



DOCUMENTATION OF
BEST PRACTICES ON 3R's

REDUCE

REUSE

RECYCLE

Supported by
Cities Combatting
Plastic Entering Marine
Environment (CCP-ME)

Helping cities and
states to formulate
appropriate strategies



As a federally owned enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development.

Published by:

Ministry of Housing and Urban Affairs (MoHUA),
Government of India

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Address

Ministry of Housing and Urban Affairs (MoHUA)

Nirman Bhawan, Maulana Azad Road,
New Delhi, Delhi 110011

GIZ

Cities Combatting Plastic Entering Marine Environment
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
3rd Floor, B-5/5, Safdarjung Enclave
New Delhi 110029
T + 91 4949 5353
F + 91 4949 5391

E info@giz.de

I www.giz.de

Responsible

Mrs. Vaishali Nandan
Head of Project, Cities Combatting Plastic Entering Marine Environment, GIZ
E: vaishali.nandan@giz.de

Designed by

Aspire Design, New Delhi

Authors

Sourabh Manuja, GIZ India

Peer Review

Central Public Health & Environmental Engineering Organisation (CPHEEO), Ministry of Housing and Urban Affairs (MoHUA), Government of India

Editorial:

Soma Biswas, GIZ India
Muskan Mascharak, GIZ India

Disclaimer

Responsibility for the content of external websites linked in this publication always lies with their respective publishers. MoHUA and GIZ explicitly dissociates itself from all such content.

May, 2023

DOCUMENTATION OF BEST
PRACTICES ON 3R's

REDUCE

REUSE

RECYCLE

Supported by
Cities Combatting
Plastic Entering Marine
Environment (CCP-ME)

Helping cities and
states to formulate
appropriate strategies

FOREWORD

The notion of reduce, reuse, and recycle is not recent, for decades sustainability has been inextricably linked with the practice of the 3Rs' (Reduce Reuse & Recycle). However, it is over the recent years that this practice is being considered as a 'Principle', the sole proven way to mitigate and manage waste from the source itself. Along with the implementation of recent policies and rules, Government of India is working in mission mode through Swachh Bharat Mission (SBM) towards making people aware, reducing usage of single use plastics, and strongly promoting the concept of reuse and recycle of waste through various innovative concepts and schemes in cities.

This document presents a compendium of best practices, both from national and international cases, concerning the principle of 3Rs' (reduce, reuse, and recycle) and its value chain. Through the documented case studies, this undertaking aims to present viable options to integrate the practice of 3Rs', in every walk of life. Through the chosen case studies, numerous innovative approaches to reduce the energy and economic losses while reinforcing the wealth-in-waste notion has been put forth. Waste has been underutilized for years together, this case study documentation intends to showcase implementable, up-scalable, and sustainable ways to manage non-biodegradable waste and low-value recyclables.

The case studies collated in this document comprehensively present the way forward and ensure that the readers not only become aware of the emergent and existing innovations, but also sensitize readers towards the long-lasting impact of proper waste management, and the benefits of practicing the 3Rs'.

I am pleased that the GIZ India, in collaboration with the Ministry of Housing and Urban Affairs, has brought out this compilation of best practices entitled 'Documentation of Best Practice on 3Rs' to help states and cities in formulating appropriate strategies for managing waste.



SHRI MANOJ JOSHI
Secretary
Ministry of Housing and
Urban Affairs,
Government of India

FOREWORD

India and Germany established diplomatic relations more than 70 years ago. For decades, our countries are working together towards clean, sustainable and climate friendly cities. It gives the Embassy of the Federal Republic of Germany in New Delhi immense pleasure to be part of the launch of “*Documentation of Best Practices on 3R’s (Reduce, Reuse, and Recycle) – Helping cities and states to formulate strategies*”.

This document supports states and cities in India to plan for an effective and efficient waste management system. It has been developed under the Cities Combatting Plastics Entering Marine Environment (CCP-ME) project funded by the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) as part of its Marine Debris Framework – Regional hubs around the globe (Marine:DeFRAG). CCP-ME is anchored at Ministry of Housing and Urban Affairs (MoHUA) of the Government of India and implemented by GIZ.

Waste management is an issue for almost all countries in the world. Thus, reducing, reusing and recycling of waste is of utmost importance. Germany, through GIZ, has been working in the waste management sector in India for long and continues to do so. This document outlines to states and cities how things are being practiced in the area of 3R’s for waste management not only in India but globally, and identifies strategies to implement this measure on the ground. This will help states and cities to achieve the goals of Swachh Bharat Mission-2.0m, making them garbage free.

The Government of Germany would like to wish states and cities in India all the very best in their journey towards a sustainable tomorrow. Also, the German Embassy and BMUV would like to take this opportunity to thank MoHUA for its continued support for the cooperation without which this would not have been possible.



DR ANTJE C BERGER
Counsellor
Head of Environmental
Affairs



DR STEFFEN KOCH
Minister
Head of Department
for Economic & Global
Affairs

PREFACE

India generates close to 55 million metric tonnes of municipal solid waste every year, of which only 74% gets treated (SBM Urban, 2022). Indicating a huge requirement of land to dispose untreated and uncollected waste from cities. This waste burden is further linked with requirements for manpower to handle waste, transportation, processing, etc. Thus, linking waste management with environmental, financial, health and socio-economic aspects. To help cities manage waste appropriately, Government of India revised the Solid Waste Management and Plastic Waste Management Rules in 2016. These rules mandate segregation at source by generator, establishing material recovery facilities to manage waste and help cities aim to achieve zero waste going to landfills. The 2021 amendment to the Plastic Waste Management Rules also bans 'Single Use Plastics'. However, implementation of the rules has always been a challenge for cities.

With a focus on improving management of waste and using as guidance, the Rules and the waste management hierarchy, the emphasis for cities has to be on waste reduction, reuse and recycling following the 3Rs' (reduce, reuse and recycle) concept and the principles of circular economy. These practices will help cities optimise solid waste utilization and ensure that minimum waste goes to the landfill, thus helping cities manage their resources in a sustainable manner.

Due to lack of awareness, infrastructure and sustainable options, many cities do not get a chance to engage their citizens in achieving 3Rs' – Reduce, Reuse and Recycle waste and some of the age-old practices in India are also getting lost. As a result, many of the recyclables are left out of the circular economy loop converting valuable resource material into waste and thereby becoming a burden for cities.

This booklet "Documentation of Best Practices on 3Rs' - Helping cities and states to formulate appropriate strategies for waste management" has been prepared with the intention to bring forth the best practices in the area of 3Rs' and help states and cities to develop their own strategies towards appropriate management of municipal solid waste.

The 'Cities Combating Plastic Entering Marine Environment' (CCP-ME) project, under which this booklet is getting produced, is funded by the German Federal Ministry for Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and implemented by the Ministry of Housing and Urban Affairs (MoHUA), Government of India jointly with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. This document has been prepared as part of this support.

The booklet considers both national and international examples that can be easily replicated by cities and states across the country. Case studies include the Green Protocol in Kerala; Refill and No-packaging stores in India; the good old practice of reusing clothes, shoes and other materials in day-to-day life; using recycled products; buy-back systems, shop-with-your-waste campaigns; use of digitization among others. With this rich collection of examples, we hope that this booklet will serve as a tool in guiding cities and states to choose appropriate strategies for their respective locations, thus enabling them to make systems around 3Rs' self-sustainable and easy to replicate. This will result in effectively transforming waste into resource, thus preventing dumping and reduce the environmental burden on cities.



MR. ERNST DOERING
Director & Cluster
Coordinator
Sustainable Urban and
Industrial Development,
GIZ India

ACKNOWLEDGEMENT



VAISHALI NANDAN
Project Head
Cities Combating
Plastic Entering Marine
Environment

‘Documentation Of Best Practices On 3Rs’: Helping cities and states formulate appropriate strategies for waste management” is a knowledge product which intends to help Cities and States to formulate appropriate strategies for managing waste. It has been prepared as a support under the project “Cities Combating Plastic Entering the Marine Environment (CCP-ME)” project funded by the German Federal Ministry for Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH jointly with the Ministry of Housing and Urban Affairs (MoHUA), Government of India.

The CCP-ME project focuses on enhancing practices (incl. digital tools) to prevent plastic entering the marine environment in selected cities, states and at national level, through various interventions and technical support at all levels, including pilot demonstrations in cities, developing strategies and guidelines, building capacity of states and cities, etc. Thus enabling improved waste management in the country and better monitoring recycling and reuse quantities by cities, states and national level through digital tools.

Based on the objective to help cities and states to formulate strategies for improved waste management, keeping waste management hierarchy in focus, the documentation of Best Practices on 3Rs’ has been prepared. This document captures various examples of interventions and strategies adopted by different stakeholders around reduce, reuse and recycling that has helped in diverting waste resources back to the circular economy loop.

We would like to thank Ms. Roopa Misra, Joint Secretary, Swachh Bharat Mission and Mr. Binay Jha, Director, SBM at MoHUA for constant motivation and support in compiling the case studies.

We express our sincere gratitude to the organizations/ individuals who have been referred and showcased in the document. We would like to thank these persons/ organizations for showcasing their concepts, designs and implemented ambitious strategies, helping others to learn and apply these concepts.

1. Green Protocol – Suchitwa Mission Local Self Government Department Kerala: sanitation.sm@kerala.gov.in
2. United Cities and Local Government (UCLG) Committee on Social Inclusion, Participatory Democracy and Human Rights: cisdpl@uclg.org
3. [Vikalp- borrow a bag -Why Waste Wednesdays Foundation:](#) whywastewednesdays@gmail.com
4. Unpackaged Innovation Ltd: info@beunpackaged.com
5. Ecoindian Zero Waste Organic Store: ecoindian.com@gmail.com
6. 7 to 9 Green Store: bittujohn87@gmail.com

7. Muditha Zero Waste – Pratyusha Sharma (Founder): <https://www.linkedin.com/in/pratyusha-sharma-43064523/>
8. Bare Necessities: info@bare necessities.in
9. Ecoposro: ecoposro@gmail.com
10. Adrish: adrishzerowaste@gmail.com
11. Veras: contact@verasvintage.dk
12. Twirl.store: info@twirl.store
13. Latasita.in: www.latasita.in
14. Goonj: mail@goonj.org
15. Vytal: hallo@vytal.org
16. E-namo: info@namoewaste.com
17. Cashify: info@cashify.in
18. RePack: info@originalrepack.com
19. Alas – Indonesia: kontak.alas@gmail.com
20. Shayya by Lakshmi Menon: 2pureliving@gmail.com
21. GreenSole: care@greensole.in & csr@greensole.in
22. Recykal: support@recykal.com
23. Return and Earn – New South Wales, Australia: info@service.nsw.gov.au
24. Thaely Sustainable sneakers: sales@thaely.com
25. Corporation of city of Panaji, Goa: office@ccpgoa.com & commissioner@ccpgoa.com
26. Project Mumbai: info@projectmumbai.org
27. Re>Pal: sales@re-pal.com

Last, but not the least, we would like to express our appreciation to Sarfuddin family in Jamalpur, Aligarh; Harmonium Sales and Services shops in Ramanreti, Vrindavan; cobblers in localities of Vrindavan and Delhi; various Electrical Appliances Repairing centers around Delhi and Mumbai; and many others with whom interactions took place during the compilation of this document.

We are also thankful to Mr Sourabh Manuja for steering this document along with our interns Ms. Keerthana Thyagaraj and Ms Himani Gaikwad.

Hope that this document will serve as a useful tool helping Cities and States to formulate appropriate approaches and strategies for effectively converting waste into a resource.

ABBREVIATIONS

BMUV	The Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection, Government of Germany
BYOC	Bring Your Own Container
CCP-ME	Cities Combating Plastic Entering Marine Environment
CCP	Corporation of the City of Panaji
CPCB	Central Pollution Control Board
DRCCs	Dry Resource Collection Centres
DRS	Deposit Return Scheme
EDMC	East Delhi Municipal Corporation (Now part of unified Municipal Corporation of Delhi)
EU	European Union
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoI	Government of India
IEC	Information, Education and Communication
IPCA	Indian Pollution Control Association
IPCC	Intergovernmental Panel on Climate Change
MCG	Municipal Corporation of Gurugram
MDFVPL	Mother Dairy Fruit and Vegetable Pvt Ltd
MoHUA	Ministry of Housing and Urban Affairs
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
MTPA	Million Tonnes per Annum
NAMA	Nationally Appropriate Mitigation Actions
NEERI	National Environmental Engineering Research Institute
PPE	Personal Protective Equipment
RDF	Refuse-Derived Fuel
TERI	The Energy and Resources Institute
ULBs	Urban local bodies

CONTENTS

Foreword	iii
Preface	v
Message	vii
Acknowledgment	ix
Abbreviation	xi
BACKGROUND	1
Navigation through the case studies	3
Energy and economic linkages for waste management process	4
Stakeholder involvement	4
CHAPTER 1: BEST PRACTICES UNDER REDUCE	5
1.1. Green Protocol: Use of sustainable utensils	5
1.2. Capannori (Italy): A zero-waste city	10
1.3. No packaging grocery stores	16
1.4. Refill Stores	21
CHAPTER 2: BEST PRACTICES UNDER REUSE	27
2.1. Clothing reuse and upcycling	27
2.2. Reusable packaging delivery systems	32
2.3. Re-using waste materials to make mats and mattresses	36
2.4. Other Good practices under Reuse	41
CHAPTER 3: BEST PRACTICES UNDER RECYCLE	44
3.1. Recykal	44
3.2. Return and Earn: New South Wales	48
3.3. Shop With Your Waste Campaign: Barter System	53
3.4. Re>Pal: Pellets from recycled plastic waste	57
4.0 IMPORTANT TAKE-AWAYS FROM CASE STUDIES	60
5. REFERENCES	61

BACKGROUND

Urban India, with about 34% of the country's total population of 1.37 billion today generates close to

51

million tonnes

of municipal solid waste (MSW) per year, out of which 73% gets processed



The world generates 2.01 billion tonnes of municipal solid waste annually, with at least 33 percent of that (extremely conservative) not managed in an environmentally safe manner. Urban India, which is about 34% of the country's total population of 1.37 billion, generates close to 51 million tonnes of municipal solid waste (MSW) every year. The average per capita waste generation which was reported to be 338.06 grams/capita/day in 2012 has increased to 358.81 grams/capita/day in 2018 (TERI 2021).

Increasing population, rapid urbanization (projected to be 50% by 2050) and increasing waste generation rate in India indicate that the amount of urban waste generated is going to increase at a rapid rate. The MSW is projected to reach 165 million tonnes per annum (MTPA) by 2031 and about 436 MTPA by 2050 (Planning Commission 2014; TERI 2021). Thus, MSW management must be a priority for government.

MSW generated in India varies in characteristics regionally and seasonally, along with other factors. In 2004, the Central Pollution Control Board-National Environmental Engineering Research Institute (CPCB-NEERI) conducted a study that indicated that 52% of the MSW was organic. A 2017 CPCB study showed that 6.92% of MSW was plastic on an average. In 2019, a study conducted by The Energy

and Resources Institute (TERI), at the Bhandwari landfill in Gurugram, indicated that MSW was composed of 32.2% organics, 10.96% plastic, 4% paper, 1% metal, 0.5% glass and 52% other waste including inert. Similarly, a 2019 Nationally Appropriate Mitigation Actions (NAMA) project-backed waste characterization study in Varanasi revealed that solid waste collected from wards were comprised of around 29.2% organic waste, 5.4% paper, 4.8% plastic, 0.3% metal, 0.2% glass, 7% leather and textile, 2.1% sanitary waste, 7.7% C&D waste, 0.6% domestic hazardous waste, 0.7% tires, 0.1% electronics and 40.5% fines/inerts (Manuja et al. 2020).

India recycles close to 70% plastic (Plastindia Foundation 2019) and 27% paper (Manuja & Pandey 2020), most of which is through well-established linkages with the informal sector. However, economic and energy-related challenges in collecting low-value waste items (like LDPE, MLP, etc.) cause many recyclables to be disposed of in dumpsites/landfills.






Government of India (GoI) notified rules on solid waste management and plastic waste management in 2016. These rules mandate segregation at source by a generator and integration of the informal sector into existing systems. The rules also outline that cities should become zero-waste in the near future, establish material recovery facilities and ban single-use plastics according to the Plastic Waste Management Rules (Amendment), 2021 and 2022. The rules emphasize the 4Rs of the waste management hierarchy for optimum utilization of the components of solid waste to ensure minimal landfilling and to minimize the impact of solid waste on human health and the environment. However, due to non-sustainable waste management practices, lack of citizen participation in cities and lack of implementation and monitoring of the rules, many recyclables are left out of the 3R's practices.

To address the challenges in bringing non-biodegradable waste to circular economy loops, enterprises and entrepreneurs around the world have demonstrated many innovative approaches. These approaches not only reduce the energy and economic linkages involved in the collection of recyclable waste but also infuse the concept of waste-to-wealth among stakeholders. Further, many low-value recyclables, which are usually difficult to segregate, are now being brought into circular economy loop then entering the environment.

This case study document is prepared to support MoHUA in effective implementation of Goals of Swachh Bharat Mission, helping cities and states to formulate appropriate strategies around 3R's. It presents various case studies with concepts outlined in the 3R's and provides different options to governments and policymakers for integrating such systems into city to help them decouple economic growth and urbanization from the trends of increasing waste generation and disposal.



NAVIGATION THROUGH THE CASE STUDIES

Priority of implementation	 REDUCE	 REUSE	 RECYCLE
 NATIONAL EXAMPLES	GREEN PROTOCOL USE OF SUSTAINABLE UTENSILS	TWIRL.STORE	RECYKAL
		LATASITA.IN	
		GREEN BY GOONJ	TRAELY
	ECOINDIAN, CHENNAI	DARI MAKING IN INDIAN CITIES	BARTER SYSTEMS-SHOP WITH YOUR WASTE CAMPAIGN, GOA
	VIKALP- BORROW A BAG		
	7 TO 9 GREEN STORE, KOCHI	SHAYA MATRESS	THE MUMBAI PLASTIC RECYCLOTHON
	ECOPOSRO, GOA;	RECYCLE INDIA	
	ADRISH, PUNE AND DELHI	GREENSOLE	
	MOTHER DAIRY	OLX- ONLINE PLATFORM	
		REPAIR STORES FOR ELECTRONICS AND APPLIANCES	
CASHIFY			
NAMO E-WASTE			
 INTERNATIONAL EXAMPLES	CAPANNORI, ITALY: A ZERO WASTE CITY	VERAS, DENMARK	RETURN AND EARN NEW SOUTH WATES, AUSTRALIA
		VYTAL, GERMANY	
		REPACK, FINLAND	
	THE UNPACKAGED GROCERY STORE [UNPACKAGED INNOVATION LTD, UNITED KINGDOM]	ALAS REUSABLE, INDONESIA	RE>PAL - PELLETS FROM RECYCLED PLASTIC WASTE
	SELF-SERVICE REFILL MACHINES, SLOVENIA		

India recycles close to 70% plastics (Plastindia Foundation, 2019) and 27% paper, most of this is through the well-established linkages with and within the informal sector

ENERGY AND ECONOMIC LINKAGES FOR WASTE MANAGEMENT PROCESS

It is important to make the systems around 3R's self-sustainable. This not only helps in generating employment and easy replication in similar places but also helps to divert waste away from disposal, reducing the environmental burden of cities.

Energy linkages involved in the segregation and transportation of waste – is interlinked with economy as well. These define if it is feasible for a particular waste stream in a given region to be segregated and transported to the recycling facility or if waste can be transformed into a useful resource. Thus, it is important that economic and environmental sustainability is suitably analyzed while adopting innovative technologies.

STAKEHOLDER INVOLVEMENT

Several stakeholders are involved in waste management and implementation of innovative strategies to help reduce, reuse and recycle waste. These include waste generators, collectors, waste-treatment units, waste dealers and aggregators, recyclers, road construction firms and co-combustion units utilizing refuse-derived fuel (RDF).

FIGURE 2: STAKEHOLDERS INVOLVED IN WASTE MANAGEMENT



BEST PRACTICES UNDER REDUCE

Around

43%

of all manufactured plastics are single-use plastics. In 2017, Indian cities generated about **9.47 million tonnes** of plastic waste



1.1. GREEN PROTOCOL: USE OF SUSTAINABLE UTENSILS: SUCHITWA MISSION, KERALA

SUMMARY

The Green Protocol initiative of the Suchitwa Mission first began during the National Games in November 2015 wherein sustainable cutlery made from glass, stainless steel and porcelain was used as alternative to disposable plastic. The protocol was implemented by serving water in steel tumblers, banning the usage of disposables by the catering unit and engaging the spectators in various cultural activities through which information, education and communication (IEC) messages were given out. The protocol is now being adopted successfully in many events and institutions, including the Legislative Assembly.

Use of sustainable utensils as alternative to single-use items has recently been adopted by other municipalities in India to reduce waste. The Municipal Corporation of Gurugram (MCG) has opened two steel utensil banks in sectors 10 and 48, which have around 2,000 utensil sets each. The utensil banks rent out utensils to residents free of cost so they can avoid the use of disposable plastics (Hindustan Times Correspondent 2021; The Times of India 2021).

BACKGROUND

Single-use plastic refers to plastic items that are intended to be disposed of after only one use. Around 43% of all manufactured plastics are single-use plastics. In 2017, Indian cities generated about 9.47 million tonnes of plastic waste (Manuja & Pandey 2020). Single-use plastics pose two problems for waste management. The first is that the volume of waste has drastically increased in recent years due to rapid urbanization and increased consumption patterns. The second and bigger problem is that disposable materials create increased mixed waste which can neither be composted nor recycled, thereby increasing the non-recoverable materials in a waste stream.

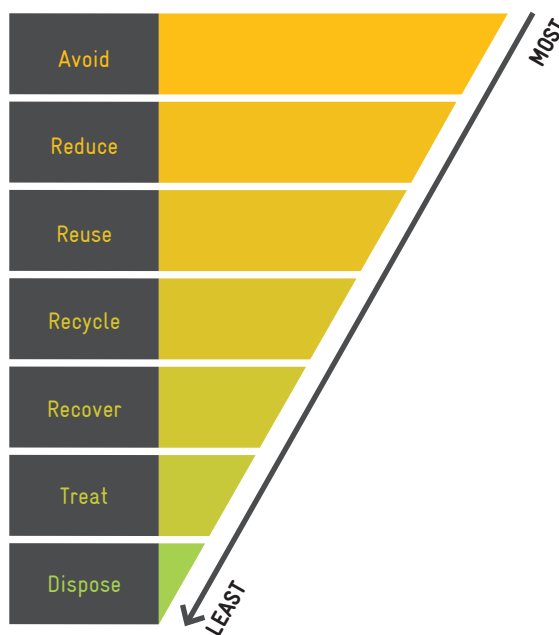


FIGURE 3: WASTE MANAGEMENT HIERARCHY OF GREEN PROTOCOL

To tackle this issue, the Government of Kerala launched the Green Protocol initiative for the reduction of waste. The key focus of the Green Protocol is to minimize waste by preventing the use of disposables and promoting

FIGURE 4: INAUGURATION AND DISTRIBUTION OF STEEL CUTLERIES AS PART OF THE GREEN PROTOCOL IN OFFICES [LOCAL SELF GOVERNMENT DEPARTMENT OF KERALA (2015)(B)]



FIGURE 5: SAMEERA'S HOME CROCKERY BANK [CROCKERY BANK FOR EVERYONE, FACEBOOK]



the use of sustainable alternatives such as glass, stainless steel and porcelain cutleries. The top priority in a waste-management hierarchy is the prevention of waste generation. The purpose of the protocol is to show how the prevention of waste generation can be the best contribution to greening the environment (Local Self Government Department of Kerala 2017).

SCALABILITY OF THE MODEL

A utensil bank is a simple model that requires minimal investment and maintenance costs and can last for a long time. It does not require skill or training, storage units or staff and can be run by citizens. This intervention of using reusable utensils instead of use-and-throw cutleries is helping cities reduce their waste burden. Many cities and citizen groups have adopted such initiatives. For example, “Crockery Bank for Everyone” is a non-profit initiative started by Sameera Satija in Gurgaon, Haryana, that lets people rent free of cost steel crockery for events. Satija runs it from her home and uses Facebook to communicate. To rent the utensils, one can message her on the Facebook page, with details and a copy of an identity proof. The only condition is that the utensils borrowed are to be washed properly and returned without damages. She also spreads awareness through various platforms and encourages users to start utensil banks in their localities (NDTV 2019).

The use of sustainable utensils is also gaining popularity among street vendors, making them more responsible towards the city’s environmental needs by adopting reusable cutleries instead of use-and-throw ones.



In just a year since its inception, Crockery Bank for Everyone has saved over

175,000

sets of single-use cutlery items from being used

SUSTAINABILITY OF THE MODEL

The Ministry of Environment, Forest and Climate Change released the Plastic Waste Management Rules (Amendment) in 2021. The amendment places a three-stage ban on the manufacture, import, stocking, distribution and sale of certain single-use plastic items starting from January 1, 2022. Of this, the second stage proposes the ban of items such as plates, cups, glasses and other cutlery such as forks, spoons, knives, and straws, starting July 1, 2022. The updated rules will now act as a driving force for urban local bodies to adopt sustainable initiatives such as utensil banks. Since they have a low investment cost, utensil banks can also be adapted as for-profit businesses where utensils are rented out for a small fee to recover the investment. Such businesses can maintain user accountability and ensure the quality of utensils.

FIGURE 6: GREEN PROTOCOL VOLUNTEERS IN PALAKAD [LOCAL SELF GOVERNMENT DEPARTMENT OF KERALA (2015)(B)]



IMPACTS

- The Green Protocol, introduced during the National Games, 2015, has since become a successful people’s movement in Kerala, where it is readily implemented in many events including wedding ceremonies, religious gatherings and election assemblies.
- During 2016–2017 alone, the Green Protocol was implemented in several gatherings including the general elections, weddings, religious ceremonies and sporting events, which had over 1.2 million combined participants.
- In just a year since its inception, Crockery Bank for Everyone in Gurugram has saved over 175,000 sets of single-use cutlery items from being used.

FIGURE 7: GREEN PROTOCOL FOLLOWED AT THE NAVARATRI CELEBRATIONS IN KASARGOD [LOCAL SELF GOVERNMENT DEPARTMENT OF KERALA (B)]



FIGURE 8: GREEN PROTOCOL FOLLOWED AT THE NAVARATRI CELEBRATIONS IN KASARGOD [LOCAL SELF GOVERNMENT DEPARTMENT OF KERALA (B)]



KEY LEARNINGS

- State-level policy interventions along with awareness-raising campaigns and IEC tools have motivated citizens in Kerala to avoid single-use plastic. The Green Protocol is now a people's movement where the usage of sustainable utensils is being adopted in many gatherings and celebrations.
- The change in policy regarding the use of single-use plastic is pushing local bodies to come up with innovative solutions and sustainable alternatives. However, such interventions must be pushed more aggressively for uptake by the masses.
- Social media platforms (like Facebook) are key in spreading awareness and reaching a large number of people.



1.2. CAPANNORI, ITALY: A ZERO-WASTE CITY

SUMMARY

Waste disposal methods such as landfill disposal and incineration pose a challenge to sustainability by encouraging waste generation and impeding recycling rates. To tackle this issue, the local waste collection corporation and policymakers of Capannori, Italy, not only looked at ways to boost recycling rates but also to reduce the amount of waste generated at the source by following the waste management hierarchy. To achieve this goal, the town council adopted a zero-waste strategy in 2007, the first city in Europe to do so, and pledged to send zero waste to landfills by 2020. Capannori is now one of Europe’s best performing zero-waste cities, with a separate-collection rate of 82% and an average residual waste generation of 87 kilogrammes–88 kilogrammes/capita/year. To reduce waste generation further, the municipality has invested in reuse centres, upcycling skills training and short-chain stores and provides local families with direct support and incentives to minimize their waste.



Capannori is now one of Europe’s best performing zero-waste cities, with a separate-collection rate of

82%

and an average residual waste generation of **87 kilogrammes–88 kilogrammes/capita/year.**

BACKGROUND

Key strategies implemented by Capannori urban local bodies to reduce waste generation at the source are as follows:

Pay-as-you-throw policy:

In 2012, a new pay-as-you-throw waste tariff was launched in several villages in the Capannori municipality. The frequency of collection per household is measured using coded stickers on waste collection bags which are scanned by a reader on the collection vehicle. In areas where this system was used, the new tariff incentivized better separation and prevention, driving local source separation rates up to 90% (Vliet 2018).

FIGURE 9: SEGREGATED WASTE COLLECTION BINS PROVIDED BY THE MUNICIPALITY FOR DOOR-TO-DOOR COLLECTION



Tax incentives for packaging-free stores:

The municipal council further provided tax incentives to local businesses to stock products that could be refilled using containers brought by the customers, such as liquid detergents. With these incentives, in 2009, a local grocery store was opened which sold over 250 locally sourced food and drink products in bulk.

Zero-waste family challenge:

The Zero Waste Research Centre, Capannori, helped pilot the first local zero-waste family challenge, involving 85 families who were supported to reduce their waste. Each family received a notebook divided into different colours, corresponding to the colours of the separate-collection bags. Families were requested to record the weight of the residual (mixed) waste fraction before they left it outside for collection. The research centre provided participants with support and guidance by conducting training sessions on composting, production of soap, repair of household furniture items, etc. The families received a discount on the bill for residual (mixed) waste collected, resulting in savings of approximately €80–€90/year/family. An additional 30% discount on waste tariffs was given to families composting their food and garden waste at home.

Reuse centre:

In 2011, the municipality also opened a reuse centre in the village of Lammari. Citizens were encouraged to give away unused or slightly damaged items such as clothes, toys, shoes, electrical appliances and furniture. These items could be repaired and sold at low price to those who needed them. The centre also provides courses for various upcycling skills like sewing, upholstery, woodwork and bicycle repair, encouraging the values and practice of reuse.

Short-chain stations:

A short-chain supply model was introduced, which allowed farmers to sell their goods to consumers directly. This model of food distribution eliminated the intermediary of a packaging plant or retailer, leading to a price reduction for the consumers and an increased profit margin for the farmers. Two self-service refill milk stations were opened where milk was directly supplied from a local farmers' cooperative.

SUSTAINABILITY OF THE MODEL

In 2009, the city council saved around €2 million by selling materials to recycling plants and reducing the amount of waste sent to landfill sites. These savings were reinvested into the waste-reduction infrastructure. This resulted in a further reduction of waste tariffs by 20% (Vliet 2013). In 2010, public canteens were supplied with Joraform composting machines, which was then extended to cover resident groups. This could help to reduce the cost of collecting, transporting and treating organic waste by between 30%–70%.

Additionally, residents were encouraged to take up home composting. Over 2,200 households were given free composters along with training on composting techniques. The households following home composting are given a 10% discount on their waste tariff as incentive.

FIGURE 10: SHORT-CHAIN GROCERY STORE EFFECORTA SELLING PRODUCTS IN BULK [ZERO WASTE EUROPE]



FIGURE 11: THE RESIDENTS OF CAPANNORI PROMOTING ZERO-WASTE [LOVEWAVES]



The zero-waste family challenge is a continued initiative from the leadership to reduce waste generation as much as possible. Involving residents in activities has created a change in consumption and disposal patterns. The drop-off point for bulky waste and reusable items in Lammari points to a change in culture over the years. Through policies and awareness campaigns, people are finding value in recovering items rather than disposing of everything.

SCALABILITY OF THE MODEL

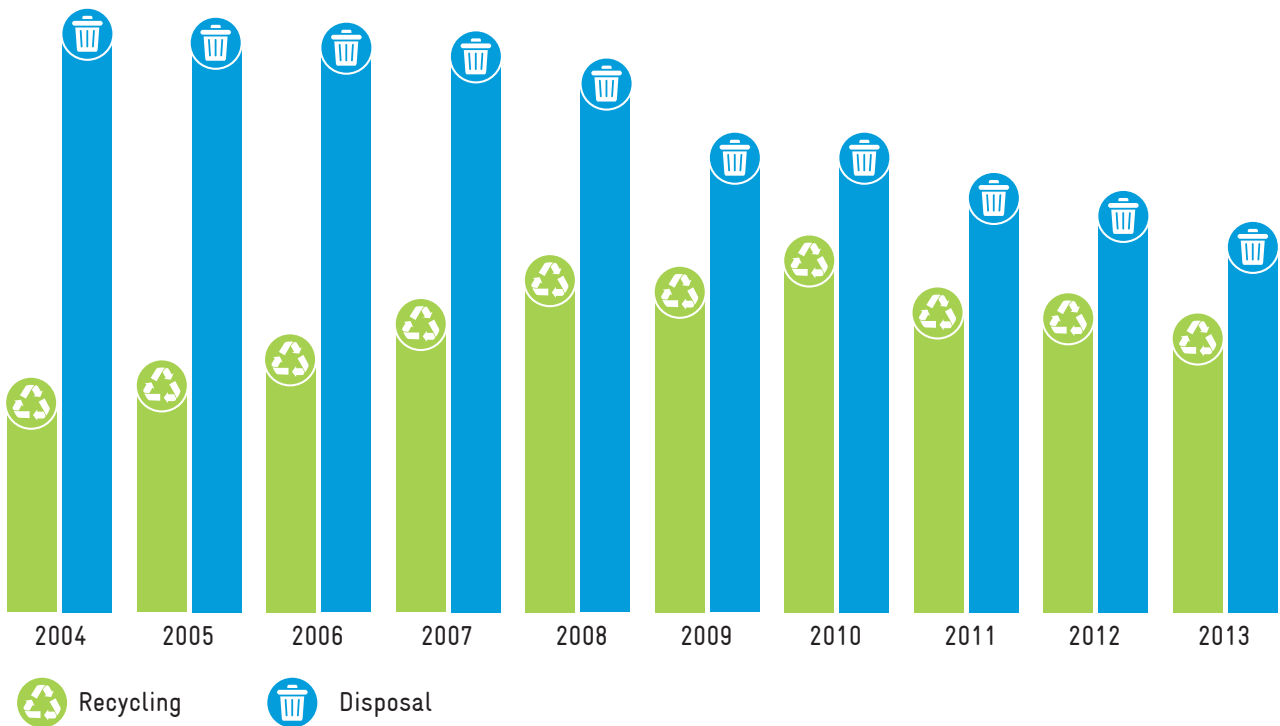
It can be argued that Capannori has an easy situation in terms of territory, density of inhabitants and confidence relationship factoring from a quite peaceful social environment. To implement similar policies in other communities, they will need to be adapted to the social and territorial contexts. This adaptation has to be in a way that enhances the relationship between citizens and public authorities. (Maurano 2010). A trusted relationship between public institutions and citizens and a strong commitment by the public administration to the local environment are the cornerstones for the implementation of such policies elsewhere. The people and the city of Capannori approached waste management and prevention proactively in order to realize their zero-waste goals. Through transparency and community engagement, Capannori was able to do so with minimal hindrances.”



Over **2,200**
households

were given free composters along with training on composting techniques

PROGRESS OF RECYCLING ACHIEVED AT CAPANNORI, ITALY OVER 2004-2013.



IMPACTS

- Between 2004–2012, the overall volume of waste generated per person decreased by 39% (from 192 kilogrammes/person/year to 118 kilogrammes/person/year). It is predicted to fall further due to the extension of the pay-as-you-throw scheme.
- The rate of unseparated waste (residual waste) per capita was reduced from 340 kilogrammes/year in 2006 to 146 kilogrammes/year in 2011, showcasing a 57% drop.
- In 2012, 93 tonnes of objects were dropped off at the Lammari reuse centre.



The rate of unseparated waste (residual waste) per capita was reduced from **340 kilogrammes/year** in 2006 to **146 kilogrammes/year** in 2011, showcasing a

57%
drop



KEY LEARNINGS

- Involving residents in every stage of policymaking and taking a holistic and proactive approach made Capannori a leading example for waste prevention in Europe.
- Transparent engagement with the population has made the zero-waste goal of Capannori an achievement of the entire community. Meetings were held in public places to gather input and ideas and involve the local population in the zero-waste strategy.
- Incentives given for the reduction of waste encouraged resident participation.
- Innovative efforts such as reuse centres, upcycling skills training, short-chain stores, etc., contributed to the reduction of waste.



INDORE, MADHYA PRADESH | A ZERO-WASTE CITY

Divided into 85 Wards and 19 Zones for operation of Solid Waste Management (SWM), city has 100% door-to-door garbage collection & segregation of waste at the source from 100% of its households and commercial premises. The total waste generation is 1115 MTPD out of the total waste 58.25% is wet or organic waste, 41.75% is dry waste and 0.5% is household hazardous and sanitary waste.

Indore worked on four points to keep the city clean:

- a. Removing Garbage Bins
- b. Night Cleaning of Roads
- c. New-design Municipal Waste Trucks:
3.3 cubic meter-capacity
- d. Children Made Brand Ambassadors



Information, Education, and Communication (IEC) ranging from traditional to audio visual to print and electronic media to social/digital media was the key that brought out behavioural change which is the foundation of making the success of the Swachh Bharat Mission. Grassroots innovations, street plays, wall paintings, and FM radio constantly upgraded their content by incorporating new thematic messages to be communicated and utilizing creative ways of undertaking the same. Cultural events such as the Ganesh festival, Dusshera, and Gandhi Jayanti were utilized as events to spread the message of cleanliness.

A massive drive was undertaken to remove stray cattle loitering on the roads – 40,000 stray cattle were removed from the roads. Cattle were taken to panchayat areas and kept there.

The steps undertaken by IMC included:

1. Plastic waste collection centre.
2. The rag pickers - re-oriented and are now working at a plastic waste collection centre with the help of NGOs Sarthak and Basix.
3. Engaged NGOs to use their soft skills to create awareness.
4. Segregated dry waste is transported to the Garbage Transfer Station (GTS) for sorting (GPS tracked). The garbage is also compressed with machines and transported for processing.
5. Strict monitoring by municipal authorities coupled with strong action, which includes hefty penalties and suspension for dereliction of duty, has ensured that there are no gaps.
6. Two engineered landfills of 6.25 acre each have been constructed and are used as and when required.
7. Service station has been established where 6 vehicles can be serviced at a time.
8. Bioremediation of 15,00,000 MT waste dumped on 100-acre land has been achieved.



1.3. NO-PACKAGING GROCERY STORES

SUMMARY

In order to reduce plastic waste, the number of zero-waste or no-packaging supermarkets is increasing in many countries. The concept originated in Europe more than a decade ago and has spread globally since. Zero-waste supermarkets have also gained popularity in the United States, Australia and even in India. A zero-waste retail business sells food without packaging and customers are encouraged to bring their containers or buy reusable glass containers to carry the food that they buy. Items purchased are weighed at fill-up systems and customers pay according to the quantity.

BACKGROUND

The environmental impact of plastic packaging is a critical problem to tackle, particularly due to the inappropriate management of plastic packaging that has low value, like single-use plastic items. Most plastic packaging comes from food packaging as food needs to be stored and transported safely to ensure that there is no spoilage and shelf life is intact. Several efforts have been made to create eco-friendly packaging material and bio-degradable plastic, but a solution has not been found yet.



FIGURE 13: PLASTIC WASTE GENERATED (IN MILLION TONNES PER YEAR) BY THE INDUSTRIAL SECTOR IN 2015 [GEYER ET AL. 2017]

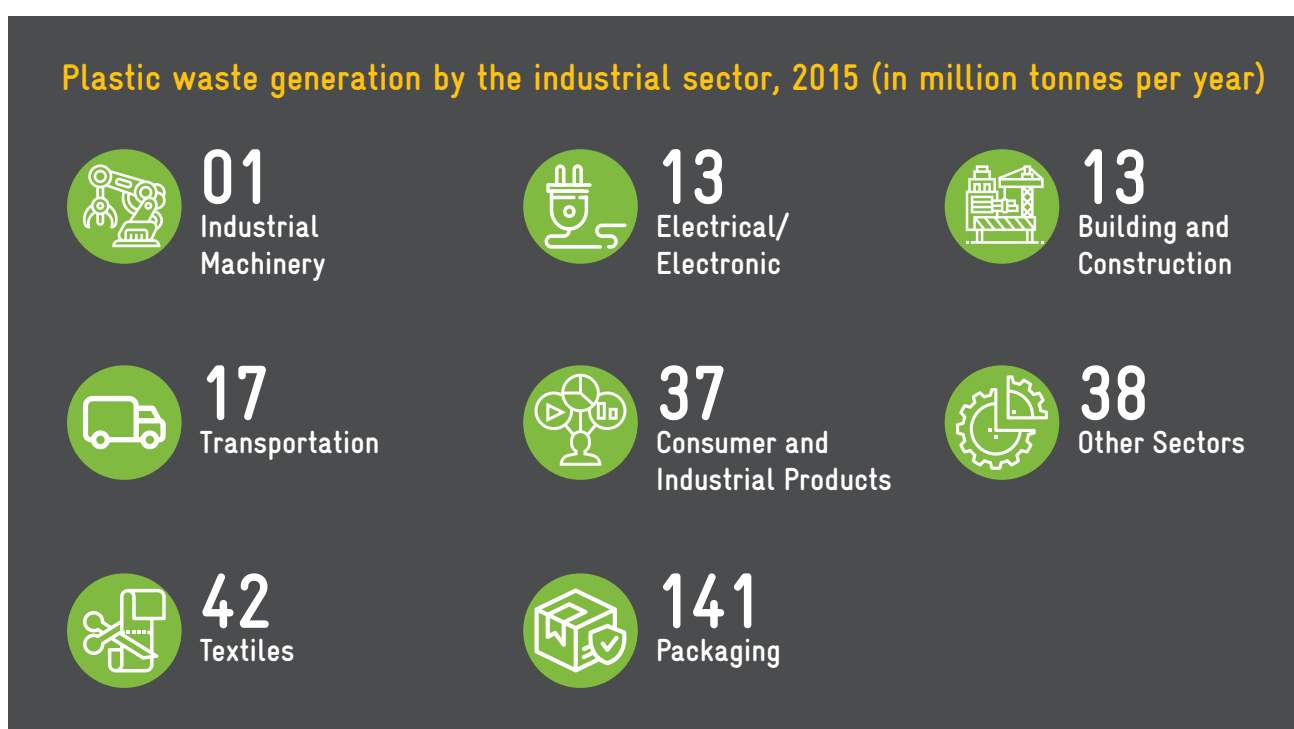


FIGURE 14: THE UNPACKAGED GROCERY STORE [UNPACKAGED INNOVATION LTD, UNITED KINGDOM]



The best way to replace food packaging is to reduce its usage. This is also in line with the first principle of the waste management hierarchy – waste reduction. Packaging-free supermarkets may seem like a new trend, but they have been around for generations. They seem new because modern-day eco-conscious stores, which promote a zero-waste, sustainable lifestyle, are opening in major cities around the world. On the contrary, this was a normal way of shopping just a few decades ago when people shopped at the local grocery store or the city market where grains were sold from barrels, vegetables out of a crate and milk straight from a churn. It was only in the middle of the 21st century that pre-packaged goods and foods began to replace this way of shopping to provide a longer shelf life.

Unpackaged is the first of the modern-day zero-waste grocery stores offering traditional bulk shopping and selling over 700 products. It was founded in 2006 by Catherine Conway, an early advocate of the zero-waste movement, who believed that there is a better way to sell products (Simon 2011). Unpackaged continues to develop a range of retail and consultancy services while tackling plastic packaging at all stages of the supply chain.



Unpackaged is the first of the modern-day **zero-waste grocery** stores offering traditional bulk shopping and selling over

700
Products

SCALABILITY OF THE MODEL

The concept of zero-waste is gaining momentum among urban populations and several efforts are being made to offset the use of plastic. However, packaging-free stores in trendy neighbourhoods are not the only frontrunners. Conventional retailers have adopted strategies to reduce packaging waste as well.

In 2018, a first-of-its-kind packaging-free aisle was opened in the Amsterdam branch of the Dutch supermarket chain Ekoplaza. The aisle contains over 700 plastic-free products including dairy, chocolates, cereals, meat, rice, snacks, fresh fruits and vegetables. The company aims to expand and open similar aisles in all its 74 branches. These aisles also serve as an innovative way of testing compostable biomaterials which are an environmentally friendly alternative to plastic packaging (Taylor 2018).

SUSTAINABILITY OF THE MODEL

Although packaging-free stores are a great sustainable alternative to conventional supermarkets, they demand time and effort. Elizabeth Balkan, the food-waste director at the National Resources Defence Council – a United States-based non-profit environmental advocacy group – says that “packaging is inextricably linked with modernity and convenience”. She points out that no packaging means no shelf-stable food (Matchar 2019).

Non-packaged foods could become a challenge for people who rely on canned foods, pre-cooked meals and tetra pak drinks. As some foods have a shorter shelf-life, the inventory needs to move quickly before they spoil. It is therefore unlikely that zero-waste stores will fully replace conventional supermarkets but they can take over where possible.

Still, many innovative solutions can be integrated into the supply chain. The Plastic Waste Management (Amendment) Rules, 2021 will act as a strong catalyst to motivate food-supply chains to eliminate single-use plastic items. Research on biodegradable plastics and sustainable packaging that could increase the shelf life of products is underway. Alternate eco-friendly packaging can also replace the conventional plastic packing of products. For example, Bare Necessities – a Bangalore-based company that sells health and beauty products – uses only post-consumer packing materials to ship products. They also use reusable glass jars, cloth scraps from local tailors and paper scraps from their printer for packaging.

IMPACTS

- Conservation of resources through reduction of packaging materials in the supply chain.
- Reduction in the amount of waste sent to landfills and incineration.
- Greenhouse gas reduction from less packaging.
- Positive behaviour change of customers.

FIGURE 13: PLASTIC FREE STORE AT DUTCH SUPERMARKET CHAIN (EKOPLAZA PHOTOGRAPH)



VIKALP- BORROW A BAG:

An NGO in Delhi, Why Waste Wednesdays Foundation has joined hands with South Delhi Municipal Corporation to promote use of cotton textile shopping bags. These bags can be purchased and even be refunded at Vikalp (project name) linked stores at the price they were bought (₹20 each). They easily can be recognised via QR code available with each bag. The movement towards sustainable lifestyle is also leaving a big social and environmental impact as the bags are made by women of NULM linked Self help groups who use reject cloth cuttings/ dead stocks from market to make new bags. The concept has quickly picked-up and there are more than 152 Vikalp linked stores now in Delhi. The bags returned are cleaned, dried and up-cycled to give them a new life.



NO-PACKAGING STORES IN INDIA



FIGURE 16:
ECOINDIAN,
CHENNAI
[SRIPRADHA 2018]

Ecoindian, Chennai

Opened in 2018, Ecoindian is the first zero-waste grocery store in South India. The store has a BYOC policy – bring your own container – and offers a 5% discount to encourage customers to do so. All products from the store are sourced from organic farmers, local artisans and self-help groups (Patel 2019).

FIGURE 17:
7 TO 9 GREEN
STORE

7 to 9 Green Store, Kochi

The 7 to 9 Green Store sells food, pantry essentials and cleaning solutions. Customers are encouraged to bring their containers to avail of a 2% discount, or they can take the items home in paper bags and glass jars (Tranco 2021). The bill given to customers also tells them how much plastic they have saved. Bittu Jhon, the founder, modified his family’s conventional grocery store to incorporate eco-friendly alternatives. He plans to expand to 50 other locations in Kerala.

Since its inception, the store has saved around 13.2 lakh pieces of plastic from unnecessary usage (Siddiqui 2021).



FIGURE 18:
MUDITHA ZERO-
WASTE STORE
[SRIPRADHA 2018]



Ecoposro, Goa

Ecoposro is a zero-waste shop in Goa opened in 2018. The store sells basic grocery items and household essentials like detergents, soaps, toiletries and sanitary items. They have several locally-sourced products like coconut, vinegar, rock salt, jaggery and dairy products. Regular customers of the store have shared that their waste generation has reduced by 75% (Sripradha 2018).

FIGURE 19:
ECOPOSRO,
GOA [SRIPRADHA
2018]



Adrish, Pune and Delhi

Adrish is a zero-waste organic store chain located in Pune and Delhi. The store has all-organic products including grains, pulses, cereals, herbal soaps, oils and earthenware. The products benefit around 8,000 farmers across 14 States in India (Sripradha 2018). They plan to expand to other locations.

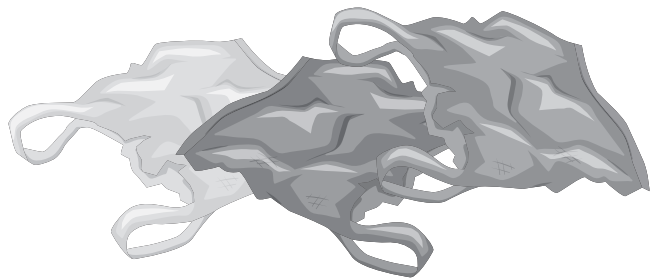


FIGURE 20:
ADRISH, DELHI
[SRIPRADHA 2018]



KEY LEARNINGS

- Innovative business ideas associated with no-waste systems can be established sustainably.
- Eco-friendly packaging in place of single-use plastics can facilitate shelf-life maintenance and limit the environmental impact of plastic packaging waste.
- The city can benefit from waste-reduction strategies of entrepreneurs and limit plastics from entering the environment.
- No-packaging outlets also help reduce the expenses associated with food packaging and can sell at a lower cost.



1.4. REFILL STORES

SUMMARY

Refill shops are small, independent stores that sell non-packaged personal care items, such as shampoo, body wash and hand soap, as well as household products, such as laundry detergent and all-purpose cleaners. Shoppers are required to bring their own containers and fill them with the product they buy. Some stores also stock food and other sustainable biodegradable products. The main goal is to reduce the single-use plastic packaging.

BACKGROUND

Self-service refill machines, Slovenia

In 2017, the municipality of Vrhnika, Slovenia, set up an automated liquid-refill station that dispensed ecological cleaning products. The space was provided by a public utility company, KP Vrhnika, while the technological solution for refilling was provided by an automation company (McQuibban 2020).

The municipality of Vrhnika wanted to make the zero-waste lifestyle more feasible for their residents so they started offering plastic- and packaging-free refills for cleaning products at the Depo store. Customers can thus refill reusable packaging with desired amounts of cleaning products and other liquid supplies. The weight of the packaging and the volume of liquid dispensed are calculated together to decide the price to be paid. After the transaction, a sticker is generated which acts both as an invoice and as a product declaration. The machines used in the store are also an example of reuse and recycling practices since their frames are made of secondary materials (McQuibban 2020).

FIGURE 21:
REFILL MACHINE AT THE DEPO
STORE, VRHNIKA [ZERO WASTE
EUROPE, 2020]



SCALABILITY OF THE MODEL

The use of refill machines has since spread to the capital of Slovenia, Ljubljana, and can be found in several locations around the city, which also has its own zero-waste agenda. Another refill machine, Bert, is operated by a waste management company called Snaga. Bert, which is essentially a vending machine, was awarded the most innovative retail concept of 2019 by Euromonitor International, as part of its annual global retail market research. The machine is being used across other Slovenian cities and has also reached Croatia.

Policy changes, coupled with increasing awareness of environmental issues caused by plastic waste, are making such zero-waste concepts popular. In Slovenia, consumers are recognizing the importance of packaging-free shopping and more businesses are adapting specific business models to offer reusable and refillable options. A website (<https://manjjevec.si/>) has been set up in Slovenia to make it easier for citizens to find the closest refill stores and shops with a BYOC option, as well as more information on the topic. Similarly in India, Mother Dairy customers are opting for token milk as it is ₹4/litre cheaper than packaged toned milk.

Refill stores not only benefit businesses by streamlining the supply chain and increasing individual profits, but they also help customers save money on packaging. Initiatives like the Mother Dairy vending machines make the price of the product significantly cheaper, thereby incentivizing customers to choose refill options over packaged options. Customers also have the flexibility to buy as much as they need since there are no standard sizes.

FIGURE 22:
A BERT MACHINE IN LJUBLJANA
[ZERO WASTE EUROPE, 2020]



EXAMPLE IN INDIA:

A refill model, set up by Mother Dairy, can be found in Delhi-NCR. Mother Dairy is a leading milk supplier that has a milk token system. Customers can visit its booths and fill up milk from vending machines in their own containers. The company aims to promote consumption of token milk and reduce the use of plastic packaging (Express Web Desk 2019).

Mother Dairy Fruit and Vegetable Pvt Ltd (MDFVPL) has also initiated a research programme on eco-friendly packaging to continue their sustainability efforts and has also implemented the following measures.

FIGURE 23: MOTHER DAIRY MILK VENDING MACHINES, DELHI [EXPRESS WEB DESK 2019]



IMPACTS

- In just a few months, about 90,000 bottles have been prevented from entering the waste system of Slovenia.
- Mother Dairy has been encouraging its consumers to opt for token milk through an automated milk vending system at the company's booths in Delhi NCR. This effort has eliminated the generation of around 700 MT of plastic wastes per year (Express Web Desk 2019).
- Mother Dairy has replaced plastic trays for curd cups with paper trays, which will eliminate the usage of approximately 100 MT of plastic.
- Mother Dairy has replaced plastic spoons with wooden spoons as well as eliminated plastic straws which were provided with a few products.
- Increase in consumption of one litre milk packets instead of 500 millilitre packets has helped Mother Dairy reduce the use of plastic bags/pouches by approximately 240 MT annually.



KEY LEARNINGS

- Through thoughtful shopping, it is possible for customers to prevent the generation of new waste as well as save costs associated with the transportation and handling of packages.
- Incentives given by local authorities can go a long way to increase the number of sustainable businesses. Local businesses as well as large retailers can be inspired to implement innovative solutions to avoid packaging waste.
- Municipalities and local authorities can set an example of alternate solutions and incentivize entrepreneurs to bring such ideas to their city. This can kick-start the zero-waste movement in cities and involve multiple stakeholders.
- A push from ULBs towards such schemes and the competitiveness of being more eco-friendly in making buying choices motivates citizens to choose wisely.



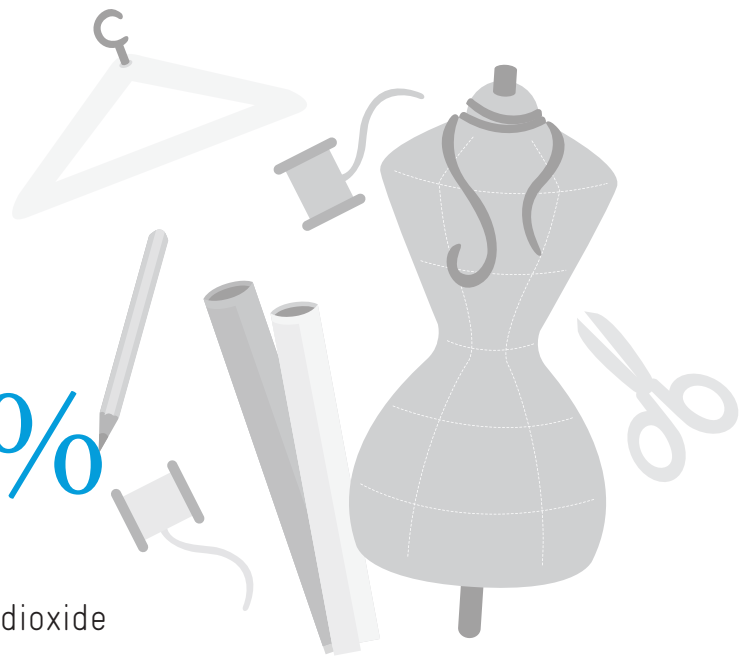
BEST PRACTICES UNDER REUSE

On an average people bought

60% more garments in 2014 than they did in 2000.

Fashion industry generates

10% of global carbon dioxide emissions every year



2.1. CLOTHING REUSE AND UPCYCLING

SUMMARY

Every year, the environmental cost of the fashion industry increases as it is the second-most polluting industry on the planet. Veras, Denmark, is a circular-clothing concept store where people are encouraged to exchange, sell, buy and repair used clothing. Veras engages with customers in stores, online and in weekly markets. Similarly, Twirl.store in India, exchanges old clothes for discounts. Latasita.in uses old clothes to design new ones in India.

The Veras sustainable model includes the following activities:

- Swapping of old clothes for new clothes in Veras clothes exchange shops and at the Veras Market.
- Selling one's wardrobe to others at the Veras Market.
- Buying new, used clothes from the Veras concept in physical stores, its online store and the Veras Market.
- Repairing or donating old clothes for upcycling in the Veras workshop (Veras n.d.).

FIGURE 24: VERAS UPCYCLED BLANKETS [VERAS N.D.]

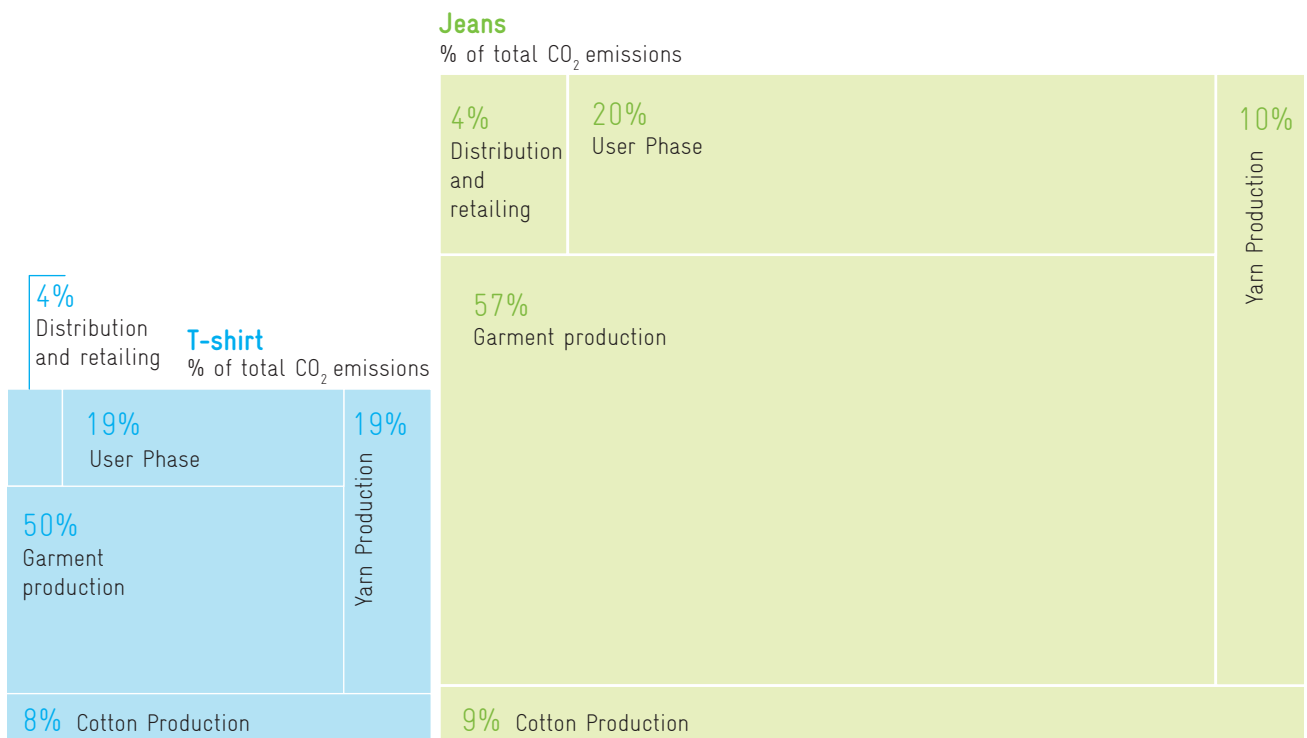


BACKGROUND

As the market for cheap clothes and new styles grows, consumers have been purchasing more clothes than ever. On average, people bought 60% more garments in 2014 than they did in 2000. This increase in consumption comes with a heavy environmental cost (McFall-Johnsen 2020). The Intergovernmental Panel on Climate Change (IPCC) estimates that the fashion industry produces 10% of global carbon dioxide emissions every year. It is also the second-largest consumer of the world's water supply with an estimated annual usage of around 1.5 trillion litres of water. Other environmental concerns raised by the industry include a rise in pollution levels due to chemical waste, water pollution and microplastics from the use of certain types of fabrics (Davis 2020).

Veras is a platform for clothing reuse and upcycling. It was founded by Rebecca Vera Stahnke in 2016 and has an all-female staff. It has a circular business model where clothes can be exchanged, sold and upcycled. Based in Copenhagen, Veras works towards reducing waste from the fashion sector by making the swapping and selling of clothes easier for customers. It has an online store, which ships to all European countries, where users can send in their old clothes to get discounts on new garments from Veras. Veras also hosts weekly clothing markets in Copenhagen for consumers to buy and sell their clothes (European Circular Economy Stakeholder Platform n.d.).

FIGURE 25: THE COST OF PRODUCING A T-SHIRT AND A PAIR OF JEANS IN TERMS OF CO₂ EMISSIONS [DAVIS 2020]



All the clothes sold by Veras come from local Danish wardrobes, and no fresh textiles or cloth is used. The business aims to transform use-and-throw consumption habits and tackle the fast-fashion industry. With several platforms in play, old clothes find a new purpose and get new life. In addition, the company offers a range of upcycled products, including tote bags, dresses and trousers that are made from discarded textiles, bed linen, tablecloths and so on, handed in by users. All of these products are produced in Copenhagen (Veras n.d).

SUSTAINABILITY OF THE MODEL

As Veras has a circular business model involving several platforms, it provides value for all clothes regardless of the quality and condition they are in.

Veras is a green business and strives to make room for improvement. In January 2020, they launched their first upcycling initiative through which they can extend the lives of defective clothes. In October 2020, they implemented new sustainable carry bags that are made from 100% discarded clothing.

Veras believes in sharing observations, experiences and mistakes with other businesses of the clothing industry. Research in this field is still lagging, and the company contributes by actively participating in industry networks and research projects and conducting talks and debates. All the clothes available on Veras' platforms are from local wardrobes. They accept clothes in their stores and markets. Their upcycling initiatives are also produced and handled within the country.

By making it easier to swap and exchange clothes, Veras has:

- Given a new life to more than 275,000 pieces of clothing.
- Rescued 359,178 pieces of clothing from incineration.
- Encouraged 156,918 Danish citizens to adopt circular consumption patterns.
- Saved 1,490 tonnes of CO₂ equivalent.

LATASITA, KOLKATA

LataSita is a pioneering design studio creating zero-waste and ethically produced fashion using a closed-loop supply chain. They take fabric from diverse and sometimes unexpected sources - ranging from treasured private heirloom collections to the wardrobes of everyday women and even Durga Puja pandals. They have championed the circular economy by putting a special focus on using anything old and off the grid. The bulk of their collection comes from sarees sourced directly from the wardrobes of women.

Each piece is lovingly crafted at LataSita's Kolkata studio which functions to the highest standard of ethics and sustainability.

FIGURE 27: CLOTHES FROM VERAS' ONLINE STORE [VERAS N.D.]



TWIRL.STORE

Twirl.store is an online clothing platform which sells sustainable products produced from upcycled materials. The products are handcrafted by women and are shipped for free across India. The store also has a unique buy-back policy where clothing bought from the store can be sent back when the customer no longer wants to use it. In return for the used clothes, points are rewarded which can be redeemed on the next purchase. Customers can also sell old clothes they no longer use, in exchange for store points. This system reduces wastage of textiles and promotes sustainability (Twirl n.d.).

Similarly, *Crapbin* in Hyderabad, Telangana, picks up textile waste from users' doorsteps, free of cost. Users can choose to donate these to unprivileged children, but Crapbin also upcycles products; these can be purchased from their website crapbin.com.

FIGURE 26: TWIRL.STORE'S SUSTAINABLE CYCLE [TWIRL N.D.]



IMPACTS

Benefits of using upscaled fabric:

- Products made of upscaled fabric use fewer resources than those made from new fabrics, making them eco-friendly.
- Resources which would otherwise be used to create new fabric are conserved.
- Upcycled clothing saves thousands of litres of water. Around 2,700 litres of water is used just to make one t-shirt (Northeast Today 2020).
- Products are often more affordable than mass-produced items.

FIGURE 28: VERAS CLOTHING EXCHANGE MARKET IN COPENHAGEN [VERAS N.D.]



Not Just a Piece of Cloth (NJPC):

The aim of this initiative is to address issues of menstrual hygiene faced by women in rural and slum India. Cotton and semi-cotton clothes donated by people are cleaned and used to make sustainable sanitary napkins, which are given to women free of cost.



Green by Goonj:



Over 100 different products including backpacks, handbags and wallets are made by upcycling old clothes. Women are trained with the necessary skills to explore their ideas and potential in making innovative products (Goonj n.d.). Their products can be found at: <https://www.greenbygoonj.com/>

FIGURE 29: GOONJ SANITARY NAPKINS

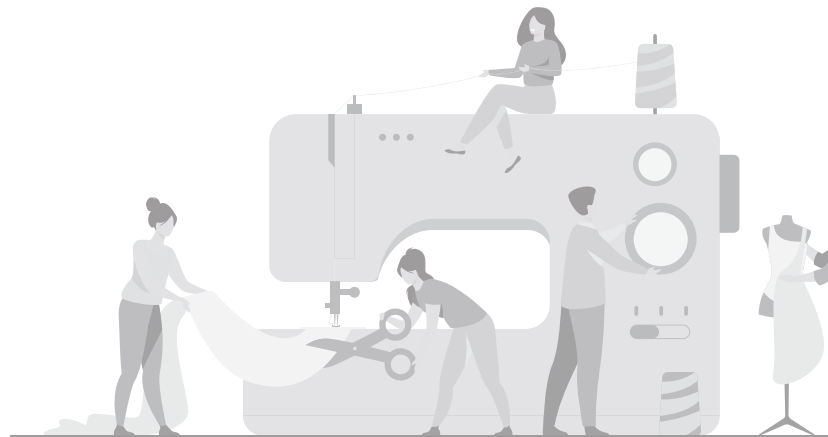


FIGURE 30: WOMAN WEAVING FABRIC [GOONJ N.D.] [GOONJ N.D.]



KEY LEARNINGS

- The points or rewards system used for clothing sale and exchange encourages customers to send clothes into the circular economy loop rather than sending them to landfills.
- The buy-back policy is a more sustainable alternative to fast fashion. Consumers can dispose of clothing when needed and keep up with trends without generating more waste.
- Along with promoting a circular fashion industry, Veras has also been promoting new fashion trends inspired by vintage outfits and upcycled fabrics. These trends have now become popular among the 15–25 age group, which is also their largest customer base.
- Simple skills like sewing, patching and altering can go a long way in refreshing old clothing because more often than, clothes that are otherwise in a good condition are discarded due to minor flaws.



2.2 REUSABLE PACKAGING DELIVERY SYSTEMS

SUMMARY

Vytal is a Cologne-based start-up that offers a digital solution for packaging waste. The business model is based on a cycle of reusable containers that are controlled by an app and tracked through QR codes instead of a deposit system. In operation since September 2019, around 700 restaurants, canteens and supermarkets are already using Vytal's services. Vytal supplies restaurateurs with reusable containers and lids which are leak-proof and store heat. The restaurant pays a small fee per filling. Once the food is delivered to customers, they are expected to return the containers within 14 days.

BACKGROUND

According to the German Environmental Aid, around 155,000 tonnes of waste was generated by disposable tableware in a year and around 400,000 meal trays were discarded every hour. This problem seemed to amplify during the COVID-19 pandemic. In the first lockdown, an estimated 80,000 single-use boxes were added per hour. Takeaway and food delivery are responsible for about 281,000 tonnes of single-use packaging waste in Germany, and this figure is increasing at double-digit rates, as per Vytal.

On the-go food containers, snack boxes and coffee cups have a very short lifespan – mostly 30 minutes – after which they are discarded. This is not only a waste of economic resources, as each single-use container costs anywhere between €0.15 and €0.60, it also has huge environmental costs. The German Nature and Biodiversity Conservation Union estimated that the single-used packaging used for on-the-go consumption generates around 556,000 tonnes of CO₂ eq per year (Vytal 2019).



Around

155,000

tonnes of waste was generated by disposable tableware in a year

FIGURE 31: VYTAL'S BUSINESS MODEL [VYTAL]





Vytal provides consumers, restaurants, supermarkets and delivery services an inexpensive and sustainable alternative to disposable plastic waste by supplying lockable containers made of heat-insulating plastic polypropylene through a digital platform (Vytal 2019).

Each container is equipped with a QR code on the lid. Before the first loan, the patrons have to register on the Vytal app where they receive a personal QR code. Both codes are scanned at the checkout point and a reusable key is assigned to the customer. If the customer does not return the bowl within 14 days, they will automatically purchase it for EUR€ 10. The response rate is, therefore, better than with the bottle deposit and Vytal estimates it to be at 98%.

It costs the restaurants €0.15 – €0.20 per filling depending on the size of the bowl. Each bowl must be borrowed at least 25 times to cover acquisition costs. The containers have a maximum service life of around 200 fillings, which fetches Vytal a net earning of €35 per bowl. From these profits, costs for personnel, logistics and marketing are deducted.

SCALABILITY OF THE MODEL

The European Union (EU) is planning to introduce a sustainable and closed circular economy as a central aspect of the Green Deal by 2025. From July 3, 2021, ten single-use plastic items including cutlery, plates, straws and stirrers were banned from being sold in the EU (Braun 2021). In January 2021, the Federal Cabinet of Germany also introduced a mandate for restaurants to offer reusable packaging by 2023 (BMU 2021). This is where companies like Vytal come into play and meet the policy requirements.

Its business model is also successful because it offers reusable packaging at a price similar to a single-use plastic container. Hence, restaurants will not need to spend more on the packaging and customers will not need to pay anything extra either.

FIGURE 33: REVENUE STREAMS FOR VYTAL [VYTAL INTERNAL]

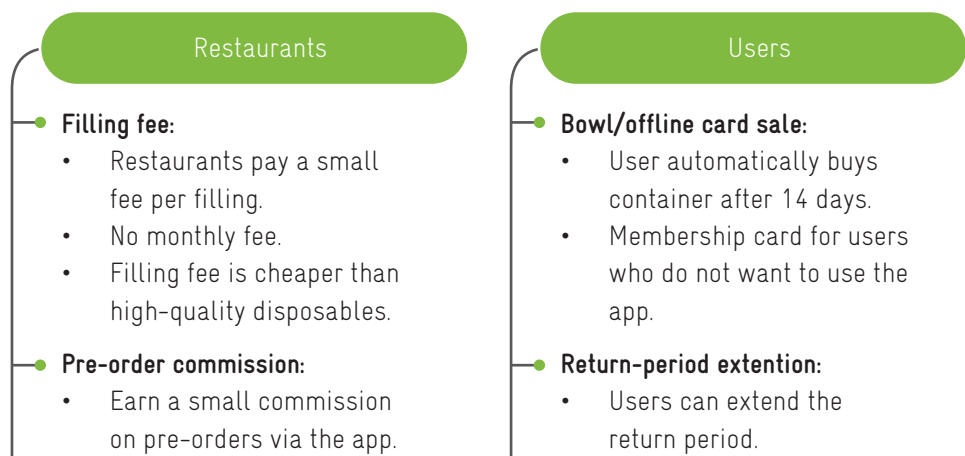
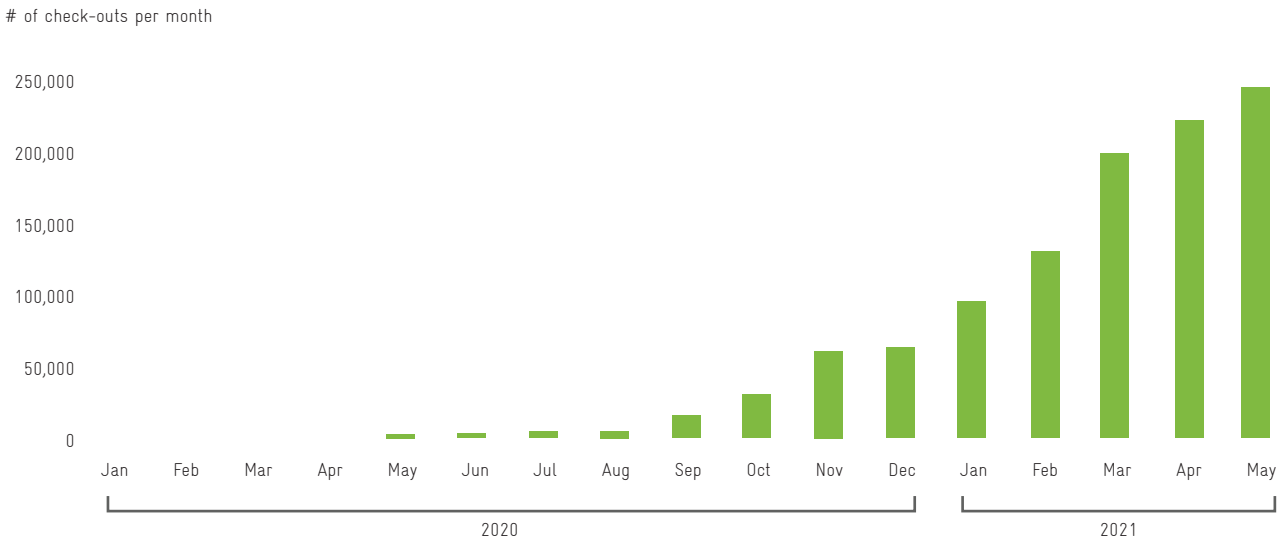
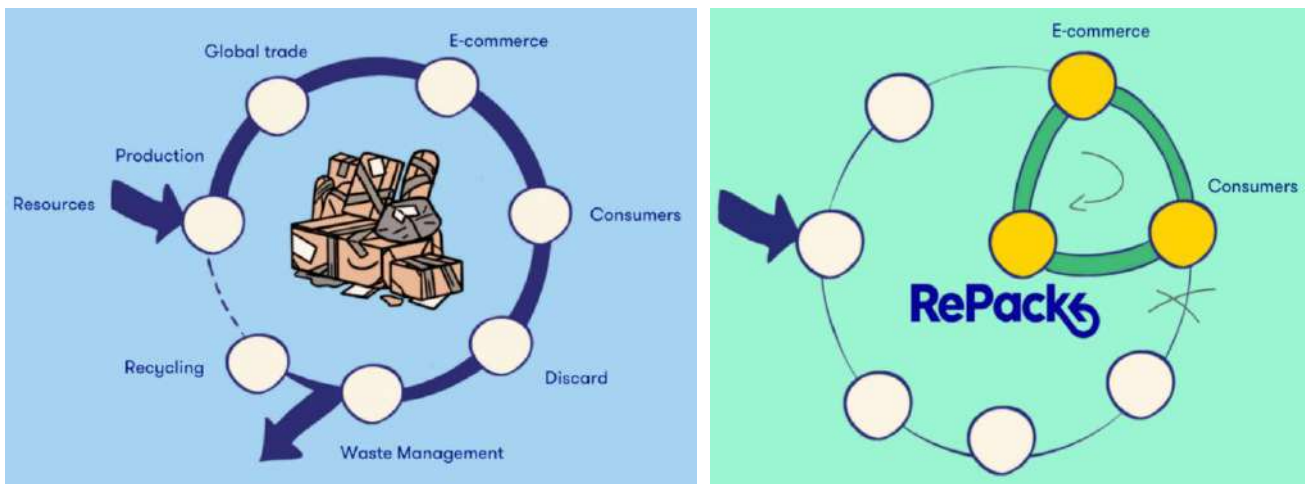


FIGURE 34: USAGE OF VYTAL CONTAINERS, 2020–2021 [VYTAL INTERNAL]



Delivery in reusable packaging is not limited to the food industry. This model can be adapted to any e-commerce business or product delivery system. For instance, RePack, which is a packaging service founded by a Finnish company, enables the return and reuse of delivery packaging for online retailers and their users. Customers can opt to use RePack as their packaging on partner sites. The customer then receives their items in RePack’s recyclable packaging. This packaging can be returned to RePack at any local letterbox, after which it is circulated in the system and can be reused up to 20 times on average. Once the packaging has been registered as returned, the user will receive a digital voucher that can be used towards future purchases from RePack-supported online stores (RePack n.d.).

FIGURE 35: REPACK’S CIRCULAR ECONOMY MODEL [REPACK N.D.]



IMPACTS

- Vytal began with 1,000 reusable bowls.
- In 2020, it saved 200,000 disposable packaging pieces. This year, the number is expected to increase by a factor of 15, to 3 million.

1.2 million
packaging pieces
were saved.

120,000+
customers registered.

1,300 partners
across Germany
and Austria.

51
employees.

KEY LEARNINGS

- Convenience is key to the success of reusable packaging in the delivery industry. For example, RePack makes the return of packaging easy, by just having to drop it off at a post box. Vytal on the other hand does not require customers to pay a deposit fee and they have up to 14 days to return the containers.
- Reusable packaging is affordable and does not impose any additional costs on users.
- Studies show that 70% of consumers are willing to switch to refill-and-reuse systems (Greenpeace 2020), and 74% are willing to pay for reusable packaging (Enviu, 2021). This shows the increasing awareness amongst consumers to switch to sustainable solutions.



ALAS REUSABLE, INDONESIA

Indonesia is the world's second-largest leakage point for plastic pollution in the ocean. Enviu's zero-waste lab program is working on several different projects to tackle single-use plastic pollution by creating reuse business models. The demand for reusable solutions is increasing.

One significant reuse initiative is the ALAS reusable food delivery box. Customers can opt for reusable packaging while ordering their food and can return the containers at drop-off points or ask for drivers to pick them up. The business model has already become popular with over 120 registrations in the first week of the pilot in Jakarta.

FIGURE 36: ALAS REUSABLE PACKAGING (ALAS, 2019)



2.3 REUSING WASTE MATERIALS TO MAKE MATS AND MATTRESSES

SUMMARY

Rug-making or mattress-making is a common entrepreneurial practice amongst low- and middle-income groups in India. This process is economically viable and environmentally friendly because there are minimal raw-material costs and requires semi-skilled workers. India has a large textile industry and several skilled large- and small-scale tailors who produce significant amounts of fabric waste. When prepared appropriately, these fabric remains can be used as the primary raw material to make handwoven rugs or flat carpets, known as Daris, thus creating a circular economy business model.

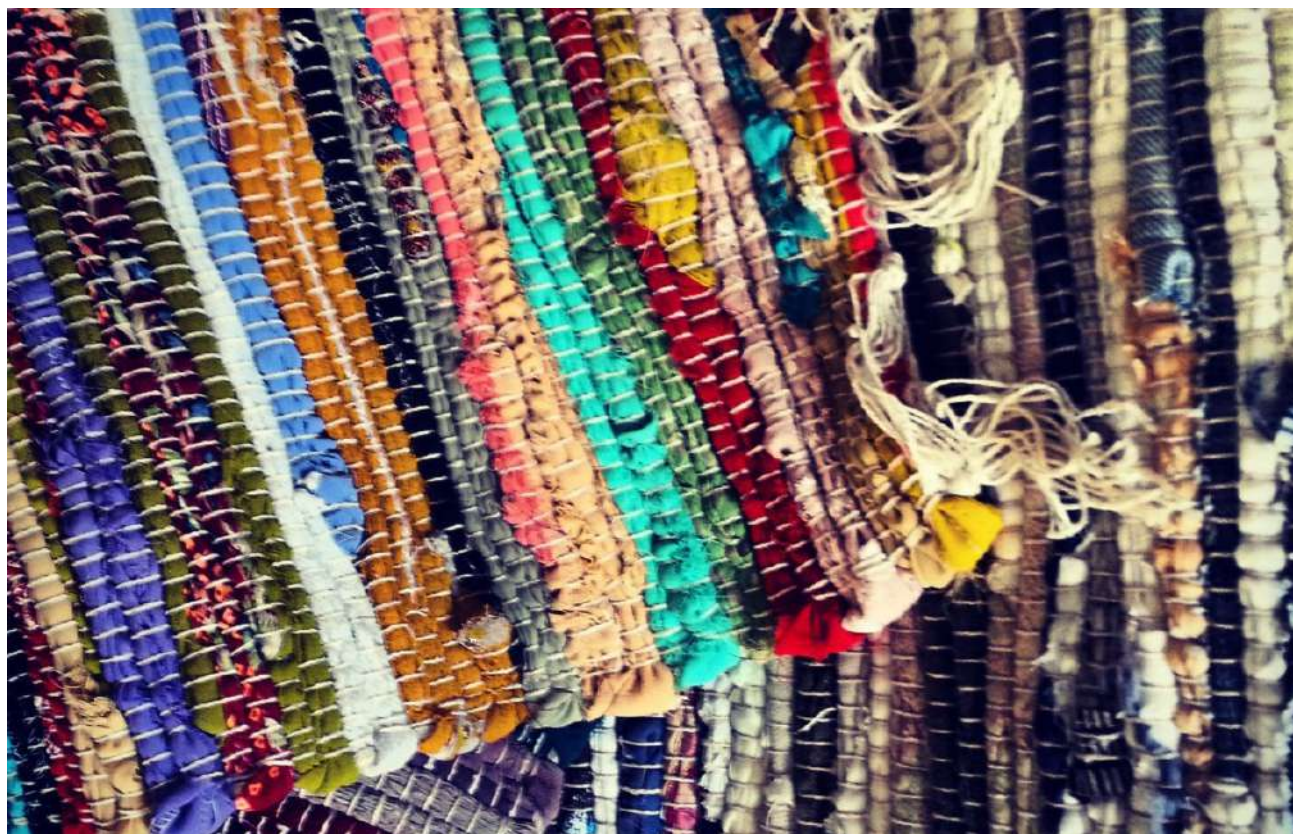


When prepared appropriately, these fabric remains can be used as the primary raw material to make handwoven rugs or flat carpets, known as Daris, thus creating a circular economy business model

BACKGROUND

In India, old-fashioned clothes that are unused, either due to obsolescence or being worn out, are cut into strips and woven to make mattresses. Thus, textiles are prevented from going to disposal sites and a better use of old clothes is also made. Depending on the type of discarded textiles, different methods can be used to convert them into mats or mattresses.

FIGURE 37: DARI MADE FROM USED CLOTHES [HUBPAGES]



EXAMPLE IN INDIA:

Dari Making: One such common example that can be found in India is Dari-making, which involves the use of scrap fabrics or old clothes. The clothes are cut into long strips and made into balls of fabric. These fabric balls are a combination of different pieces of cloth and are multi-coloured. They can be loaded into a weaving machine and made into Daris.

Shaya: Mattress Making: Shaya is a social entrepreneurial venture that hopes to provide mattresses for homeless people. During the COVID-19 pandemic, developer noticed that personal protective equipment (PPE) kits were being manufactured at a rapid pace and there was a large amount of waste generated from the cut-out scraps (World Economic Forum 2021). Shaya contacted a local manufacturing unit, asked them to send the waste generated from PPE manufacturing and made mattresses from it. These mattresses were sent to COVID-19 hospitals and given to patients who could not afford beds. The mattresses were lightweight, fluffy and easy to wash (Balakrishnan 2020).

Recycle India: A start-up based in Hyderabad that aims to make furniture, drums, speakers, lighting systems and footwear out of tyres; bus shelters, low-cost houses and sofa sets out of discarded PET bottles; furniture with cardboard waste; and others (Shalini 2017).

FIGURE 38: DARI MADE BY SARFUDDIN FAMILY IN JAMALPUR, ALIGARH, U.P.



SCALABILITY OF MODEL

The weavers take clean old clothes and cut them into long stripes of approximately an inch wide (depending on the requirement of the output product). The stripes are then woven together to make the rug. Weavers make different designs and mattress sizes depending on the requirements. Generally, one mattress measuring 3 x 6 feet is made with 3 kilogrammes of used cloth. The prepared mattress is then stitched on all sides to prevent its threads from losing the weaved pattern. This weaving is generally done by manual or mechanical weaving machines and requires minimal skill.

FIGURE 39: USING PPE WASTE TO MAKE BEDS FOR COVID PATIENTS [THE BETTER INDIA, 2020]



Anyone can make the Shaya mattress since they do not require any specialized skill. They use a simple technique of interweaving strips together. Thus, anyone who knows how to weave can make a mattress. Depending on the materials available and techniques used, mattress-making from recycled material can become a viable means of income for many low-income groups (The Better India 2020).

FIGURE 40: SHAYA MATTRESS MADE FROM OLD CLOTHES [THE GUARDIAN]



SUSTAINABILITY OF MODEL

Mattress-making out of used clothes in India is very common among low- and medium-income groups. Generally, high-income group societies tend to give away their used clothes to low-income groups who, after use, tend to reuse them for activities such as making mattresses.

In some regions, due to the unavailability of weavers to process used clothes, the practice is not very common. However, the art of mattress-making gives employment to semi-skilled persons, both men and women.

IMPACTS

A whole bed mattress can be made from nearly 3 kilogrammes of cloth. Thus, creating a setup utilises a strong potential for preventing textile waste from entering city waste streams.

KEY LEARNINGS

- Used clean clothes can be put to alternate use with mattress-making.
- There is still a need to formally organize such weavers into self-help groups, which can benefit through linkages through NGOs and municipal corporations.
- Used PET bottles, tyres and cardboard are also being used to make alternative usable (upscaled) products like furniture, mattresses, etc., through new start-ups. There is a need to identify innovative ideas and create a marketplace for these products.



GREENSOLE

Started by two athletes—Shriyans Bhandari and Ramesh Dhmi—who used to run through at least three to four pairs of sports shoes every year. They noticed that the soles were in good condition, but the shoe sides tore within months. They wondered if they could find some use for the intact soles of these quality sports shoes. A bit of research led to the idea of refurbishing them into trendy slippers. That brainwave eventually spawned an eco-friendly enterprise that reuses shoe soles and is named GreenSole.

GreenSole contributes to:

1. **Social good** by creating self-sustaining infrastructure that facilitates the provision of the basic necessity of footwear to everyone;
2. **Environmental good** by refurbishing discarded shoes with zero carbon footprint soles and
3. **Economic good** by giving employment to refurbish shoes (GreenSole n.d.).

FIGURE 41: GREENSOLE PRODUCT [GREENSOLE N.D.]



2.4. OTHER GOOD PRACTICES UNDER REUSE

SUMMARY

One of the good practices under reuse strategy for cities and states is to promote repair of items, which are broken down but can be easily repaired. However, to continue the culture of reusing old items after repairing it is vital that small repair shops and skilled labour or workmanship are retained and motivated in urban clusters. Many high urbanized clusters are lacking these workmanship skills and repair persons. One of the reasons of this is the developing habit/culture among people of use and throw, and other reason is lack of designing for repairability and recyclability in latest product designs. There is a need for cities to develop skills of youth and encourage them to become entrepreneurs and start developing cities momentum towards zero waste. It is also equally important that states and national governments promote design for recyclability in product development.



To continue the culture of reusing old items after repairing it is vital that small repair shops and skilled labour or workmanship are retained and motivated in urban clusters

BACKGROUND

If we look around the old cities and even the smaller cities and towns, we can see small repair shops like cobbler, electrical and electronics repair shop, music instrument repair shops, furniture repair shop, etc. These are mostly entrepreneurs who have learned the skills from their parents or trainers and started their own ventures. On contrary, if we look at highly urban clusters where cost of livings is high, we see very few of these repair shops and mostly people go ahead with use and thrown concepts for their convenience. The concepts of repair and reuse are diminishing around highly urbanised clusters and these skill holders are also moving towards other lucrative professions. It is important that reuse concepts are promoted in cities and urban agglomerations and materials are moved into circular economy loop for a longer time.

OLX- ONLINE PLATFORM

One of such platform that allows users to sell and buy used items for further reuse is OLX. An online marketplace platform currently operational in Brazil, Indonesia, Portugal, Romania, South Africa and India among others. The platform connects consumers who want to sell used items to those who want to buy at a cheaper price. This includes cars, motorcycles, mobile phones, home appliances and furniture. The selling price can be decided by the seller as long as the item for sale follows the marketplace guidelines and can further be negotiated. All product description, photograph and damages or defects of the item on sale need to be disclosed to the buyer or the item is eligible for return. This ensures transparency within the marketplace and builds trust among users.

Increasing use of such second-hand marketplace increases the life cycle of several items and prevents them from being discarded into recycling networks or towards landfills. Often, products that are in a good, usable condition are discarded. This way, people who can't afford to pay for new products can buy the same thing at a cheaper price (olx.in).

REPAIR STORES FOR ELECTRONICS AND APPLIANCES

FIGURE 42: HARMONIUM SALES & SERVICING SHOP



FIGURE 43: COBBLER MENDING FOOTWEAR



FIGURE 44: ELECTRICAL APPLIANCES REPAIR SHOP



FIGURE 45: UMBRELLA REPAIR SHOP



FIGURE 46: ELECTRICAL APPLIANCES REPAIR SHOP



FIGURE 47: ELECTRICAL APPLIANCES REPAIR SHOP



SCALABILITY

With skill development programs and special booth spaces in cities to promote reuse/repair stores such models and workmanship can be promoted. It is also important that such skills are uplifted, and repair shops are promoted through various schemes run by government of India.

SUSTAINABILITY

Like online platforms such as OLX, there are many more platforms like cars24 etc which are into used automobile selling and buying. There is a greater need of materials which are waste for one (due to changing trends) but can be used by another one, is promoted in markets. We can also see refurbished electronic items on sale via amazon and flipkart.

However, for repair and refurbish stores which are generally run by entrepreneurs, it is important that the manpower is trained, materials are made for reparability, and spare parts are easily made available by companies to undertake repairs of their products. Appropriate spaces at key market locations which have larger footprints of people and good skill development programs can help make these concepts sustainable in urban clusters.



There is a greater need that materials which are waste for one (due to changing trends) but can be used by another one, is promoted in markets

NAMO E-WASTE:

With collection centres across 12 states and union territories in India, NamO E-waste helps reduce, reuse and recycle electronic assets. Once a customer has scheduled the electronic waste pickup, the organisation handles the collection and brings the waste to their recycling plant in Faridabad, where they extract those parts which can be reused and sustainably dispose the rest through in an environment friendly way. Their client list includes Taj Hotels, Resorts and Palaces, ICICI Bank, Tata Sky and Godrej, among others.

CASHIFY:

Cashify not just enables its customers to sell but also, buy, recycle, accessorize & repair their smartphone through a digital platform/partner stores. Customers can sell phones for cash/ discount coupons at various cities across India. They also help corporates in achieving Extended Producer Responsibility (EPR).

IMPACT

A large amount of materials, especially furniture and electronic items which are thrown away from cities, due to non-repairability or non-easy availability of appropriate spare parts can be routed back into circular economy loops and retained for larger timespans in use.

The programs like 'Atmanirbhar Bharat' can also be integrated for skill development and a workforce with skills to repair many items and earn their livings can be created. This will lead to employment generation on one hand and reuse of materials on other.

KEY LEARNINGS

- There is a need for cities and states to promote the concepts of reuse through better communication and awareness generation.
- Online platforms, repair shops and refurbish stores need to be promoted through interventions by cities and states.
- Skills to be developed to promote workmanship within cities
- Policies to be introduced to promote design for refurbishment and repairability and easy availability of product spares.



BEST PRACTICES UNDER RECYCLE

3.1. RECYKAL

SUMMARY

Recykal, an Indian start-up, is an end-to-end digital solutions provider that facilitates transactions for all stakeholders across India’s waste management and recycling value chain. Recykal is an innovator in “waste-commerce” and digital management of waste. Its smart software helps waste handlers digitize their records and track the flow of waste. Its digital platform connects waste generators, waste processors, recyclers and brand owners who are tackling the challenges faced by the industry including demand–supply mismatch and lack of transparency and traceability.

Through its digital platforms, including Marketplace, Smart Centre Solutions and EPR LOOP, Recykal channels

over

10,000

metric tonnes of recyclables every month



FIGURE 48: RECYKAL CONCEPT AND BUSINESS MODEL [RECYKAL 2017]



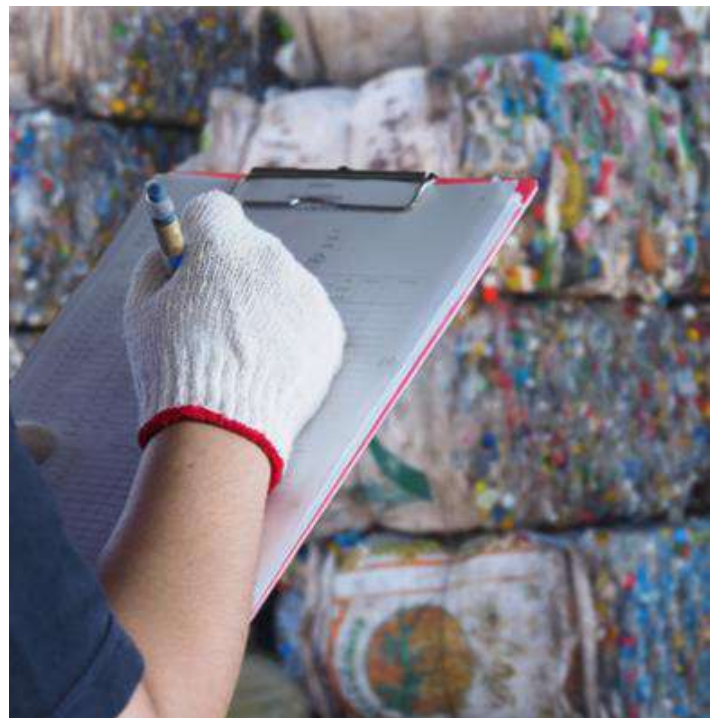
BACKGROUND

Recykal was founded in 2017 in Hyderabad and expanded its operations to Pune, Delhi, Bangalore and Chennai over the years. It seeks to ensure higher rates of waste collection and recycling by involving all stakeholders across the waste value chain and thereby paving the way for a circular economy.

The waste collection for recycling in India is primarily led by the informal sector where the offline transactions are mostly unrecognized and lack the benefits of a formal ecosystem. The stakeholders often function with a lack of information and communication. Reliable and scalable technologies that close material loops and pave the way for a circular economy are a promising way to tackle the issues related to low recycling rates for recyclables, as well as formal recycling chains (Recykal 2017).

Some of the key challenges faced by the waste management and recycling industry include demand–supply mismatch, lack of transparency and traceability, and missing data. Digital technology can create a bridge, while data and reporting solutions also help governments, policymakers, organizations and communities adopt sustainable practices.

FIGURE 49: REPRESENTATIVE PHOTOGRAPH- DATA RECORDING AT MRF [RECYKAL 2017]



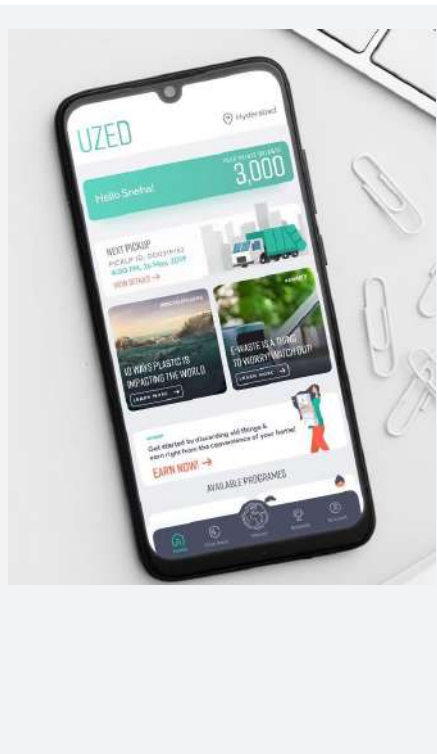
A few of the solutions offered by Recykal are as follows (Recykal 2017):

Recykal Marketplace is an online platform (app-based) for buying and selling recyclable items like plastics, paper and e-waste. Recykal Marketplace connects various stakeholders in the waste management sector including bulk-waste generators/dry-waste collection centres, waste aggregators and recyclers enabling transactions to bring transparency and traceability to the system.

Smart Centre Solution helps waste aggregators, dry resource collection centres (DRCCs) and material-recovery facilities to digitize their day-to-day activities such as record keeping, settlements and transactions, giving complete visibility of collection centre operations.

Recykal Deposit Return Scheme (DRS) solution is a cloud-based system that helps governments and smart cities deploy and manage Deposit Return schemes digitally with an app-based collection and payments mechanism.

The UZED App allows consumers to dispose of recyclable waste responsibly by offering a convenient pick-up service and online incentives. The app is also used by brands, schools and colleges to run takeback and engagement programs.



SCALABILITY OF MODEL

Being an information technology-based platform, it has a substantial scope of large-scale scalability. Through its digital platforms, including Marketplace, Smart Centre Solutions and EPR LOOP, Recykal channels over 10,000 metric tonnes of recyclables every month. The company has plans to scale and influence upwards of 2 million metric tonnes of plastic annually by 2025. The waste collected from different segments, including consumers, businesses, aggregators and the informal sector, is channelized to recyclers, co-processors and cement kilns (with EPR linkage). There are several other digital waste management solution providers spread across Indian towns and cities. The large gap in the Indian waste-management sector allows for an ideal market for innovative digital ventures.



The company has plans to scale and influence upwards of

2 million

metric tonnes of plastic annually by 2025

SUSTAINABILITY OF MODEL

Circulate Capital, a Singapore-based investment management company, has invested in Recykal to expand its business. The funding will enable Recykal to expand its network of Recykal points to over 100 locations. These points are already functional in more than 60 cities across the country. Circulate Capital has committed \$39 million to form the largest investment portfolio dedicated to fighting plastic pollution and advancing the circular economy for plastic waste in India (BusinessLine 2020).

IMPACTS

The digital solutions provided by Recykal ensure higher rates of waste collection and recycling and unlock value for stakeholders across the waste value chain, ensuring that more materials enter recycling streams and less move to landfills.

Digital Foot Print:

400,000 Consumers	1,000 businesses	500 Aggregators	100 Recyclers	30 Municipalities	25 States and Union Territories
-----------------------------	----------------------------	---------------------------	-------------------------	-----------------------------	--

Recykal has saved:

12.86 million-kWh energy	57.71 million ltrs of oil	18.23 million cubic feet of landfill space	44.44 million ltrs of water	8,047 trees.
---------------------------------------	--	---	--	------------------------



KEY LEARNINGS

- Digitization in the waste-management sector is not only helpful in appropriately monitoring data from cities but is also helpful in easily connecting different stakeholders and helping them match the demand and supply gaps with sustainable and easily assessable resources.
- There are many more platforms like kabadiwala.com that provide services such as scrap dealing through app-based systems that are transparent and reliable. These demonstrate the impact society can make through recycling resources.
- There have also been short-term campaigns run via social media, connecting citizens to act cumulatively and help reduce waste burdens. For example, the “My 10 kg Plastic” campaign run by the Indian Pollution Control Association (IPCA), Delhi, provides services via a WhatsApp number to collect a minimum of 10 kg segregated plastics from one’s doorstep on call.

3.2. RETURN AND EARN—NEW SOUTH WALES

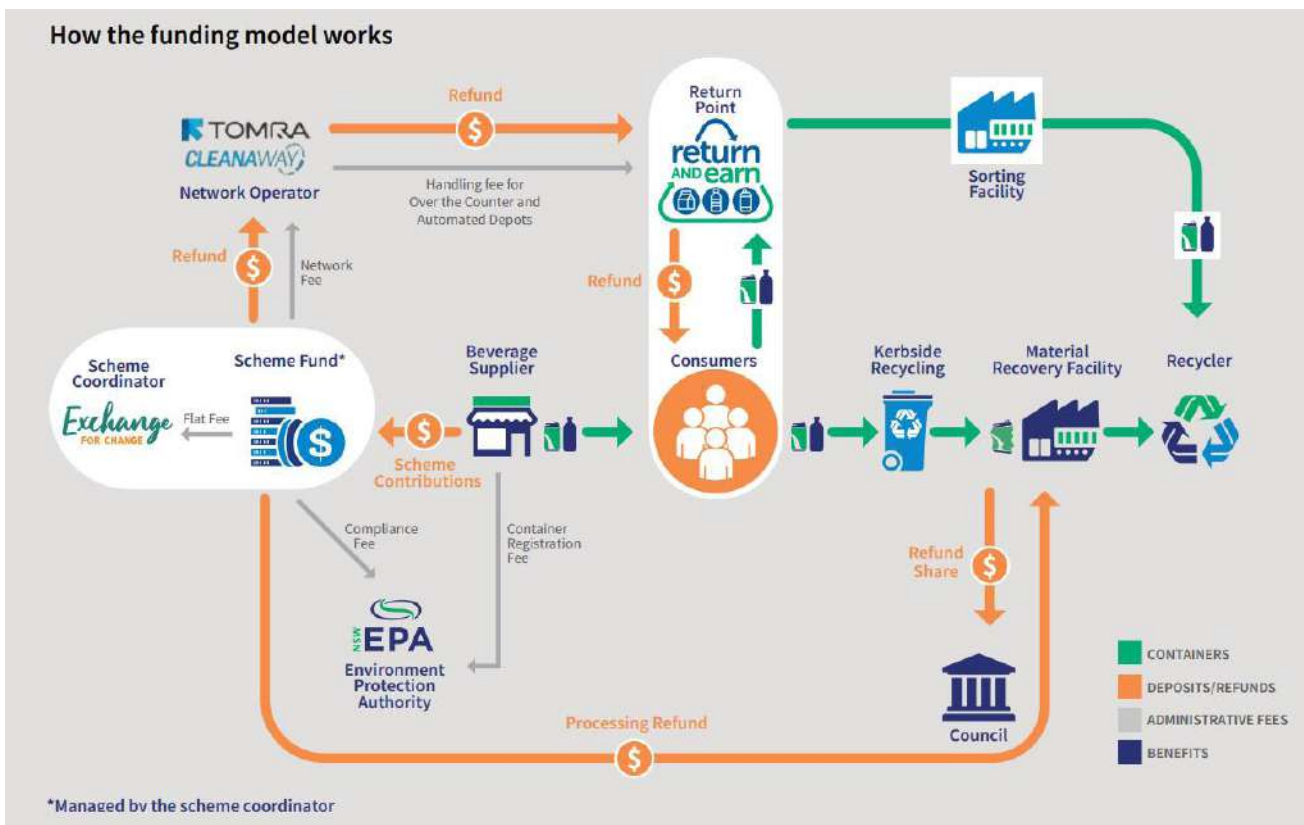
SUMMARY

The container deposit scheme, “Return and Earn”, is a litter reduction scheme introduced in the state of New South Wales, Australia. It was launched on December 01, 2017 to achieve the goal of reducing the volume of litter in the state by 40% by 2020. Since it started, the scheme has been largely successful in reducing litter in the environment and in boosting recycling rates.

“Return and Earn” scheme was launched to achieve the goal of reducing the volume of litter in the NSW state by

40%
by 2020

FIGURE 51: FUNCTIONALITY DIAGRAM OF THE “RETURN AND EARN” MODEL [NSW GOVERNMENT 2017]



BACKGROUND

In the Australian state of New South Wales, the litter from drink containers accounts for 44% of the total volume of litter in the state. Before the introduction of the Return and Earn scheme, the streets, beaches, waterways and parks were littered with an estimated quantity of 160 million containers. The yearly management of such containers incurred an approximate cost of 162 million. To tackle this pressing issue, the state launched a Return and Earn container deposit scheme in 2017. On the deposition of eligible drink containers, a refund of 10 cents is offered to consumers. Return points are established across the state to facilitate the deposition.



In the Australian state of New South Wales, the litter from drink containers accounts for

44%

of the total volume of litter in the state.

This scheme is run by the New South Wales Government and funded by contributions from the beverage industry (NSW Government n.d.).

The scheme also covers cartons and cans. To help determine which containers are eligible to be returned, officials use a container database that lists eligible and non-eligible items. Containers not eligible under the scheme can be recycled through the household recycling collection.

FIGURE 52: THE THREE STEPS OF THE RETURN AND EARN SCHEME [NSW GOVERNMENT 2017]



Over 600 return points have been developed for the scheme in New South Wales. They are customized as per local requirements, depending on how many bottles, cans and cartons are to be returned. There are also different options for receiving the refund, including electronic refunds, retail vouchers, cash and donations.

Every eligible bottle, can or carton that is returned is worth 10 cents. The return is made at a Reverse Vending Machine which offers the option of receiving cash vouchers, electronic payment or making a donation. Over-the-counter operations offer cash refunds and/or the opportunity to donate, whereas automated depots have the option of cash refunds. Some of the automated depots also offer an electronic transfer.

FIGURE 53:
OPTION 1-OVER THE COUNTER
[NSW GOVERNMENT N.D.]

The Return and Earn scheme provides several options for citizens to return containers. The depositors can choose the option best suited to them based on how they want to claim the credit and the proximity of the return points. These options can be used as examples for other states and can be adapted and altered according to the specific needs of the geography and society. Even one out of the three return models shown here can be a starting point as they don't require much space or human labour to run.



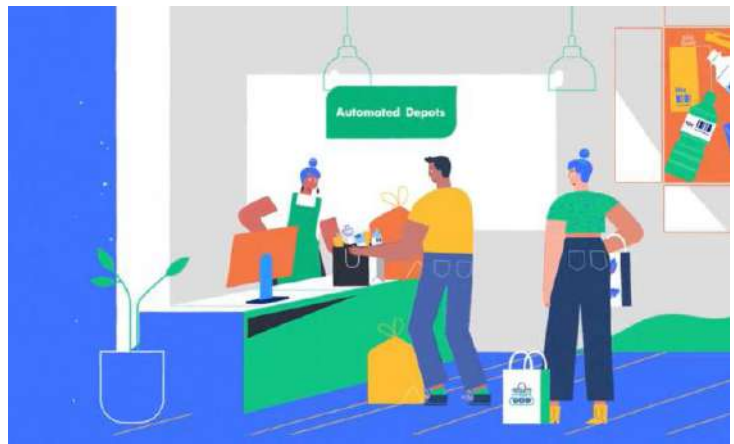
FIGURE 54:
OPTION 2- REVERSE VENDING MACHINES [NSW GOVERNMENT N.D.]



Reverse Vending Machines are self-service machines into which the containers are fed. Plastic containers need to be individually returned into the plastic chute and glass containers into the glass chute. The machine will then read the container barcode and either accept or reject the container based on its eligibility.

FIGURE 55:
OPTION 3—AUTOMATED DEPOTS
[NSW GOVERNMENT N.D.]

The Automated depots are operated by service staff. They are designed as specialist return and recycling centres where eligible containers can be handed over to a service assistant for automated counting. Once completed, the assistant will issue a refund for the containers given.



At the over-the-counter sites, the store assistants are responsible for counting the containers and issuing a refund. Local businesses such as news agencies or corner stores often utilize such models (NSW Government n.d.).

SUSTAINABILITY OF MODEL

The success of the Return and Earn model is based on the involvement of several stakeholders. The model and functionality of the scheme are carefully charted out. It is structured such that each stakeholder is given a specific responsibility that they need to execute (NSW Government n.d.).

The “Exchange for Change” is the administrator and coordinator of the “Return and Earn” scheme. Its responsibilities include the collection of contributions from the beverage suppliers, management of the scheme’s finances and the distribution of finances to the participants of the scheme including the network operator. It is also responsible for fraud-risk management and community engagement including increasing awareness about the scheme.

FIGURE 56: NUMBER OF RETURN POINTS IN EACH ZONE IN NSW (AS OF MARCH 2020) [NSW GOVERNMENT N.D.]



The return points are managed by a network operator TOMRA Cleanaway. They ensure that the returned containers are recycled and that the refunds are issued to the customers. They receive a network fee dependent on the material type of the container collected.

The design and development of the scheme are managed by the scheme regulator the NSW EPA. They also manage the registration of all eligible beverage containers as well as the obligations and performance of contracts. This is done in collaboration with the scheme coordinator and the network operator.

A supplier under the scheme is defined as any business that sells beverages in containers or gives them away as part of a promotion. This includes manufacturers, distributors, wholesalers and retailers. A first supplier is mandated to enter into a supply agreement with Exchange for Change and verify that its supplied container is registered with the EPA. A first supplier contributes to the scheme in proportion to its share of containers supplied and thus financially helps the Refund and Earn scheme.

The refunds for eligible containers collected through kerbside recycling bins can be claimed by the material recovery facility (MRF) operators registered with the NSW EPA.

IMPACTS

- The Return and Earn model has provided a valuable stream of clean recyclable material.
- Since launching on 1 December 2017, the scheme has collected over 8 billion containers.
- The state has 600 return points, over 1000 reverse vending machines and has helped reduce the volume of eligible drink container litter across the state.
- In 2020, drink container litter was reduced by 52% with 78% of New South Wales adults participating in return and earn.
- A total of 755,000 tonnes of materials has been recycled.
- Around 700 direct jobs were created within the network alone.



KEY LEARNINGS

- The Return and Earn scheme has ensured convenience of usage by setting up over 600 return points.
- Central and localized return points facilitate the collection efficiency of the scheme.
- Automated counting and verification of containers and automated depots using the latest technology allow compacting of containers, enabling more efficient transport of collected materials.
- Community engagement has been key to the success of the scheme. This was maximized through marketing and awareness campaigns.



A total of
265,000 tonnes
of materials has been re-cycled

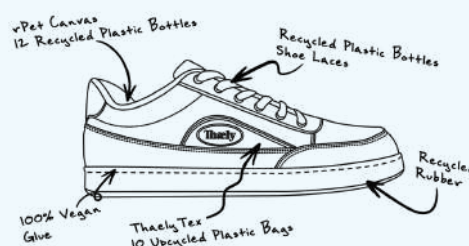
EXAMPLE IN INDIA:

Thaely – Sustainable Sneakers

Thaely is a sustainable sneakers brand founded by Akshay Bhawe. It makes sneakers using components recycled from waste materials. It was named after the Hindi word for plastic bags. The brand offers a practical solution to the plastic problem through its Y2K Pro sneakers crafted using upcycled plastic waste. The sneakers are made in India and use waste materials from plastic bags and bottles to create the shoe's upper body, while the sole comprises recycled rubber. As of August 2020, the brand has recycled 36,000 plastic bags and 25,000 bottles.

ThaelyTex is a revolutionary new material that looks and feels like leather but is made entirely out of waste plastic bags; the production process does not need any additional chemicals, nor does it release any toxic chemicals as a by-product. The production process is designed to be safe and cost-effective and to have the lowest emissions possible. Each sneaker uses ThaelyTex, which is made using ten upcycled waste plastic bags. ThaelyTex is produced in collaboration with TrioTap Technologies in Gurugram, Haryana. The waste plastic bags are collected from housing complexes, offices and stores in and around Gurugram. The collected plastic bags are then segregated, sanitized and processed into ThaelyTex at TrioTap Technologies' Gurugram waste-management unit. This allows them to reduce carbon emissions (Afthab 2021).

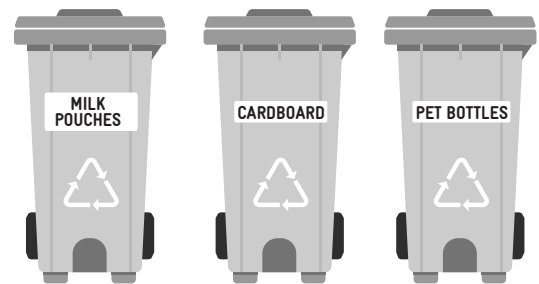
FIGURE 57: THAELY SUSTAINABLE SNEAKER DESIGN (THAELY)



3.3. SHOP WITH YOUR WASTE CAMPAIGN – BARTER SYSTEM

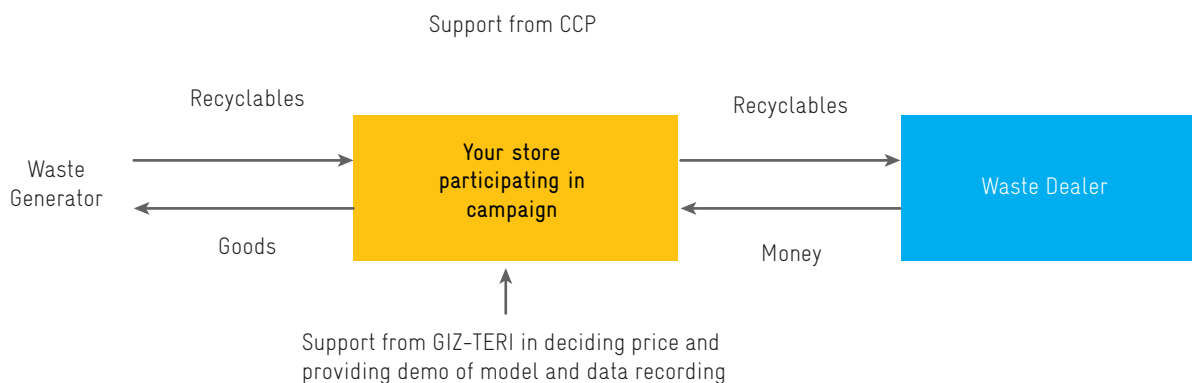
SUMMARY

The ‘Shop With Your Waste’ (SWYW) campaign is an initiative by the Corporation of the City of Panaji (CCP), which is aided by GIZ and The Energy and Resources Institute (TERI) under the waste NAMA project. The campaign aims to increase citizen participation in achieving the circular economy goal. The SWYW campaign acts as a barter system where citizens are encouraged to submit their clean and segregated waste in exchange for commodities from their local grocery stores. Currently, three types of waste are accepted by the stores in the barter exchange: milk pouches, cardboard and PET bottles. When customers bring their waste to the store, it is weighed, and in return, they can purchase items from stores based on the compensation from recyclables (current market price) offered to them.



Currently, three types of waste are accepted by the stores in the barter exchange: milk pouches, cardboard and PET bottles.

FIGURE 58: SNIPPET FROM “SHOP WITH YOUR WASTE” GOOGLE FORM



BACKGROUND

The recyclable items in Panaji comprise of 13.25% glass, 1.49% metal, 7.29% paper, 13.24% plastics and 7.16% textiles. As part of the city’s policy, the citizens of Panaji segregate their waste daily. The city currently has a 5-way segregation policy that is being upgraded into a 16-way segregation policy. Panaji also has several material-processing facilities that are well-linked to the city’s dry-waste collection centres in the city’s 12 zones (Manuja & Rathi 2020). The SWYW campaign is a step forward in the city’s waste management efforts to incentivise and increase citizen participation.

FIGURE 59: SWYW SHOP IN PANAJI WITH 3 COLLECTION BINS



FIGURE 60: SWYW SHOP IN MAPUSA WITH 3 COLLECTION BINS



The SWYW campaign acts as a barter system that allows the exchange of households' waste for goods from the grocery store. First, the shop owner who is interested in participating in the campaign must register themselves via CCP through a Google form or get in touch with a designated contact. Once registered, the CCP will provide three large bins which are labeled so the shop owner can store the waste given by citizens. The CCP also connects the shop owner to the city's MRF which oversees picking up the waste at least once a week. The shops can also leverage other ongoing schemes, like the one run by Goa Dairy which provides 500 millilitres of milk in exchange for 25 clean and empty packets of milk (500ml). Under the system, if the bins get full earlier, the shopkeeper can also contact the MRF facility and request for a pick-up. The shop owners are paid immediately at the time of pick up for the waste they provide, and the rate they get is based on the current market rate.

There are several other CSR and citizen-initiated efforts to recover plastics from city dumps, beaches and public spaces and send them back into the circular economy loop. Two notable campaigns are given in the box:

FIGURE 61: IMPACTS OF MUMBAI PLASTIC RECYCLOTHON



The Mumbai Plastic Recyclothon

In a unique initiative, The Mumbai Plastic Recyclothon, an award-winning plastic recycling citizen initiative of Project Mumbai has announced that it will donate one kilogram of grocery for every kilogram of plastic waste donated by Mumbaikars. Project Mumbai started its first campaign, which involved collecting plastic waste and converting them into usable furniture, in October 2018 and subsequently did another one in October 2019 (Raja 2020).

My 10 Kg Plastic Campaign

The “My 10 Kg Plastic” campaign was conceived by the IPCA in July 2019 and adopted by Dabur India Ltd. under its CSR initiative with the support of the East Delhi Municipal Corporation (EDMC). It was designed to create awareness of plastic waste collection and its segregation at the source and to stop littering. Under this campaign, general citizens and people from resident welfare associations, schools, corporates, and institutes participated in segregating their plastic and storing it separately. Each month, the IPCA collected the plastic waste stored by them and sent it to the respective recycling/ co-processing units. The participating citizens and organizations were given an appreciation certificate and a product made from recycled material. Under this initiative, various activities such as cleaning drives, awareness workshops and competitions were conducted to generate awareness. In the year 2020, 6,367 kilogrammes of plastic waste were collected from residences, offices, societies, schools and colleges; the non-recyclable plastic waste was sent to an Infrastructure Leasing & Financial Services (IL&FS) waste-to-energy plant for its proper disposal (Indian Pollution Control Association , 2019).

SUSTAINABILITY OF MODEL

This unique campaign provides opportunities to help manage waste through citizen participation, while also creating economic opportunities for entrepreneurs having space to deal in recyclable commodities. The citizens are incentivized to segregate and collect their waste at home until they have enough to give to the store. Since they get store credit for their waste, they can buy something for that value. The shop owners are incentivized to participate in this system because they obtain a small margin of ₹1–2 for every kilogramme of waste they trade. Their investment costs or additional costs are small, with the only major requirement being space. It is estimated that the shop owners can earn up to ₹1,000–3,000 for every tonne of waste they trade. The MRF facilities are also incentivized to participate in the campaign because they can easily collect a large amount of waste from one point, and they have an assured waste flow from the associated shop.

IMPACTS

- In just over 6 months of the initial launch of the SWYW campaign, a total of 432 kilogrammes of waste was collected from 5 stores that had registered in the campaign and shop owners earned extra money during this period.



KEY LEARNINGS

- Within 24 hours of starting the SWYW campaign, one full bin of PET bottles was collected in the store. This demonstrated the enthusiasm and willingness of citizens to participate in the barter system.
- The barter system is designed in such a way that all stakeholders including customers, shop owners and MRF facilities benefit from it; they are incentivized to participate.
- The barter system encourages citizens to segregate their waste and increases the percentage of source segregation which further helps urban local bodies (ULBs) in waste management.
- Since the bins were provided by the ULB, the shop owners did not incur any additional investment or maintenance costs.

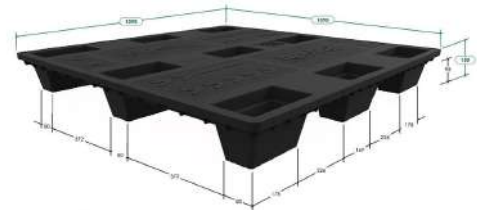


3.4 RE>PAL – PELLETS FROM RECYCLED PLASTIC WASTE

SUMMARY

Re>Pal is an Australian company with its main factory in East Java, Indonesia. Re>Pal was founded by Matthew Darby in 2002. He experimented for over 15 years with the ThermoFusion process as a solution to the growing plastic waste problem. He was especially keen to find a solution for reusing thin film or LDPE plastics and for the mixing of a waste plastic stream. The first test plant for the process was opened in Bali in 2012, followed by a full-scale operation and opening of a modern factory in Pasuruan, Indonesia in 2016.

FIGURE 62: NESTABLE PALLET [RE>PAL]



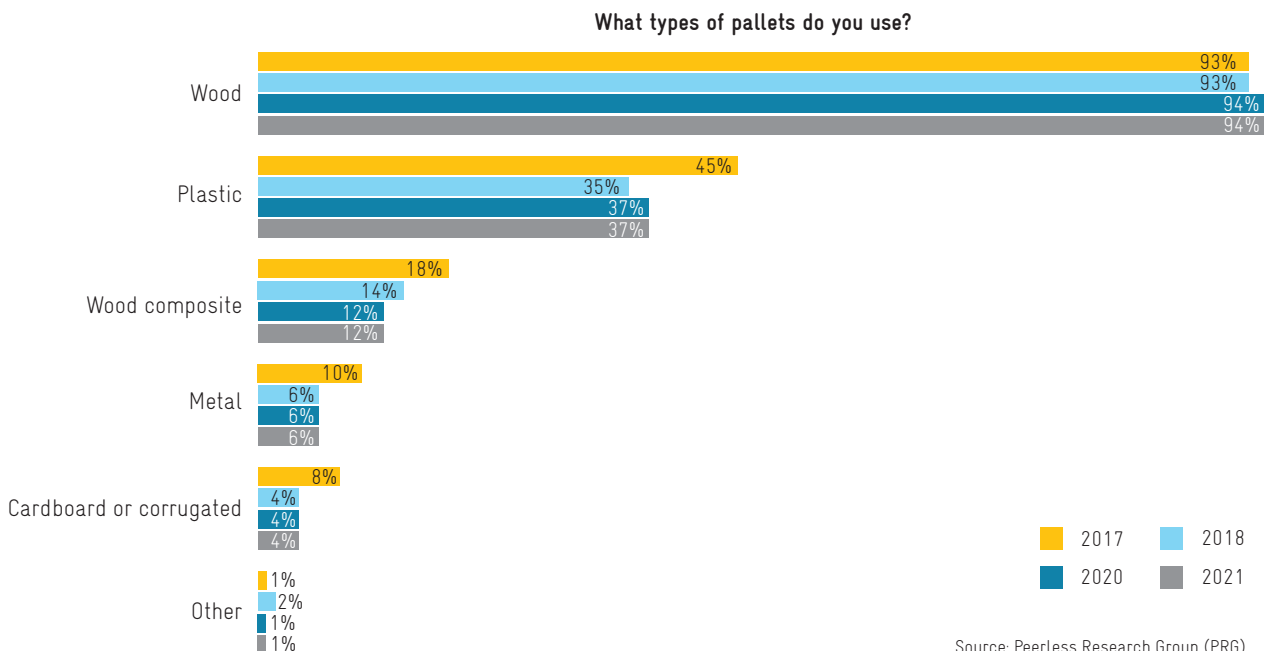
Re>Pal uses pallet technology to offer environmentally responsible pallets made from 100% waste plastic. These pallets can be used for a wide range of applications across business supply chains in South-East Asia and Australia. Re>Pal manages and supplies its recycled and reclaimed plastic pallets to many global and domestic companies, including Unilever, Veolia, Nestle and Givaudan by offering environmentally friendly and affordable solutions.

BACKGROUND

The use of wooden pallets for shipping is a growing environmental concern. A 2017 study from Deakin University revealed that in the Australian market alone, there are over 140 million pallets in use – the majority are wooden. While wood may seem to be the more environmentally friendly option compared to plastic, it is not the case anymore due to the ongoing development of recyclable plastic for use as pallets. Additionally, plastic pallets are more lightweight and durable compared to wooden pallets (Retallack 2021).

Range International estimates that 40% of the world’s timber supply is used for making pallets, posing a large threat of further deforestation. The Modern and Peerless Research Group conducted annual surveys garnering 176 responses from pallet users, and the results were published in a 2021 report. The report shows that over 90% of users continue to use wooden pallets. Hence, a more sustainable alternative made from recycled plastic saves trees while also removing plastic waste from landfills (Michel 2021).

FIGURE 63: TYPES OF PALLETS USED FOR TRANSPORTATION OF GOODS (2018–2021) [PEERLESS RESEARCH GROUP]



SCALABILITY OF MODEL

The Indonesian logistics market is estimated to reach \$240 billion by 2021. Indonesia is a rapidly developing country for supply chain and logistics management with a GDP of over \$1 trillion. However, Indonesia is also a large plastic producer, producing over 1.15 and 2.5 million tonnes of new plastic every year. Re>Pal launched their recycled plastic pallets across Asia’s major manufacturing hubs including China, Malaysia, Thailand and Vietnam, which were identified as having the greatest initial potential. Re>Pal interacted with major pallet-using stakeholders and identified that even though companies are eager to make their supply chains more sustainable, they are often limited by increased costs. Therefore, Re>Pal is an ideal solution that both fits the budget of companies and also encourages a circular economy business model (Re>Pal n.d.; Re>Pal Pallets 2020).

Re>Pal has already partnered with some of the major players in the production industry using pallets, including Nestle, Tetra Pak, LF logistics, Danone, DHL and Unilever. Re>Pal offers customized solutions for each of the companies so that the pallet is designed to transport its products. Re>Pal has designed over 10 different pallets with varying sizes and dimensions to meet the needs of its partners.

FIGURE 64: MARKET RESEARCH CONDUCTED FOR RE>PAL [BASE CREATIVE]
Top economies assumed to use pallets in 2014 (billion \$)

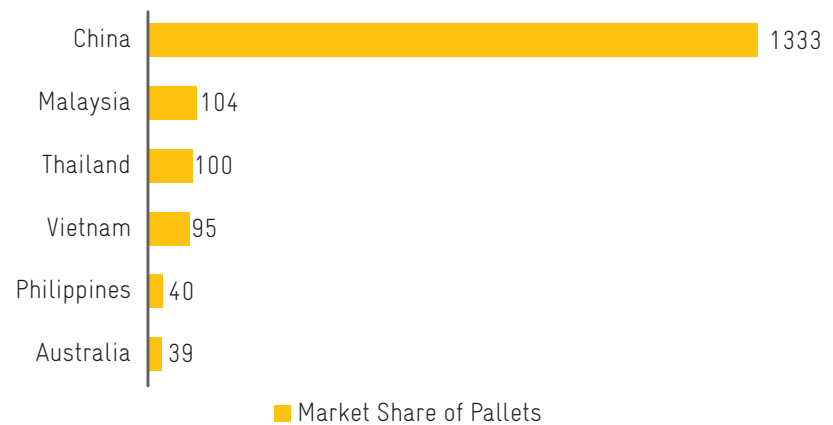
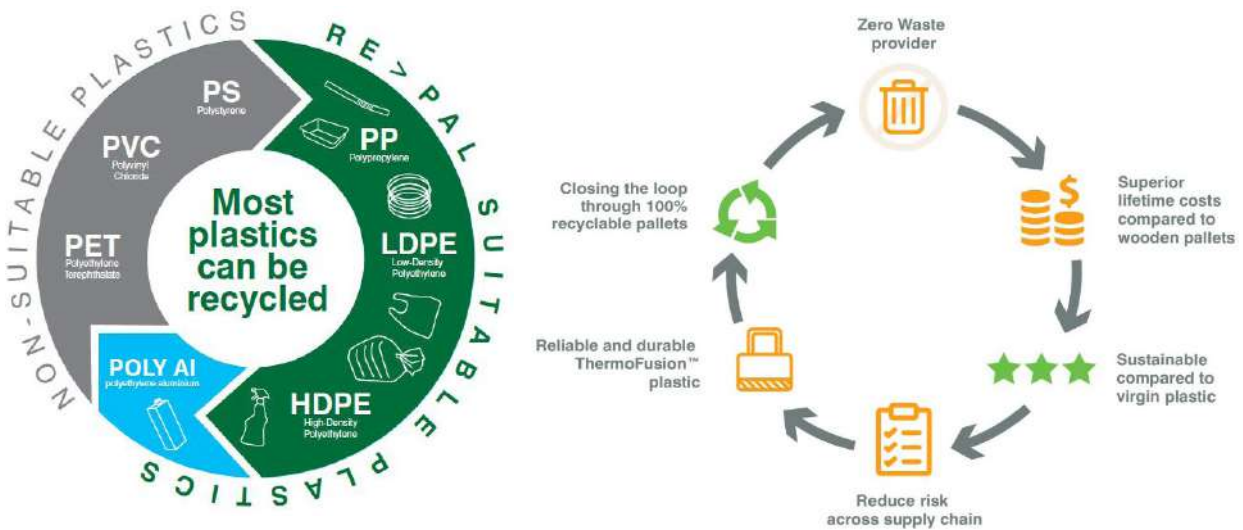


FIGURE 65: RECYCLED PLASTICS USED IN MAKING RE>PAL PALLETS [RE>PAL OFFICIAL WEBSITE]



IMPACTS

- It takes around 13 kilogrammes of mixed plastic waste to make one Re>Pal pallet; that is 13 kilogrammes of waste removed from landfills.
- Around 4 trees are saved for every wooden pallet that is replaced by a Re>Pal pallet.
- Using recycled plastic pallets helps make supply chains more sustainable and helps companies achieve the 2030 sustainable development goals.
- By reducing the usage of wood, Re>Pal reduces deforestation and pressure on sensitive ecosystems.



KEY LEARNINGS

- Finding solutions for mixed plastics and low-value plastics is one of the biggest challenges because a high level of segregation is required for recycling plastics efficiently. Re>Pal largely overcomes this issue with its patented ThermoFusion process.
- Using waste as a raw material in making new products is a key to circular economy business models and for keeping waste out of landfills.
- The environmental impacts of wooden versus plastic pallets can be determined based on different criteria such as durability, costs, carbon footprint, etc. However, it is important to consider that recycling material can often be more sustainable than harvesting newer/virgin materials.



IMPORTANT TAKE-AWAYS FROM CASE STUDIES:

Cities should start looking at practices to reduce waste. Thereafter, what has been used needs to be reused and what cannot be reused needs to be recycled. The table below highlights some strategic interventions for cities which can help them adopt 3R's more effectively.

	Reduce	Reuse	Recycle
Short-term	Awareness-raising campaigns and IEC tools can play a key role in motivating citizens to avoid single-use plastic and switch to sustainable alternatives.	The "points" or "rewards" system used for clothing sale and exchange encourages customers to send clothes into the circular economy loop rather than sending them to landfills.	Using the latest technology that is transparent allows for enabling a more efficient process in waste management and can lead to the successful implementation of policies. Cities should also leverage the existing opportunities like diversion of milk packets, PET and cardboard through buy back/ barter systems.
	Cities can motivate enterprises and citizens to adopt sustainable choices and target to become zero waste.		
Long-term	Social media platforms are key tools in spreading awareness and reaching a large number of people.	Convenience and affordability are key factors in getting more people to use reusable packaging.	Digitization in the waste management sector is not only helpful in monitoring data from cities but is also helpful in easily connecting different stakeholders and helping them match the demand and supply gaps with sustainable and easily assessable resources.
	The change in policy regarding the use of single-use plastic is pushing local bodies to come up with innovative solutions that include the use of sustainable alternatives targeting zero-waste units.	Skilled workers such as weavers, need to be formally organized and associated into self-help groups that can benefit from linkages through NGOs and municipal corporations. Policies around design for recyclability to allow easy refurbishment of products. Research around making products from waste which are more sustainable and can infuse wealth to waste.	
	Transparent engagement with the population by holding meetings in public can gather input and involve the local population to implement a strategy.	R&D towards affordable and reusable packaging must be funded and entrepreneurs venturing into this can be incentivized and supported to expand the business.	
	Cities can benefit from waste reduction strategies involving entrepreneurs and limiting plastics from entering the environment.		ULB intervention into the facilitation of a new idea can bridge the gap between entrepreneurs and MRF facilities and can channel more waste into the recycling and recovery system. Policies around the promotion of the usage of recycled products should be looked at. This can help bring more value to waste, indirectly increasing the collection of recyclables.

REFERENCES

1. Afthab, Z. (2021, November 8). The New Age Of Sneakers: Thaely Introduces Shoes Made From Plastic Waste. Retrieved from: <https://www.grazia.co.in/fashion/the-new-age-of-sneakers-thaely-introduces-shoes-made-from-plastic-waste-8412-1.html>.
2. ALAS. (2019). Borrow, Use Return. Retrieved from: <https://www.alas.co.id/>.
3. Balakrishnan, R. (2020, August 10). Social Entrepreneur Lakshmi Menon is Upcycling PPE Scrap and Providing Employment to Women. Retrieved from: <https://yourstory.com/herstory/2020/08/social-entrepreneur-lakshmi-menon-upcycles-ppe-cloth-scrap-mattresses/amp>.
4. BMU. (2021, January 20). Federal Cabinet Approves Amendment to the Packaging Act. Retrieved from: <https://www.bmu.de/pressemitteilung/mehrweg-wird-moeglich-im-to-go-bereich/>.
5. Braun, S. (2021, July 3). 5 Things to Know About the EU Single-Use Plastics Ban. Retrieved from Deutsche Welle: <https://www.dw.com/en/5-things-to-know-about-the-eu-single-use-plastics-ban/a-58109909>.
6. BusinessLine (2020, December 10). Circulate Capital Invests in Recykal for Waste Management, Recycling. Retrieved from BusinessLine: <https://www.thehindubusinessline.com/companies/circulate-capital-invests-in-recykal-for-waste-management-recycling/article33298937.ece>.
7. Central Pollution Control Board. (2019). Annual Report for year 2018-19 on Implementation of Solid Waste Management Rules (as per provision 24 (4) of SWM Rules, 16. Retrieved from: https://cpcb.nic.in/uploads/MSW/MSW_AnnualReport_2018-19.pdf.
8. Davis, N. (2020, April 7). Fast Fashion Speeding Toward Environmental Disaster, Report Warns. Retrieved from The Guardian: <https://www.theguardian.com/fashion/2020/apr/07/fast-fashion-speeding-toward-environmental-disaster-report-warns>.
9. European Circular Economy Stakeholder Platform (2016). Veras - Multiplatform for Clothing Reuse and Upcycling in Denmark. Retrieved from European Circular Economy Stakeholder Platform: <https://circulareconomy.europa.eu/platform/en/good-practices/veras-multiplatform-clothing-reuse-and-upcycling-denmark>.
10. Express Web Desk. (2019, October 02). Mother Dairy Urges Consumers to Switch to Token Milk. Retrieved from The Indian Express: <https://indianexpress.com/article/india/mother-dairy-cuts-price-of-token-milk-by-rs-4-to-discourage-plastic-use-6045743/>.
11. Ghanekar, N. (2021, June 17). India's Ban on Single-Use Plastics Runs into Challenges, Pitches New Rules. Retrieved from Business Standard: https://www.business-standard.com/article/current-affairs/what-india-must-do-to-implement-ban-on-single-use-plastics-effectively-121061700235_1.html.
12. Goonj . (n.d.). Our Initiatives. Retrieved from Goonj: <https://goonj.org/our-initiatives/>.
13. Greensole. (n.d.). About Us: GreenSole. Retrieved November 26, 2021, from: <https://www.greensole.com/p/Our-Story>.
14. Hindustan Times Correspondent. (2021, March 08). MCG Opens City's First Steel Utensil Bank to Eliminate Plastics. Retrieved from Hindustan Times: <https://www.hindustantimes.com/cities/gurugram-news/mcg-opens-city-s-first-steel-utensil-bank-to-eliminate-plastics-101615227922226.html>.

15. Indian Pollution Control Association. (2019). My 10 Kg Plastic. Retrieved August 24, 2021, from IPCA: <https://ipcaworld.co.in/10-kg-plastic/>.
16. Local Self Government Department of Kerala (2017)(a). Green Protocol Documentation. Retrieved from <http://sanitation.kerala.gov.in/wp-content/uploads/2018/04/Green-Protocol-DOCUMENT.pdf>.
17. Local Self Government Department of Kerala (2015) (b). Green Protocol Initiative. Suchitwa Mission.
18. Manuja S., & Pandey, S. (2020, December 02)(a). Plastic Waste Management: Turning Challenges into Opportunities. Retrieved from The Energy and Resources Institute: <https://www.teriin.org/policy-brief/plastic-waste-management-turning-challenges-opportunities>.
19. Manuja, S., & Pandey, S. (2020, September 19)(b). Energy & Economics Linkages in Waste Management. Retrieved from The Goan Everyday: <https://www.thegoan.net/sunday-mag/energy-economics-linkages-in-waste-management/59027.html>.
20. Manuja, S., & Rathi, V. (2020, September 26). This Gandhi Jayanti, Why Not Go Shopping With Your Waste in Panaji. Retrieved from The Goan.
21. Manuja, S., Singh, N. K., Gaurva, J. K., Rathi, V., Pandey, S., Ahmad, D., et al. (2020). An Audit of Municipal Solid Waste Management System in Selected Wards of Varanasi - A Case study. International Journal of Engineering Research & Technology (IJERT), 9(5), 631–636.
22. Matchar, E. (2019, February 15). The Rise of ‘Zero-Waste’ Grocery Stores. Retrieved from The Smithsonian: <https://www.smithsonianmag.com/innovation/rise-zero-waste-grocery-stores-180971495/>.
23. Maurano, S. (2010). The First Case of the Application of the Zero Waste Strategy in Italy and Other Measures to Reduce the Ecological Footprint. Retrieved from: https://www.uclg-cisdp.org/sites/default/files/Capannori_2010_en_FINAL.pdf.
24. McFall-Johnsen, M. (2020, January 31). These Facts Show How Unsustainable the Fashion Industry Is. Retrieved from World Economic Forum: <https://www.weforum.org/agenda/2020/01/fashion-industry-carbon-unsustainable-environment-pollution/>.
25. McQuibban, J. (2020). The State of Zero Waste Municipalities. Retrieved from Zero Waste Cities: https://zerowastecities.eu/wp-content/uploads/2020/12/zwe_report_state-of-zero-waste-municipalities-2020_en.pdf.
26. Michel, R. (2021, September 8). Annual Pallet Report 2021: Short Supply Meets High Demand. Retrieved from Modern Materials Handling: https://www.mmh.com/article/annual_pallet_report_2021_short_supply_meets_high_demand.
27. Muralidhar, A. (2021, August 21). Shop at These Zero Waste Stores in India to Cut Your Plastic Footprint. Retrieved from The Shooting Star: <https://the-shooting-star.com/zero-waste-stores-india/#24-7-to-9-green-store-kochi>.
28. NDTV. (2019, Feb 01). Gurugram Woman Starts a ‘Steel Crockery Bank’ to Reduce Plastic Menace. Retrieved from: <https://www.youtube.com/watch?v=-wfkIOBPalk>.
29. Northeast Today. (2020, October 31). WEAR is the Project! Retrieved from Northeast Today: <https://www.northeasttoday.in/2020/10/31/wear-is-the-project/>.
30. NSW Government. (n.d.). Return and Earn. Retrieved from Return and Earn: <https://returnandearn.org.au/>.
31. Patel, T. (2019, May 24). Exclusive: These Chennai Friends Give Tamil Nadu its First Zero-Waste Grocery Store. Retrieved from The Better India: <https://www.thebetterindia.com/183313/chennai-first-zero-waste-grocery-store-ecoindian-tamil-nadu/>.
32. Planning Commission. (2014). Report of the Task Force on Waste to Energy. Retrieved from: <http://planningcommission.nic.in/reports/genrep/repwte1205.pdf>.
33. Plastindia Foundation. (2019). Indian Plastics Industry Report. Plastindia Foundation.
34. Raja, V. (2020, September 14). Every Kilo of Plastic Waste You Donate, a Kilo of Free Rations Reach the Needy. Here’s How. Retrieved from The Better India: <https://www.thebetterindia.com/237826/project-mumbai-plastic-waste-collection-donation-food-benches-pencil-pouches->

- grocery-rice-atta-salt-drop-off-point-vid01/.
35. Re>Pal (n.d.). Re>Pal. Retrieved from Base Creative: <https://www.basecreate.com/work/project/repal>.
 36. Re>Pal Pallets. (2020, January 7). Re>Pal Pallets- Long Documentary. Retrieved from https://www.youtube.com/watch?v=3Ta-EO_mCvw.
 37. Recykal. (2017). About. Retrieved from Recykal: <https://www.recykal.com/>.
 38. RePack. (n.d). Impact. Retrieved from RePack: <https://www.repack.com/impact/>.
 39. Retallack, E. (2021, July 19). The True Environmental Cost of Wooden Pallets. Retrieved from Eco Pallets Australia: <https://www.ecopallets.com.au/blog/the-true-environmental-cost-of-wooden-pallets/>.
 40. Return and Earn (2017). New South Wales.
 41. Siddiqui, H. (2021, September 26). This Is Not Your Regular Grocery Store. Retrieved from <https://www.facebook.com/brutindia/videos/226914782824189/>.
 42. Shalini, B. (2017). Recycled India – Reuse, Reduce , Recycle. Retrieved August 24, 2021, from Startup Hyderabad: <http://startuphyderabad.com/recycled-india-reuse-reduce-recycle/>.
 43. Sripradha. (2018). 8 Zero Waste Stores in India – Package Free Shops. Retrieved from Waste Free Culture: https://wastefreeculture.com/8-zero-waste-stores-in-india-package-free-shops/#3_Muditha_Zero_Waste.
 44. Taylor, M. (2018, February 28). World's First Plastic-free Aisle Opens in Netherlands Supermarket. Retrieved from The Guardian: <https://www.theguardian.com/environment/2018/feb/28/worlds-first-plastic-free-aisle-opens-in-netherlands-supermarket>.
 45. TERI. (2021). Chapter-12: Solid Waste Management. In TERI Energy and Environment Data Diary and Yearbook (pp. 271–297). New Delhi: TERI.
 46. The Better India. (2020, December 19). Kerala Eco-Innovator Upcycles PPE Scrap, Makes 700 Mattresses For COVID Centres. Retrieved from The Better India.
 47. The Times of India. (2021, March 23). Utensil Bank to Help Residents Do Away With Single-Use Plastic. Retrieved from The Times of India: <https://timesofindia.indiatimes.com/city/gurgaon/utensil-bank-to-help-residents-do-away-with-single-use-plastic/articleshow/81640217.cms>.
 48. Trading Economics. (2021). India GDP. Retrieved from: <https://tradingeconomics.com/india/gdp>.
 49. Tranco, B. (2021). 7-9 GREEN STORE: Transforming Shoppers. Retrieved from: <https://www.no-burn.org/business-unusual-green-store/>.
 50. Twirl. (n.d.). About us. Retrieved from: Twirl Store: <https://twirl.store/about-us/>.
 51. Veras. (n.d.). About Us. Retrieved from: Veras: <https://verasvintage.dk/om-veras/>.
 52. Vishnoi, A. (2021, March 13). Ministry Proposes Three-Stage Ban on Single-Use Plastic. Retrieved from: <https://economictimes.indiatimes.com/news/politics-and-nation/ministry-proposes-three-stage-ban-on-single-use-plastic/articleshow/81472538.cms?from=mdr>.
 53. Vliet, A. V. (2013, September 25). The Story of Capannori – A Zero Waste champion. Retrieved from: Zero Waste Europe.
 54. Vliet, A. V. (2018). Thr Story of Capannori. Retrieved from Zero Waste Europe: https://zerowastecities.eu/wp-content/uploads/2019/07/zero_waste_europe_cs1_capannori_en.pdf.
 55. Vytal. (2019)(a). About Vytal. Retrieved August 24, 2021 from LinkedIn: <https://www.linkedin.com/company/vytal-global/>.
 56. Vytal. (n.d)(b). About us. Retrieved from Vytal: <https://en.vytal.org/about-us>.
 57. World Economic Forum. (2021, January 19). This Indian Designer is Turning Waste PPE into Mattresses for COVID-19 Patients. Retrieved from: <https://www.weforum.org/videos/this-indian-designer-is-turning-waste-ppe-into-mattresses-for-covid-19-patients>.

Published by:

Ministry of Housing and Urban Affairs (MoHUA),
Government of India

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

Cities Combating Plastic Entering Marine Environment (CCP-ME)
On behalf of Federal Ministry for the Environment,
Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)

B5/5, Safdarjung Enclave,
New Delhi-110 029, India
T +91 49495353
F +91 49495391
www.giz/india