materials in lots (by company) Provide detailed monthly reports to clients along with suggestions for better practices Sell recyclables Educate cooperative members Educate school and community groups 	Value proposition	<p>Aim: Materially improve the quality of life of the waste pickers</p> <p>Value proposition to companies: Provide waste collection, sortation, awareness, diagnostics, and material recovery reports for EPR mandates</p> <p>Value proposition to other cooperatives: Through social franchising, expand corporate customers pool while providing education and operational efficiency improvements</p>	Waste output	<ul style="list-style-type: none"> Sorted, cleaned, and baled recyclables 	Customers served	<ul style="list-style-type: none"> Companies Other waste picker cooperatives 	
Key Resources	<ul style="list-style-type: none"> Trucks Sorting facilities Waste tracking software, including client report generation 					Impact	<ul style="list-style-type: none"> Collection of 100 tons/month Stable living for 35 waste pickers Six franchised cooperatives Categorisation of 37 different types of recyclables 			
Key legislation	<ul style="list-style-type: none"> REP Law Brazil National Law Of Solid Waste, 12.305\10 									
Cost structure	<ul style="list-style-type: none"> Staff salaries Facility operational costs (electricity, maintenance) Vehicle costs (maintenance, petrol) Landfill tipping fee Safety gear Administration costs Customer care 		Revenue structure	<ul style="list-style-type: none"> Collection fees from businesses Recyclable material sales Franchising fees 						



QUICK FACTS

Name: Yaksa Pelestari Bumi Berkelanjutan (YPBB)
Organisation type: Association
Location: Bandung, Cimahi, and Soreang, Jawa Barat, Indonesia
Households served: 8,021

YPBB had been actively building awareness of eco-friendly lifestyles for many years. It then joined forces with the Mother Earth Foundation (Philippines) and other organisations to pilot a Zero Waste program (Kawasan Bebas Sampah) in Bandung municipality in 2015.

This program is part of the Asia Pacific Action Against Plastic Pollution: Reducing Land-Based Leakage of Plastic Waste in Philippines and Indonesia Through Zero Waste Systems and Product Redesign, which aims to prevent 14,000 tons of plastic from leaking into the ocean each year. It consists of door-to-door behaviour change education, waste separation, and reduction of landfill waste by 30 percent through organic processing and recycling. Activities include green profiling, consulting with stakeholders, establishing a waste council at district level, developing an integrated waste management regulatory system, training waste collectors, door-to-door education, experimentation and system improvement, and law enforcement.

Besides international zero-waste organisations, YPBB has joined forces with other stakeholders to actively lobby and support the municipalities government (currently focusing at Citarum River region) in drafting environmentally sound waste management and waste reduction regulation, building MSWM masterplan and other waste governance aspect.

YPBB's campaign in the long term is on the aspect of waste reduction. The disaggregated waste collection system that is encouraged through regulation and technical implementation is an intermediary strategy to achieve conditions where there is a separation between recyclable waste and residue. Waste segregation is not only intended to improve processing and recycling,

but also as a way for the government to develop waste reduction policies. Through sorting, the government can monitor the types of waste and those responsible for residual waste that overload the public waste management system. This will open the way to identify and monitor the parties responsible for residual waste and regularly carry out waste audits and brand audits. This approach is used to develop policies to ban or limit products and packaging that are routinely reported to the city government, and in the future it is hoped that the central government can develop policies and implement EPR based on a strong database.

YPBB also conducts training for volunteers from local cadres and others, including training for waste workers in supporting the implementation of the system in the area. For areas that do not have facilities or land for processing waste, YPBB works closely with The Environmental Agency of city to serve the transportation of disaggregated waste, especially organic waste. Currently 10 sub-sub-districts in Bandung and eight sub-sub-districts in Cimahi have received door-to-door education, with approximately 7,742 (45 percent compliance rate) separating their waste. Efforts have been especially strong in Cimahi city, where YPBB is the official waste partner of the Cimahi municipality government, serving 100 percent of the city. For Bandung city, waste diversion rate is 16,15% or 658,12 kg, consist of organic waste 563,74 kg, recyclable plastic 72,91 kg, other recyclables 21,47 kg and compliance rate 34,38 % or 3189 households. For Cimahi city, waste diversion rate is 35,17 % or 1808,78 kg, consist of organic waste 1503,44 kg and recyclables 305,34 kg, while the compliance rate 56,11%. For Soreang District waste diversion of organic waste is 223,93 kg and recyclable 18,83 kg, while compliance rate is 61,56% or 1062 households.



BUSINESS CANVAS: YPBB

ORGANISATION	YPBB	ORGANISATION TYPE	Foundation						
Key partners	<ul style="list-style-type: none"> Mother Earth Foundation Bandung Municipality government Cimahi municipal government Bandung Cleanliness Corporation 	Key activities	<ul style="list-style-type: none"> Green profiling Consulting with stakeholders Establishing waste council at district level Developing municipal waste management system and regulation Training waste collectors Behaviour change training Experimenting with system improvement Fully implementing waste management system Law enforcement 	Value proposition	<p>Aim: Prevent annual 14,000 tons of plastic flow into ocean with door-to-door education (100%), waste separation (90%), and reduced landfilled waste (30%)</p> <p>Value proposition: Guide the local government in implementing a responsible waste management system</p>	Waste output	420 kg/day of recyclables and compostable	Customers served	<ul style="list-style-type: none"> Residents of Bandung, Cimahi (Jawa Barat, Indonesia) and Soreang District
Key Resources	Mother Earth Foundation principles of sustainable solid waste management	Key legislation	<ul style="list-style-type: none"> Waste Management Law 18, 2008 Government Regulation 81, 2012 Bandung Local Regulation 9, 2011 Cimahi local regulations 						
Cost structure	<ul style="list-style-type: none"> Operation of education program Manpower Advocacy campaign Education 		Revenue structure						
			Grant from Ford Foundation to fund the YPBB program						

GLOSSARY

- **5-Dol:** Abbreviation for 5-day old black soldier fly larvae, the age at which larvae are added to biowaste.
- **Aerobic composting:** Decomposition of organic matter using microorganisms that require oxygen. Byproducts include heat, water, and CO₂. Heat produced in aerobic composting is sufficient to kill harmful bacteria and pathogens, while helping the growth of beneficial bacteria.
- **Aggregators:** The second level of recyclable waste buyers in the recycling hierarchy. Buyers of sorted waste from junk shops that then further sort, clean, shred, and/or bale materials before selling it on to recyclers.
- **Anaerobic composting:** Decomposition of organic matter using microorganisms that do not require oxygen to survive. Chemical energy released as methane generates only a small amount of heat, not strong enough to safely kill plant pathogens, weeds, and seeds.
- **Baling:** To tightly compress and secure materials (frequently using a baler) for shipping, storage, or sale of recyclable materials.
- **Belief:** Something believed; an opinion or conviction that something exists or is true.
- **BSFL:** Black soldier fly larvae.
- **Bulk waste generators:** Residential complexes with more than 50 households or commercial establishments generating more than 50 kilograms of waste per day.
- **Campaign:** A planned, connected series of activities over a period of time designed to bring about a particular objective.
- **Capex:** Abbreviation for “capital expenses”, which are funds used to acquire or upgrade physical assets, like buildings and equipment.
- **Clean Development Mechanism (CDM):** Defined in Article 12 of the Kyoto Protocol, allows a country with an emission-reduction or emission-limitation commitment to implement an emission-reduction project in developing countries. Each credit is equivalent to one tonne of CO₂ and can be traded and sold, stimulating emission reductions, while giving industrialised countries some flexibility in how they meet their emission reduction limitation targets.
- **Clean point:** Pre-recycling stations where environmental education is provided, along with pre-treatment of materials to ensure proper recycling and traceability.
- **Cocopeat:** Multipurpose fibrous growing medium made of coconut husk that has high water holding capacity and air-filled porosity.
- **Collection point:** A central point of collection where households and businesses can bring their recyclable materials to, rather than having them collected door-to-door.
- **Compost:** A rich organic soil made from the decomposition of organic matter (e.g., kitchen and yard waste). Once formed, compost feeds the soil.
- **Consumer Packaged Goods (CPG):** Products that people consume and replace on a frequent basis like food, beverages, cosmetics, and cleaning products.
- **Cue:** A trigger such as a sound, or smell that serves as a signal prior to the next activity.
- **Depots:** Community storage areas for household waste prior to final transport.
- **Dry waste:** Non-organic waste
- **Dry waste collection centre (DWCC):** A specialised facility where waste is received from households and businesses, separated, then prepared for further processing or recycling. Also referred to as Materials Recovery Facilities (MRF) or Dry recovery centres.
- **Extender producer responsibility (EPR), [Also ESR (extended stakeholder responsibility)]:** A policy approach under which producers are given a significant financial and/or physical responsibility for the treatment and disposal of post-consumer plastic waste.
- **Fairtrade plastics:** A global movement in which fair prices are paid to waste workers in developing countries.
- **Fertiliser:** Natural and synthetic materials (e.g., manure, nitrogen, phosphorus, and potassium compounds) that are worked into the soil to support plant growth.
- **Free rider:** A person or organisation who obtains something without effort or cost while others pay for it.
- **GHG balance:** An estimate of the volume of greenhouse gas emissions emitted by an organisation or country over a given period.
- **Gold Standard (GS):** Developed in 2003 by WWF and other not-for-profit organisations, the GS uses the same methodology for measuring and verifying carbon emission reductions as CDM but gives greater attention to the impact of projects on the economic, environmental and social welfare of a population, and is generally considered sufficient validation for participation in the voluntary carbon market. Although CDM and the Gold Standard were initially linked, today they operate independently, with the GS oriented towards more “elite” projects.
- **Habit:** A usual way of behaving or a tendency that someone has settled into and is hard to give up.
- **Hand pallet:** Tool used to lift and move bales.
- **Hauler:** Private company that is contracted to collect waste and transport it to its final destination.
- **HDPE (High Density Polyethylene):** a sturdy plastic commonly used to produce jugs for milk and laundry detergent as well as plastic bags, plastic roll and plastic sheet. Also known as number 2 plastic.
- **Humus:** A dark, organic carbon-based spongy material that can no longer be broken down (all organic material becomes humus eventually if left undisturbed). Humus gives soil a desired crumbly texture and improves soil structure by making the soil looser, allowing for easier flow of air and water.
- **Incentive:** Something that motivates or encourages one to do something.
- **Influence:** To cause someone to change a behaviour, belief, or opinion, or to cause something to be changed.
- **Junk shop:** Local buyer of recyclable materials primarily from waste pickers, who collects and stores materials until enough quantity is collected before selling to an aggregator.
- **Kerbside:** Sidewalk or kerb where waste bins are left for collection.
- **Kneader:** Device used to compress cans and plastic bottles.
- **Leachate:** Liquid that has percolated through organic waste and leached out some of its constituents, generally high levels of salts, NH₄-N, and organic nutrients. In clean organics waste, compost leachate is a source of nutrients and water that can be used as a fertiliser.
- **Local body:** Institution of local self-governance in India that looks after the administration of communities such as villages, towns, or small cities.
- **Loan shark:** A moneylender who charges extremely high interest rates, typically under illegal conditions.
- **Material Recovery Facility (MRF):** Commonly pronounced “murf”, a specialised facility where waste is received from households and businesses, then separated and prepared for further processing or recycling. Other commonly used terms for MRFs are non-organic material sorting centres, dry waste collection centres (DWCCs common in India), and TPS 3Rs (common in Indonesia).
- **Materials of purpose:** Recycled waste that is traceable and has a story of hope.
- **Mulch:** A material (such as decaying leaves, bark, or compost) spread around or over a plant to reduce evaporation, maintain even soil temperature, prevent erosion, control weeds, and enrich the soil.
- **NIMBY:** Acronym that stands for “not in my backyard.” Refers to a common societal push to locate waste facilities away from residences, pushing them outside main generation centres, resulting in excess travel costs.
- **Non-organic material sorting centre:** See MRF.
- **Ocean-bound plastics:** Plastic waste collected within a certain geographic distance from a waterway (i.e., generally 50 kilometres or less).
- **Opex:** Abbreviation for “operating expenses,” which are funds needed to run daily operations, including fuel, maintenance, utilities, rent, and staff salaries.
- **Pellets:** Small (a few millimetres wide), round granules of plastic, that are sold to manufacturers who then re-melt the plastic and mould it into final products.
- **PET (polyethylene terephthalate):** A form of polyester that is commonly extruded or moulded into plastic bottled, packaging, textile and many other consumer products.
- **PP (Polypropylene):** common plastic in packaging with a relatively slippery surface, low density and ability to bend without breaking, making it suitable for a wide range of applications.
- **PRO (“Producer Responsibility Organisation” or “Packaging Recovery Organisation”):** Professional organisations authorised or financed (collectively or individually) by producers that ensure the collection, recycling, and safe disposal of end-of-life waste generated by their production.
- **Recyclate:** Materials that are recyclable.
- **Refuse Derived Fuel (RFD):** A fuel with calorific value produced from various types of waste, for example in cement kiln production.
- **Reward:** Something that is given in recognition of an appreciated action.
- **Role model:** A person admired by others as a good example to be imitated.
- **Routine:** A usual or fixed sequence of actions regularly followed.
- **Scrap dealer:** Another name for junk shop.

GLOSSARY

- **Sieve:** A sieve is a mesh strainer used to separate lumps and clumps from the finer compost material.
- **Silage:** Silage is fermented, high-moisture stored fodder which can be fed to cattle and sheep in the winter or used as a biofuel feedstock for anaerobic digesters.
- **Slurry:** A mixture of water and small pieces of a solid.
- **Social plastic:** Term coined by Plastic Bank to describe waste plastic that is collected by collectors and turned into money, items, or services at an above market rate, incentivising its collection.
- **Source separation:** The segregation of different types of solid waste (e.g., organics and inorganics) at the location where the waste is generated (i.e., household or business).
- **Supply chain:** The sequence of processes involved in the production and distribution of a commodity.
- **Transfer station:** Building or processing site where local collectors take waste prior to transport to landfill.
- **Urban local bodies:** An Indian term referring to institutions of the local self-government that administer in municipal areas with populations between 100,000 and a million residents.
- **Urea:** A nitrogen-containing substance normally cleared from the blood by the kidneys into the urine.
- **Value chain:** The process or activities by which a company adds value to materials.
- **Vertical integration:** The combination of two or more stages of production done by one company, that is normally operated by separate companies.
- **Waste bank (another term for “collection point”):** common in Indonesia where households can bring their recyclables to in exchange for money, school fees, electricity credit, or other goods and services.
- **Waste picker (also known as “rag pickers”):** A person who is informally engaged in the collection and recovery of reusable and recyclable solid waste from streets, bins, material recovery facilities, and landfills. They sell materials to recyclers through intermediaries.
- **Waste picker carts:** An open vehicle with no engine used to carry recyclable materials.
- **Weigh bridge:** A large scale used to determine the weight of waste or recyclables transferred to processing centres.
- **“Why”:** The belief that propels action.



Endnotes

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2 In Indonesia, waste collection from public spaces and larger thoroughways are the responsibility of the municipal Environmental Agency (i.e., DLH), but door-to-door household collection is the responsibility of local communities. Few communities have the technical knowledge and financial resources to set up waste collection systems resulting in low waste collection levels countrywide. Project STOP provides financial resources and swat team support to build and train villages to run economically sustainable waste systems. Collection and transfer station workers are employed by the village business (BUMDES).

3 In Bengaluru, the Municipality provides residential door-to-door waste collection services and funds the infrastructure costs of Dry Waste Collection Centres at the ward level but bulk generator apartment complexes, institutions and businesses are all responsible for their own waste management and are mandated to pay private haulers and waste picker cooperatives directly.

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10 In countries like South Africa with high unemployment rates above 30%, the opportunity to create jobs can be the main driver for sectoral change.

11 By giving away free bins sometimes organisations struggle with bins being lost, stolen or used for other purposes, especially when the bins are brand new. Some organisations like Project STOP will use recycled, repainted formerly used paint buckets as bins to keep both costs down and the incentive to use the bins for other purposes.

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13 Projeto Relix's Facebook page. Accessed December 10, 2018. <https://www.facebook.com/projetorelix>.

14 The name Relixx, with two "xx" represents the pair of chromosomes in women.

15 "Architecture", Fundación Basura, accessed December 10, 2018, <https://basural.com/category/arquitectura-architecture>.

16 Original illustration by Jennifer Lambien, www.jenniferlambein.com.

17 EcoBali, <https://eco-bali.com/>.

18 Pinky Chandran, et al. "Informal Waste Workers Contribution in Bengaluru," *ICON SWM 2014: 4th International Conference on SWM*, January, 2014, <http://hasirudala.in/wp-content/uploads/2016/08/1.-Full-Paper-Chandran-Infomal-Waste-Workers-Contribution-in-Bengaluru-1.pdf>.

19 Find course at <https://www.udemy.com/como-vivir-basura-cero/>. Note: courses are taught in Spanish although English and German subtitles are available.

20 "Magic Eyes" transferred and adapted from Bangkok to Rio de Janeiro and Los Angeles," *Mega Cities Project*, accessed January 1, 2019, <https://megacitiesproject.org/projects/innovation-transfers/>.

21 Rangoli is a traditional Indian decoration of beautiful patterns made from ground rice often performed during festivals.

22 Photo credit to Bengaluru Ward 198 Monika JHI.

23 <https://green-indonesian.org>.

24 Translated to English, the six personal reflections to rate before and after the course are:

I am happy with myself and my abilities. I feel happy with my surroundings. I have a good relationship with my community. I feel capable of making concrete positive changes in my environment. My environment is very important for my life. I enjoy a lot of my free time in the public spaces of my community (parks, squares, etc.). I know how to care for and improve my environment. I can generate positive changes in my environment without depending on others (municipality, colleagues, etc.).

25 For administrative purposes, the city of Bengaluru is divided into nine zones, which are further subdivided into a total of 198 wards administered by the Bruhat Bengaluru Mahanagara Palike (BBMP).

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39 Brazilian Association of PET.

40 National Association of the Recycling Industry.

41 "Danone-AQUA Supports the Development of a Circular Economy," *Antara Sumut News*, March 6, 2018, <https://sumut.antaranews.com/berita/174215/danone-aqua-dukung-terbanggunnya-ekonomi-sirkular>.

42 Sustainable Waste Indonesia, "Baseline Study of Project STOP: Muncar District, Banyuwangi Regency, Indonesia," January, 2018.

43 There's often a perception that waste has more value than it does. For example, the Bengaluru airport put out a tender for their waste management in which they expected to get a share of the profits from the waste handling. There was not a single bid. They then needed to issue a new tender which included a handling fee for the waste to the service provider. http://bengaluruairport.com/bial/pdf/tender/RFP_Design_Build_Concept_of_SWM.pdf

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