

India – Australia Industry and Research
Collaboration for Reducing Plastic Waste

Towards a circular economy for plastics in India

A review of community, industry and public sector initiatives

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India – Australia Industry and Research Collaboration for Reducing Plastic Waste

The India – Australia Industry and Research Collaboration for Reducing Plastic Waste is a three-year collaboration with partners in both India – the Council of Scientific and Industrial Research (CSIR), Development Alternatives and The Energy and Resources Institute (TERI) – and Australia – the University of New South Wales (UNSW), the University of Technology Sydney (UTS) and CSIRO. Through key activities, this collaboration works closely with industry, government and community stakeholders to evaluate the economic and policy implications of transitioning to a circular economy for plastics.



Project co-ordinating
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The Challenge

Over 300 million tonnes of plastic waste are created globally each year yet only nine per cent of this plastic waste is recycled. Plastic waste also leaks into the environment and creates large problems for terrestrial and marine ecosystems and species as well as a loss of material value.

Both India and Australia are committed to take action to reduce plastic waste by driving innovation and enabling new technologies and business models to achieve this. By doing so, both countries can reduce the environmental and health impacts of plastic waste and enable new growth industries and employment in a zero-plastic waste economy.

The India – Australia Industry and Research Collaboration for Reducing Plastic Waste is a three-year collaboration with partners in both India - the Council of Scientific and Industrial Research (CSIR), Development Alternatives and The Energy and Resources Institute (TERI) – and Australia - the University of New South Wales (UNSW), the University of Technology Sydney (UTS) and CSIRO. Through key activities, this collaboration works closely with industry, government and community stakeholders to evaluate the economic and policy implications of transitioning to a circular economy for plastics.

The three-year research program will result in:

- a comprehensive knowledgebase of plastics material flows from import and domestic production, to use, disposal, recycling, and reuse;
- a full supply chain analysis of plastics use in key sectors including packaging, agriculture, construction, automotive, electronics and household appliances sectors identifying supply chain participants and physical and monetary interactions;
- a roadmap identifying the main technical innovations, both at community and large industrial scale, that will help to innovate across the plastics supply chain reducing end-of-life plastics waste and enabling design for circularity;
- a set of principles and strategies including institutional and economic factors, new business models and markets that facilitate the transition to a circular plastics economy;
- a series of demonstration projects located in different parts of India including in urban and rural locations and both small and community scale and large industrial scale applications of circular economy;
- a continuous process of evaluation and learning that will build a knowledgebase that can be scaled up to the whole economy for all types of materials to foster circular interactions; and
- a platform for research and industry collaboration between India and Australia beyond the initial three-year research program.

This report focuses on the role of community and industry-led initiatives to drive change towards a circular economy for plastics in India.

Executive summary

The India-Australia Plastics Research Initiative, conceived in June 2020 by the Indian and Australian Prime Ministers, brings together research and industry partners in the two countries to work on reducing plastic waste and driving a circular economy for plastics in India, notably through the development of a roadmap for a plastics circular economy.

The project aims to take a holistic approach to understand plastic flows and supply chains, circular economy technologies and circular economy enablers including public policy, circular business models and initiatives led by communities and industries. This working paper is focused on the role of community and industry-led initiatives to drive change towards a circular economy for plastics.

India is currently facing a substantial plastic challenge. While its plastic consumption per capita remains low, its production of plastic waste in absolute terms makes it the 15th largest producer of plastic waste in the world. A substantial proportion of this waste is mismanaged with negative consequences on the natural environment and human health. While top-down policies are known to play an essential role in tackling plastic related issues, less is known regarding the role of bottom-up initiatives conducted by communities and industry. However, sustainability transitions literature argues that bottom-up initiatives can play a central role in driving sustainability transitions, by developing niche initiatives that can enter the mainstream and potentially lead to regime shifts.

This working paper is focused on initiatives led by communities and industry stakeholders, as well as initiatives led by government and implemented on the ground. It aims at building an understanding of initiatives that have been implemented in India to address plastic waste and support a circular economy for plastics, and to learn from them to inform subsequent programs, as well as the roadmap for a circular economy for plastics. In this first iteration of the paper we:

1. Identify a range of plastics-related initiatives that have been implemented in India by local communities, industry, or through public programs implemented at the community scale
2. Characterise the initiatives in terms of the issues they address and their potential contribution to a circular economy, including common strategies and gaps
3. Identify knowledge gaps on issues of circularity
4. Select a subset of initiatives as potential future case studies for further inquiry
5. Develop an evaluation framework and research plan to assess the effectiveness of those initiatives, in terms of their contributions to circularity and sustainability, and their potential to contribute to transformative change.

The findings from our initial characterisation of initiatives – based on their potential contribution to circularity – shows that, across the board, initiatives primarily focus on the end of the plastics life cycle, that is, facilitating the collection, recycling, and recovery of waste. The second area of focus is the beginning of the plastic life cycle, notably refusing the use of single-use plastics and

reducing their use. In contrast, very few initiatives target extension of the product lifetime, such as reuse, repair, and repurposing.

With regard to the types of approaches adopted by stakeholders, community-based initiatives mainly focus on education and awareness raising, as well as on the provision of incentives for recycling, while industry and public initiatives focus on substituting plastics for another material, as well as on facilitating waste collection and recycling, notably by collaborating with the informal sector.

The main knowledge gaps identified in this initial characterisation of initiatives were as follows:

- While the objectives of the initiatives are stated, very little information is currently available on the outcomes and impacts of those initiatives.
- Similarly, little to no information is available on the factors that explain the success or failure of an initiative, particularly with regard to its ability to sustain itself in the long term and to scale up.
- There appears to be a dearth of initiatives focusing on extending product lifetime, with little information on why that is the case.
- Finally, there is a lack of understanding of the contextual factors (notably policies and government interventions) that enable/hinder the emergence of those initiatives.
- Building on the knowledge gaps identified, we formulated five research questions:
- What are the drivers (regulatory, policy-related, economic, social, technical, etc.) for plastics-related initiatives in India?
- What are the social, economic and environmental outcomes/impacts of existing initiatives?
- What are the factors that explain the longevity of an initiative (its ability to sustain itself) or on the contrary its failure to do so?
- What are the factors that explain the ability of an initiative to replicate or scale up?
- Why are there a lack of initiatives targeting lifetime extension, such as reuse, repair and repurposing of plastics products?

To answer our research questions, we adopted a case study approach. We identified nine potential case studies based on a range of criteria including: initiatives driven by different proponents, in diverse geographies, using a range of circular economy strategies and approaches; and initiatives that have seen varying levels of success and failure at different scales. In addition to answering our research questions, the evaluation of those case studies will provide insights into how initiatives can be better supported.

We drew on literature on circular economy, social innovation, and community-based initiatives to develop an evaluation framework for evaluating and analysing the effectiveness of each initiative. The framework composed of five main dimensions: i) Context – contextual elements that enabled or hindered initiatives, ii) Appropriateness – (In)adequacy of the project within the local context, iii) Governance and management – governance and management structures that enabled or hindered the project (i.e. participation, inclusion, organisational and financial sustainability), iv) Innovativeness and diffusion – the degree to which the initiative develops innovative products and

services, and its ability to diffuse them through replicating or scaling up, and v) Outcomes and impacts – environmental, social and economic outcomes and impacts.

The next step of the research will be to conduct stakeholder engagement, starting with stakeholders directly involved with the case study initiatives and then snowballing to include a range of broadly relevant stakeholders from the public, private and non-government sectors.

1 Introduction

1.1 Overview of project

The India-Australia Plastics Research Initiative was conceived in June 2020 by the Indian and Australian Prime Ministers. The intention is to collaborate on an ambitious program to reduce plastic waste and drive a circular economy for plastics in India. Over three years, the project seeks to build research and industry collaborations between the two countries to drive innovation in the plastic supply chain, implement circular economy demonstration projects, and develop a roadmap to facilitate a circular economy transition in India. The project draws on expertise from Indian and Australian institutions with a holistic approach to understanding plastic flows and supply chains in India, circular economy technologies and circular economy enablers including public policy, circular business models and initiatives led by communities and industry. This working paper is focused on initiatives led by communities or industry stakeholders, and other initiatives led by government and implemented on the ground.

1.2 Objectives of this working paper

The purpose of this working paper is to build an understanding of initiatives that have been implemented in India to address plastic waste and support a circular economy for plastics, and to learn from them to inform subsequent programs, as well as the roadmap for a plastics circular economy. To begin our analysis, this working paper sets out to:

1. Through a literature and practice review, identify a range of plastics-related initiatives that have been implemented in India by local communities, industry, or through public programs implemented at the community scale.
2. Characterise the initiatives in terms of the issues they address and their potential contribution to a circular economy, including common strategies and gaps.
3. Identify knowledge gaps
4. Select a subset of initiatives as potential future case studies for further inquiry
5. Develop an evaluation framework and research plan to assess the effectiveness of those initiatives, in terms of their contributions to circularity and sustainability, and their potential to contribute to transformative change.

In this first iteration of the working paper, we have focused on reviewing the available literature to address these three objectives and to identify gaps in knowledge that will inform the next steps in our research plan. The next steps will include stakeholder engagement and evaluation of initiatives.

1.3 Introduction

The production, consumption and disposal of plastics is becoming an increasingly pressing challenge due to their negative impacts on the environment, and potentially on human health (Eriksen et al., 2014; Li, Tse and Fok, 2016; Geyer, Jambeck and Law, 2017). In India, per capita consumption of plastic was 11 kilograms per year in 2017 (FICCI, 2017), which is far lower than the world average, at 28 kilograms per capita per year. However, despite its relatively low per capita consumption of plastics, India generated 4.49 million tonnes of plastic waste in 2010, making it the fifteenth largest producer of plastic waste worldwide (Jambeck et al., 2015; Ritchie and Roser, 2018). According to Jambeck et al. (2015), 85% of the plastic waste generated in India was mismanaged (i.e., littered, or inadequately disposed of in dumps or open, uncontrolled landfills) for the year 2010, and India could represent 4.17% of the total share of mismanaged plastic waste worldwide by 2025 (after China, Indonesia, the Philippines and Vietnam).

Mismanaged waste has the potential to negatively impact the natural environment as well as animal and human health, by polluting rivers and oceans and entering the food chain (UNEP, 2018; CSE, 2019). The Ganges River is the second most plastic-polluted river in the world, and is estimated to carry 115,000 tonnes of plastics to the ocean each year (Lebreton and Andrady, 2019). In addition, leachate from plastic waste can contaminate soil and release poisonous chemicals, disturbing soil microbe activity (UNEP, 2018; CSE, 2019).

Tackling plastic waste, notably single-use plastics (SUP), is a priority of the Indian government, with the Prime Minister announcing that India will work on phasing out SUP by 2022. To meet this objective, a wide range of actions needs to be undertaken, notably to improve the source separation of waste as well as the segregation of waste during collection and transportation (Bhattacharya et al., 2018). It is also essential for the private and public sectors to work with the informal sector, which plays an essential role in waste collection and segregation in India (World Business Council for Sustainable Development, 2016; Aparcana, 2017). Beyond enhanced waste management, it is also necessary to consider possibilities for avoiding or reducing plastic use and facilitating its reuse.

Top-down policies play an essential role in tackling plastic-related issues, and have been a topic of interest in the scientific and grey literature (e.g. Ellen MacArthur Foundation, 2015; Hartley, van Santen, & Kirchherr, 2020). In contrast, less information is available on the role of bottom-up initiatives conducted by the private sector, community organisations and public programs implemented at the community level in tackling issues related to plastic production, consumption and disposal. Some studies have undertaken a stocktake of plastic waste initiatives worldwide (GRID-Arendal, 2020); identified plastic initiatives in the FMCG sector in the United Kingdom (Gong et al., 2020); and showcased successful community-based initiatives in developing country contexts (United Nations Development Programme, 2019). However, these studies remain limited in number and do not provide a comprehensive evaluation of the factors explaining their: i) effectiveness, ii) outcomes in terms of sustainability and circularity, and iii) ability to lead to transformative change.

The literature on sustainability transitions hypothesises that bottom-up innovations play a central role in sustainability transitions. It argues that changes often start with 'pioneering organisations, technologies and users that form a niche practice on the margin' (Seyfang & Smith, 2007, p.588). If

innovations happening in niches are sufficiently robust, they can progressively be integrated into the mainstream market, potentially leading to regime shifts. For this reason, it is important to understand the transformative potential of those initiatives. In this working paper, we identify a wide range of initiatives related to plastics management in India, and provide an initial characterisation of those initiatives, along with a shortlist to be further evaluated in the next phase of this research. At the end of the paper, we set out our preliminary research design including a framework to evaluate the effectiveness of initiatives and their contribution to the circular economy and sustainability and their ability to be sustained and drive broader change by moving from their niches into the mainstream.

We will specifically look at initiatives focusing on packaging, considering that 43% of plastic manufactured in India is for packaging. We will focus on initiatives that have been led or implemented at the community scale, including community-led and publicly funded initiatives, as well as initiatives undertaken by the private sector (industry initiatives), notably fast-moving consumer goods (FMCG), e-business and hospitality, which are major consumers of packaging. These initiatives are likely to include market-based innovations, which correspond to the greening of mainstream businesses, as well as grassroots innovations, which focus on social and technological innovations developed by civil society organisations (Hatzl et al., 2016).

Investigating community-led initiatives is essential as they are increasingly considered to play a key role in sustainability transitions, notably regarding the transition to low-carbon societies and climate change mitigation (Celata, Dinnie and Holsten, 2019; Landholm et al., 2019), but also sustainable waste management (Dururu et al., 2015). Publicly funded initiatives implemented at the community level also have potential as niche innovations, as although they are informed by top-down policy, they may encounter resistance from dominant regimes, for example the commercial and socio-cultural regimes.

Considering the private sector is also important, as it plays an essential role in the implementation of the circular economy for plastics (Ellen MacArthur Foundation, 2013). This is particularly true in the Indian context, where legislated requirements for corporate social responsibility (CSR) and extended producer responsibility (EPR) facilitate private sector initiatives for plastic management. India was one of the first countries to legislate that high-net-worth companies spend two percent of their average net profit on environment and development initiatives under their Corporate Social Responsibility Act (Hickle, 2017). As a result, CSR has been a route some companies have taken to support civil society as well as municipal bodies in raising awareness about and supporting action for the sustainable management of plastics in the environment (High Level Committee, 2019). Regarding EPR, its introduction under the Plastic Waste Management Rules, along with the announcement about phasing out single-use plastics, has galvanised industry action to design innovative models.

1.4 Approach

In this working paper, we have conducted a literature review to identify plastics-related initiatives in India that have been led or implemented at the community scale or led by industry. We have subsequently characterised those initiatives using a circular economy strategy framework. Using this characterisation, we have developed a broad understanding of the common strategies employed and gaps in the types of initiatives that have been implemented in India. Following this

we have chosen several case study initiatives to examine in more detail and have established an evaluation framework to guide the next steps of our analysis.

The structure of the working paper is as follows. Firstly, we introduce the conceptual and theoretical frameworks that guide the literature review. Secondly, we present the findings from our literature review and characterisation of initiatives in India, followed by a review of international initiatives. Finally, our conclusions identify knowledge gaps, and the next steps section outlines our evaluation framework and research plan.



2 Conceptual and theoretical framings

In order to meet our study objectives, in particular to identify and characterise a range of plastics-related initiatives with respect to the circular economy, we employ several conceptual and theoretical frameworks. Firstly, we define circular economy strategies to help identify types of circular economy initiatives and secondly, we position community and industry initiatives as niche innovations within a sustainability transitions framework. These concepts are further discussed in the final section of this report where we will set out our research plan to evaluate initiatives.

2.1 Circular economy strategies

Frameworks for circular economy strategies often use the 'R' strategies, with variations in the number of 'R's identified. The circular economy strategies framework we adopt has been developed by Potting et al (2017) and refined by Kirchherr et al (2017), and contains the following Rs: Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle and Recover (see Figure 1). Focusing on circular economy strategies differs from other circular economy descriptions where the focus is on resource efficiency and material flows through the value chain, for example with design, production and remanufacturing, distribution, consumption use, and repair, collection, and recycling. The following framework is useful as it helps to prioritise circular economy strategies, where the strategies at the top are most circular and those at the bottom are more linear. We use this framework to classify the strategies used in plastics-related initiatives.

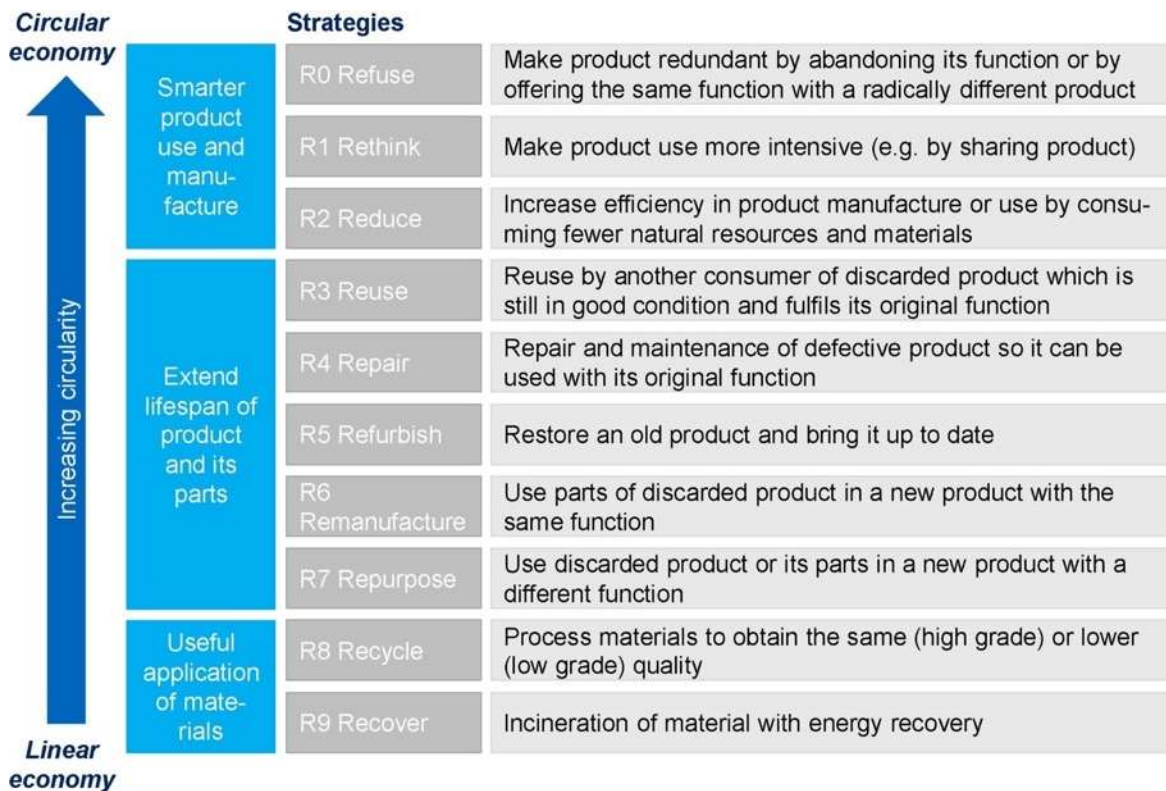


Figure 1 Circular economy strategies framework (after Potting *et al.*, 2017; Kirchherr *et al.*, 2017)

2.2 Community and industry initiatives as niche innovations

The concept of sustainability transformations is increasingly being used in the policy arena, as well as in academia, to explain the radical changes required in human societies to reach the objective of a sustainable future (Blythe *et al.*, 2018). Implementing incremental changes will most likely maintain human societies on an unsustainable pathway; as such, the concept of transformation has been developed to describe the more radical changes that are needed. Scoones *et al.* (2020) identify three complementary approaches to transformation: i) structural, ii) systemic, and iii) enabling approaches. *Structural* approaches refer to deep societal movements (e.g. de-growth, race, class or gender rights) leading to structural changes in society; while *systemic* approaches look at how modifications made in specific parts of a system can lead to system change. Finally, *enabling* approaches take a local perspective and focus on how individuals and communities can be empowered to take actions at the local scale, which may lead, as their number increases over time, to system change. The community, industry and public initiatives we are examining in this paper can be considered local scale ‘enabling’ approaches or ‘niches’ of innovation.

The concept of ‘niches’ is widely used in sustainability transformations theory, and refers to small-scale innovations that are radically different to the status quo and consequently encounter resistance entering the mainstream (Geels, 2004; Berkhout, Angel and Wieczorek, 2009). This is due to entrenched processes that are social, institutional, cognitive, economic, and technological in nature. These are referred to as ‘socio-technical regimes’, and consist of combinations of artefacts, institutions and agents that perpetuate particular practices (Seyfang and Smith, 2007). Niches are initially constrained by the dominant socio-technical regimes, as well as the physical, political and economic environment (Berkhout, Angel and Wieczorek, 2009). However, changes

can occur when established regimes are transformed due to the contextual environment or due to pressure from niche innovations (Markard, Raven and Truffer, 2012).

While the literature has often examined niches as part of the market economy, Seyfang and Smith (2007) highlighted the potential for community-based innovations and grassroots initiatives to form innovative niches. This framing considers the potential of grassroots innovations to scale and catalyse transformation in policy and market systems (Seyfang and Haxeltine, 2012). Given this framing, this research focuses on initiatives that are community-based, grassroots, market or industry-based and others that are implemented at the community level through public programs. These initiatives are niche innovations that set out to create change in the way that plastics are managed. We are examining these initiatives with a view to understanding their transformative potential, and the enabling factors needed to drive a circular economy. We revisit this theoretical framing when we develop our evaluation framework in the final section of this working paper.

3 Scope

This working paper aims to identify and review the range of plastics-related initiatives that have been led or implemented at the community scale, including community-led and publicly funded initiatives, as well as initiatives undertaken by the private sector (industry initiatives) in India. We will specifically focus on initiatives related to plastic packaging as it is one of the largest sectors with 43% of plastics manufactured in India used for packaging (TERI, 2018).

The scope of initiatives considered includes:

- Community or NGO-led initiatives funded by any stakeholder.
- Initiatives led by the industrial sector that are not profit related or do not change their business model. We specifically focus on the FMCG, e-business and hospitality sectors, which use high levels of packaging.
- Take-back partnerships (implementation of EPR).
- Industry-led corporate social responsibility (CSR) initiatives.
- Initiatives led by industry associations.
- Public programs implemented at the community level by Public Sector Undertakings (government owned corporations) and Urban Local Bodies (city level government).

This working paper does not consider:

- Industry-led initiatives that are essential to their business model – for example provision of a service instead of a product or sharing models -, as these examples will be addressed in a separate paper focused on business models.
- Top-down, government-led policies and programs and policy evaluation – as these will be separately addressed in a paper focused on policy.

We have identified initiatives through reports and websites on the internet, and through searches of academic databases.














Figure 2 Scope of the initiatives considered

4 Summary of findings: Industry, public and community initiatives

4.1 Overview of community-led, industry-led and publicly funded initiatives

The review of initiatives conducted by community organisations found that most focus on the end of life, and particularly recycling and recovery. This is similar to initiatives led by industry or through the public sector, with most focusing on recycling and recovery, however there were some industry and public sector led initiatives that focused on reducing waste as well. Across all three stakeholder groups, most focus is given to the end of life for plastics and particularly on recycling and recovery. This is illustrated in Table 1, where there is an icon for each initiative we identified with regard to community, industry and public programs and the circular economy strategy that they employ. We found very few examples of initiatives that target the use phase or the middle of the life cycle, such as reuse, repair, refurbishing and remanufacturing. There is just one example of reuse amongst the community-led initiatives. There were few initiatives targeting refuse and repurposing strategies, with community-led initiatives being the only examples.

Table 1 Summary of types of plastics initiatives identified with respect to the proponent and the circular economy strategy employed

	COMMUNITY-LED	INDUSTRY-LED	PUBLIC SECTOR-LED
Refuse			
Rethink			
Reduce			
Reuse			
Repair			
Refurbish			
Remanufacture			
Repurpose			
Recycle			 
Recover			

4.1.1 Community-led initiatives

This section identifies and characterises the initiatives led by community groups for plastic waste management. The community-led initiatives have been found to focus mostly on the end of life, particularly recycling, recovering and repurposing of collected plastics, along with awareness generation for inculcating the values of 'refusing' or avoiding plastics. A range of different types of organisations are involved in the initiatives including non-governmental organisations (NGOs), religious groups, community-based groups, and research groups. Most initiatives are undertaken as partnerships or collaborations including collaborations with waste pickers, government agencies, social entrepreneurs, municipalities, educational institutions and NGOs. In several initiatives students and women are active participants in waste management activities.

The types of community-led initiatives being implemented for plastic waste management and the circular economy include:

- Awareness raising and education campaigns for consumers, such as those run by the Arannya Environment Research Organisation in Goa and by iamgurgaon in Haryana, which encourage key stakeholders, notably small operators, shopkeepers and consumers, to refuse the consumption of single-use plastics and to use eco-friendly reusable alternatives instead.
- Awareness raising and education campaigns for stakeholders at the end of the plastic supply chain, such as initiatives to train waste pickers to improve waste segregation capacity for recycling or energy recovery (i.e. Alag Karo – Waste segregation initiative by Saahas and Plastic free railway station initiative by Chintan).
- Promotion of plastic collection and recycling. For example, the Plastic Free Mulund initiative in Mumbai, which collects plastic waste from 90 residential societies on a regular basis, or the Kollam fisher community in Kerala, which has been recovering plastic from water bodies and recycling it into plastic granules (Cockburn, 2019).
- Incentivising recycling by enabling an exchange of recyclable plastic waste, either for food (Plastic free Siliguri initiative organised by the Goethals Memorial School Alumni and Nishkam Khalsa Sewa) or in lieu of school fees (Plastic waste for quality education initiative from the Akshar Foundation, Assam).
- Facilitating reuse: the Cloth bags instead of plastics initiative led by the Asoka Trust of Research in Ecology and Environment in Kerala, where women from the fishing community make cloth bags as an alternative to plastics bags.
- Repurposing of plastic waste to sustainable products, such as plastic baskets or eco-bricks filled with plastic or mud and used for construction of benches or buildings (i.e. initiatives led by ISKON in Kolkata; Autopin community in Haryana and Samarpan Foundation in New Delhi).
- Facilitating energy recovery. For example, the Nirbhaya Group in Mumbai has worked towards recovering single-use plastic waste and converting it to refuse-derived fuel.

Appendix Table A.1 provides detailed examples of the wide-ranging initiatives conducted by community organisations in India and categorises them according to circular economy strategies.

4.1.2 Industry-led initiatives

Circular economy initiatives led by industry tend to be driven by corporate social responsibility (CSR) requirements and extended producer responsibility (EPR) legislation (Hickle, 2017), as well as single-use plastic bans, notably partial bans on plastic carry bags at religious/historical places frequented by tourists in seven states¹ (Karelia, 2019) and the complete ban of single-use plastics in two states². Industry-led initiatives have been categorised in terms of circular economy strategies, service type, type of partnership and collaborations and are mentioned in detail in Appendix Table A.2.

The types of initiatives led by major industries in India have focused on either the beginning or the end of the product life cycle. In actions upstream, FMCG companies and e-businesses have initiated minimisation of virgin plastic material use as a refuse strategy or have stepped towards eco-designing their products to reduce plastic consumption in their packaging. For example, by substituting virgin plastics with recycled materials for product packaging (Flipkart; ITC Ltd), providing options for no packaging (Amazon), and setting targets for increasing recycled content of packaging (PepsiCo). In the hospitality sector, most star-rated and boutique hotels are taking steps to phase out the use of single-use plastics in their properties (Thomas, 2019). For example, the Taj Group and the Mahindra Group have eliminated single use plastics in their hotels. The initiatives undertaken by mid-sized hotels are not very well documented. Other initiatives have focused on consumer awareness and education regarding source segregation, using alternatives to single-use plastic products, and the importance of recycling practices (Hindustan Unilever).

The downstream actions focus on material recovery by take-back systems and the development of recycling and waste to energy facilities. Major corporations have done this by incentivising the collection of waste for waste pickers (ITC Ltd), collecting waste (PepsiCo), using plastic in roads (Reliance Industries Limited), and recycling plastics or developing waste to energy facilities (Dabur, Nestlé, Amazon, Hindustan Unilever). Companies have collaborated with Producer Responsibility Organisations (PRO) and the informal sector including waste pickers and waste collectors that are incentivised to collect all kinds of plastic waste, notably those that are not usually collected, such as multi-layer plastics. The post-consumer plastic waste collected is segregated, and either recycled into products or sent to energy recovery facilities or cement plants to be used in construction. Along with the take-back schemes, industries are also undertaking awareness raising activities targeting plastic waste management such as on-ground events (PepsiCo in Uttar Pradesh), awareness and training workshops for the informal sector (Dabur, ITC Ltd, Hindustan Unilever in states like Mumbai, Uttarakhand, Punjab, etc.), and with the public more broadly.

A very small amount of corporate funds are directed towards systemic education and awareness initiatives directed at children and youth in schools or universities. These initiatives have been implemented in partnership with multiple stakeholders including local civil society organisations, NGOs, and educational institutions, and are of varied scale – from a city or neighbourhood to a whole city or even multiple states. One example of such an initiative, is the ‘Plastic Safari’ curriculum followed by the ‘Waste no more’ digital curriculum by Hindustan Unilever, which aims

¹ Arunachal Pradesh, Andhra Pradesh, Gujarat, Kerala, Mizoram, Odisha and West Bengal

² Himachal Pradesh and Sikkim

to inform school children and residents of housing societies in two districts of Mumbai about waste segregation and disposal.

Appendix Table A.2 provides detailed examples of the wide-ranging initiatives conducted by several Industries in India in partnership with communities, resident welfare committees, schools, waste collectors etc., and categorises them according to circular economy strategies.

4.2 Industry association initiatives

There are three major associations at the country level where plastic manufacturing industries are represented. These include: (i) Confederation of Indian Industry (CII); (ii) Federation of India Chambers of Commerce and Industry (FICCI); and (iii) All India Plastics Manufacturers Association (AIPMA). All of these are membership-based organisations with large memberships and extensive geographic reach. CII³ and FICCI have members/units that manufacture plastics and use plastic indirectly in their product-making (such as food processing, packaging, automobiles, electronics, etc.). FICCI's membership spans the private and public corporate sectors as well as multi-national companies. FICCI is structured around regional chambers of commerce and industry across states⁴. Those regional chambers of commercial and industry reach out to more than 250,000 companies (FICCI, 2021). Members of AIPMA⁵ include plastic processors, plastic raw material, additives and chemical manufacturers, plastic machinery and equipment manufacturers, moulds and dyes manufacturers, plastic distributors, importers, exporters, traders and others (AIPMA, 2021). Each of the three industry associations are involved with providing information to their members regarding circular economy and sustainability.

Most initiatives conducted by industry associations relate to policy advocacy, supporting scientific studies, capacity building and awareness raising in the plastics industry. As such, they do not directly implement circular economy strategies, such as reduce, reuse, recycle; however, they facilitate information sharing and collaboration. Appendix Table A.3 provides detailed examples of several initiatives conducted by Industry Associations in India.

These industry associations have the potential to play a role by:

- providing a platform for industry and research collaboration for reducing plastic waste and making an impact;
- influencing policy, educating consumers, regulators, and leaders;
- facilitating the implementation of the circular economy in the plastic sector; and
- financing start-ups in waste management.

However, certain gaps remain, notably the poor representation of smaller players, who dominate the plastic product manufacturing sector. Even so, these associations have potential to provide access to resources for smaller players through their regional offices.

³ CII has 9325 members as of 2019, representing 36 states and eight countries (CII, 2021a).

⁴ FICCI has representatives from 18 states and nine international regions.

⁵ AIPMA has 2500 direct and 22,000 indirect members through 130 affiliate associations

Initiatives by Public Sector Undertakings and Urban Local Bodies

A Public Sector Undertaking (PSU) in India is a business or a company owned by the government. These companies are wholly or partly owned by the central government (Government of India) or one of the many state governments or both. As at March 2019, there were 348 PSUs in India (PSU, 2021). Three examples of PSUs were selected to understand their initiatives towards reduction of plastic waste: (i) Airports Authority of India (AAI); (ii) Indian Railway Catering and Tourism Corporation (IRCTC); and (iii) India Tourism Development Corporation (ITDC). These were selected due to the significant infrastructure they operate and their potential for impact. AAI operates 137 airports across India. The Indian Railways is a governmental entity under the Ministry of Railways that operates India's national railway system. ITDC owns 17 hotels across India.

In addition to PSUs, Urban Local Bodies (ULBs) also implement initiatives for improving the circularity of plastic. Under the National Swachh Bharat Abhiyaan program, ULBs have flexibility in designing local initiatives in order to fulfil their mandate, notably the Smart City Mission which is meant to enable local development and improve quality of life. The Smart City mission, within a municipality, has a distinct governance framework within its jurisdiction and also proportionately larger funds and flexibility to design and implement innovative initiatives.

Most initiatives implemented by PSUs and ULBs aim to facilitate collection and recycling of plastic waste, for example by crushing bottles and recycling them (AAI and Indian Railways), or incentivising collection by exchanging plastic waste for a cup of tea (Prayagraj Nagar Nigam), free meals to waste pickers (Ambikapur), or for grocery items (Corporation of the City of Panjim/Panaji). There are also initiatives to reduce plastics with bans on SUPs (AAI and ITDC) and replacements for plastic cups (Indian Railways).

Appendix Table A.4 provides detailed examples of the wide-ranging initiatives conducted by PSUs and ULBs in partnership with waste pickers, suppliers, local informal sectors, and recyclers in India and categorises them according to circular economy strategies.

4.3 International initiatives implemented in India

Several internationally funded initiatives are currently underway in India to address plastic litter and waste management. A number of these are oriented towards improving solid waste management systems, including SWITCH-Asia Protoprint, the Alliance to End Plastic Waste and the Plastic Waste Management Programme, while SWITCH-Asia Promise focuses on preventing marine litter.

Initiatives implemented by international organisations in India

SWITCH Asia grants programme

This programme is funded by European Union and implemented by various organisations such as United Nations Environment Programme (UNEP), German Corporation for International Cooperation GmbH (GIZ), adelphi, The Energy and Resources Institute (TERI), The Institute for Global Environmental Strategies (IGES), The Maldives National University, National Cleaner Production Centre, Sri Lanka, Parley, and STENUM Asia. *Project PROTOPRINT*, based in Pune, in the state of Maharashtra, aims to improve the livelihoods of informal waste pickers, notably by facilitating the implementation of self-managed waste-processing units. Waste-pickers are members of those units, which use low-cost technologies to convert plastic waste into plastic flakes. The flakes are then sold to end users at a price which ensures that waste-pickers receive a fair-wage (Social seva initiatives, 2021). *Project PROMISE* aims to prevent marine litter in the Lakshadweep, a part of the Indian ocean situated between India, Sri Lanka and the Maldives, by helping micro, small and medium enterprises (MSMEs) to minimise waste generation (European Union (EU), 2021).

Alliance to end plastic waste (AEPW)

Singapore-based AEPW is funding projects with an aim to end plastic waste. *Project Aviral – Reducing Plastic Waste in the Ganga* is a pilot project implemented in Haridwar and Rishikesh (Uttarakhand), in partnership with GIZ (Alliance to end plastic waste, 2021a). The aim of this project is to reduce the amount of waste entering the Ganga river, by adopting a multi-pronged approach focusing on enhancing municipal capacities with regard to plastic waste management, designing and implementing new infrastructures, supporting local enterprises and start-ups involved in waste management and running educational programs targeted at the local population and visitors (GIZ, 2020). The second objective of the project is to identify best practices that can be replicated in cities across India. *Project Zero Plastic Waste Cities* aims to facilitate plastic recycling in two cities: Puducherry on the Southeast coast of India and Tan An on the Mekong Delta of Vietnam, by empowering the informal market, improving collection and sorting activities, implementing waste pre-processing systems that are adapted to the existing municipal waste management system and implementing ‘social business-based recycling solutions’ for segregated waste streams (Yunus Environment, 2020; Alliance to end plastic waste, 2021b). The *Project UN-Habitat Waste Wise Cities (WWC) Tool* aims to bridge the gap in data on plastic waste by mapping waste flows, determining potential plastic leakage points in waste management systems, and identifying pathways to improve plastic waste collection, recycling and recovery in six cities in Eastern Africa and Southern India, including Thiruvananthapuram in Kerala and Mangalore in Karnataka (Alliance to end plastic waste, 2020).

Plastic waste management program

United Nations Development Programme (UNDP) India, partners with Hindustan Coca-Cola Beverages Private Limited (HCCBPL), Hindustan Unilever Limited (HUL), HDFC Bank and Coca-Cola India Foundation (CCIF) to reduce the impact of plastic waste on the natural environment, by integrating plastic waste management into the formal economy and improving the socio-economic conditions of waste pickers, developing waste infrastructures

(i.e. Material Recovery Facilities) and integrating them into governance framework structures (UNDP, 2021).

The GEF small grants programme

With support from the Global Environment Facility's (GEF) Small Grants Programme implemented by the UNDP, the NGO Sarthak Samudayik Vikas Avan Jan Kalyan Sanstha has been working in Bhopal and Indore (Madhya Pradesh) to streamline plastic waste collection, use waste for road construction and generate income for waste pickers – mainly women - (The GEF Small Grants Programme, 2021).

5 Review of international initiatives in the Indo-Pacific region

In this section, we review industry and community initiatives undertaken in Indonesia and Australia that may contribute to enabling a circular economy for plastics. The aim of looking at initiatives beyond India is to identify whether innovative initiatives exist in the region that could be replicated in the Indian context.

Indonesia is facing a substantial plastic waste problem. In 2010, it was the 11th biggest generator of plastics waste in the world – 5.05 million tonnes -, with 81% of its plastic waste being mismanaged (Jambeck *et al.*, 2015). This has multiple consequences on the people and the environment (National Plastic Action Partnership, 2020). Marine plastic pollution affects marine ecosystems, which in turn affects communities that depend on marine ecosystems for their livelihood. Plastic pollution, particularly on beaches may also affect the tourism industry. Plastic waste may also be responsible for clogging drainage systems, which may worsen flooding in large cities. Many initiatives have been undertaken in Indonesia involving industry, the not-for-profit sector and local communities.



Like Indonesia and India, Australia has a long coastline in the region. Out of the 3.5 million tonnes of plastic consumed each year in Australia, 130,000 tonnes end up entering the marine environment (WWF and Boston Consulting Group, 2020). Single-use plastic (which is often packaging) is particularly problematic, as only 18% is recycled, while 71% goes to landfill and 11%, that is 110,000 tonnes, ends up in the environment every year, with a large proportion entering the ocean (WWF and Boston Consulting Group, 2020). Australia, like other countries in the region, has also recently experienced major disruptions to plastics export markets due to changing regulations, price fluctuations and the coronavirus pandemic (Retamal *et al.*, 2021). This has led to the introduction of new policy frameworks and initiatives from governments, industry and the community. Australia is also a project partner in the circular plastics roadmap initiative.

5.1 Community initiatives in the Indo-Pacific region

There are innovative community initiatives being implemented in Indonesia to rethink plastic use, collect plastic waste, and recycle, with the 'plastic bag diet movement' and waste banks, which provide incentives for waste collection. Many initiatives are oriented towards recycling, with several focusing on rethinking plastic and substituting it with alternatives. Similar to the Indian initiatives, these community-led approaches focus on the beginning of the life cycle through reducing the use of single-use plastics, or the end of the life cycle by facilitating collection and recycling. The highly successful waste banks initiative appears to be a relevant scheme with potential for implementation in India. In addition to the waste banks initiatives, a couple of other initiatives are worth noting, like Planet Ark Australia who is working towards providing best practice information on recycling to businesses (Business recycling) and the community (National recycling week) and also developing a Circular Economy Hub to share knowledge and information on Circular economy are also very relevant in Indian context.

Appendix Table A.5 provides detailed examples of the wide-ranging initiatives undertaken by the several organisations including CSOs, government and communities in the Indo-Pacific region and categorises them according to circular economy strategies.

5.2 Industry initiatives in the Indo-Pacific region

Some multi-national consumer goods companies are implementing plastics and circular economy related initiatives in several countries. Unilever aims to position itself as a leader in the circular economy by making a commitment to have 100% of their plastic packaging reusable, recyclable or compostable by 2025 (Unilever, 2019c). Danone-Aqua has set out to address the issue of marine plastic pollution by committing to remove more plastics from the environment than the plastics it uses, and by reaching 50% of recycled plastics in its bottles by 2025 (Danone, 2018).

A packaging recovery association in Indonesia brings together stakeholders from the packaging industry, manufacturing and retailers (Aqil, 2020), such as: Coca-Cola Indonesia, Danone-Aqua, PT Indofood Sukses Makmur, PT Nestlé Indonesia, Tetra Pak Indonesia and Unilever Indonesia. The association is called PRAISE, which stands for 'Packaging and Recycling Association for Indonesia's Sustainable Environment'. PRAISE's aims are threefold: i) increase the awareness and sense of responsibility of all stakeholders with regard to waste management, ii) use research, education and collaboration to build the capacity of stakeholders in the packaging waste management

industry, and iii) encourage government, the private sector and civil society to reduce the environmental impact of packaging waste.

The industry initiatives in the region largely focused on rethinking and redesigning packaging and supporting collection and recycling initiatives. These initiatives have also included some awareness raising programs. Industry initiatives in Australia are particularly focused on redesigning packaging for simpler sorting and recycling. This is like the Indian industry initiatives in that both focus on the beginning and end of the life cycle, and on making incremental changes to support current practices.

Appendix Table A.6 provides detailed examples of the wide-ranging initiatives undertaken by the Industry initiatives in the Indo- Pacific region and categorises them according to circular economy strategies.

6 Conclusions and knowledge gaps

In reviewing the broad range of plastics and circular economy related initiatives being undertaken in India, we established some common themes. Across all initiatives, the greatest focus is on facilitating collection and recycling, and there are few examples of initiatives employing reuse and repurposing strategies. In general, initiatives tend to focus on the beginning or end of the plastic life cycle. Approaches to recycling often involve incentivising waste collection, employment generation for waste pickers and awareness and capacity building amongst stakeholders. With regard to the initiatives undertaken by each stakeholder group, we found the following characteristics:

Community-led initiatives in India are primarily focused on education and awareness raising and providing incentives for recycling.

These initiatives included awareness raising and education for consumers and shopkeepers with regard to SUP alternatives, as well as capacity building for waste processors and waste pickers with regard to segregation. Promoting and incentivising recycling were common initiatives, and there were also some examples of repurposing waste plastics for building materials, or using waste plastics for energy recovery. In most cases these initiatives are still at pilot scale, and limited to one geographical location only, with some exceptions such as the Alag Karo waste segregation initiative, which operates in multiple locations across India. Community-led programs have involved partnerships and collaborations with governmental agencies, academic institutions, municipalities and the informal sector for recycling.

Industry initiatives tend to be focused on changes to packaging to substitute plastic for another material or incentivising waste collection and undertaking recycling

Initiatives undertaken by corporations appear to be driven by government policy, particularly in relation to CSR and EPR requirements. CSR-supported interventions at the community level mainly address awareness, end of life collection and segregation and connections with recyclers. Among the most common initiatives, apart from recycling of plastic waste, are activities related to reducing the use of non-recyclables like SUPs and increasing recyclable content in packaging material. This is extensively undertaken by e-businesses and FMCGs to meet their sustainable packaging targets. Even though the targets of most of these initiatives are measurable, the limited information shared makes it difficult to understand how efficiently they have met their goals.

Initiatives by Public Sector Undertakings (PSUs) primarily facilitate collection and recycling

While public sector undertakings (PSUs) that run Indian railways and airports have implemented some SUP reduction initiatives, including replacements for plastic cups, PSUs are primarily involved in facilitating collection for recycling through incentive schemes.

Indonesian examples of community initiatives may offer useful models for India

Indonesia's 'waste banks' program is a highly successful community-led initiative that has also scaled up. This may provide a useful model for scaling up incentive-based waste collection in India.

Industry-led initiatives in Indonesia and Australia have focused on recycling and recyclability. In Indonesia, this includes pilots to recycle small sachets, which is likely to be relevant to the Indian context.

Incentive schemes to facilitate plastic waste collection may have potential for further replication

Across the community and industry-led initiatives, incentive schemes to reward plastic waste collection appear to be widely used, which may indicate potential for replication and scaling up. Incentives are diverse, including exchanges of plastic waste for a cup of tea, a meal, groceries, charging a phone, or school fees. At the Akshar School in Assam, school fees are collected in the form of plastic waste. This initiative has not been able to secure support from the government or private sector yet but has further potential for replication. These incentive schemes could draw on the example of the ‘waste bank’ initiative in Indonesia.

Not all community-based initiatives succeed

The Suchitwa sagaram – Sundara sagaram program undertaken by the Kollam Community (All India Fishing Boat Operators Association) aimed to employ fisherfolk to collect marine plastics for recycling. This type of initiative has the potential for direct impact on mitigating marine litter pollution and offers opportunities to create revenue through recycling. However, it ceased operation apparently due to a lack of external support. Several similar initiatives have been in place in Europe over the past decade (Kania and Kramer, 2011). For future planning, it will be helpful to understand the reasons that some initiatives fail.

Key knowledge gaps

From this review of initiatives that are community-led, industry-led, or publicly funded and implemented at the community level, there are a number of knowledge gaps which if addressed will be helpful in developing the roadmap to drive a circular economy for plastics in India. Key knowledge gaps include:

- For most initiatives, there is information available about targets and intentions, but less information available on actual outcomes in terms of improving plastic pollution and driving a circular economy.
- With regard to the impact, effectiveness and potential for these initiatives to scale up, there is little information available regarding the factors that would increase the chances of success and the barriers and enablers to scaling up.
- It is unclear what enables success for some initiatives and what leads to failure in others.
- If we reflect on our circular economy strategies framework, there were very few initiatives focused on extending product lifetimes, for example through reuse, repair, and repurposing. There were quite a few examples of reducing, but in general recycling was the most commonly used strategy. It would be helpful to identify why other circular strategies are not yet being pursued.
- Incentive-based programs for waste collection such as the ‘waste banks’ initiative in Indonesia and the Akshar School in Assam appear to have potential for replication and

scaling up – it will be useful to understand how incentive-based initiatives could be scaled up in India.

- From this review, it appears that the Government of India plays an important role in driving industry-led initiatives in India. This observation and the relative influence of government compared to other drivers such as their social licence to operate and pressure from NGOs will need to be confirmed through stakeholder consultation.
- The drivers of community initiatives are potentially more diverse than industry-led initiatives, and also require further investigation. Understanding what drives and sustains initiatives in India is an important focus for this research and will provide input into the development of a circular economy for plastics roadmap.



7 Next steps

Going forward, this research will address knowledge gaps identified in the previous section by examining selected case studies in more detail and engaging with key stakeholders. We intend to use a qualitative social research methodology, focusing on interviews and potentially small online focus groups or workshops, as deemed appropriate. In this section we explain our research questions, methodology, case study selection and analytical framework.

7.1 Research questions

Based on observations stemming from our initial evaluation of initiatives against the circular economy strategies framework, and our conceptualisation of community-led and industry-led initiatives as 'niche' innovations, we propose the following research questions:

1. What are the drivers (regulatory, policy-related, economic, social, technical etc.) for plastics-related initiatives in India?
2. What are the social, economic and environmental outcomes/impacts of existing initiatives?
3. What are the success factors that explain the longevity of an initiative (its ability to sustain itself) or on the contrary its failure to do so?
4. What are the factors that explain the ability of an initiative to replicate, scale up or influence shifts in industry business models or public policies and programs?
5. Why is there a lack of initiatives targeting lifetime extension, such as reuse, repair and repurposing of plastics products?

7.2 Proposed methodology

To address our research questions, we will begin by confirming our potential case studies and engaging with stakeholders directly involved with each case. This includes proponents, managers and secondary stakeholders, such as communities or recyclers/processors. Then we will snowball out to other broadly relevant stakeholders who have perspectives on different types of initiatives. We have shortlisted nine case studies to examine in more detail and, recognising that not all stakeholders will necessarily be responsive, we aim to examine at least five to six case studies in detail. Through snowballing and understanding the networks associated with the initiatives, we will interview important stakeholders which may involve industry associations, environmental NGOs, resident associations, and potentially government officials or policymakers. We will use a qualitative social research methodology, starting with interviews and potentially using focus groups or surveys where appropriate. We will aim to speak to two to four stakeholders per case study and another six or so higher-level stakeholders. This may lead to a total of 30 stakeholder participants in this research.

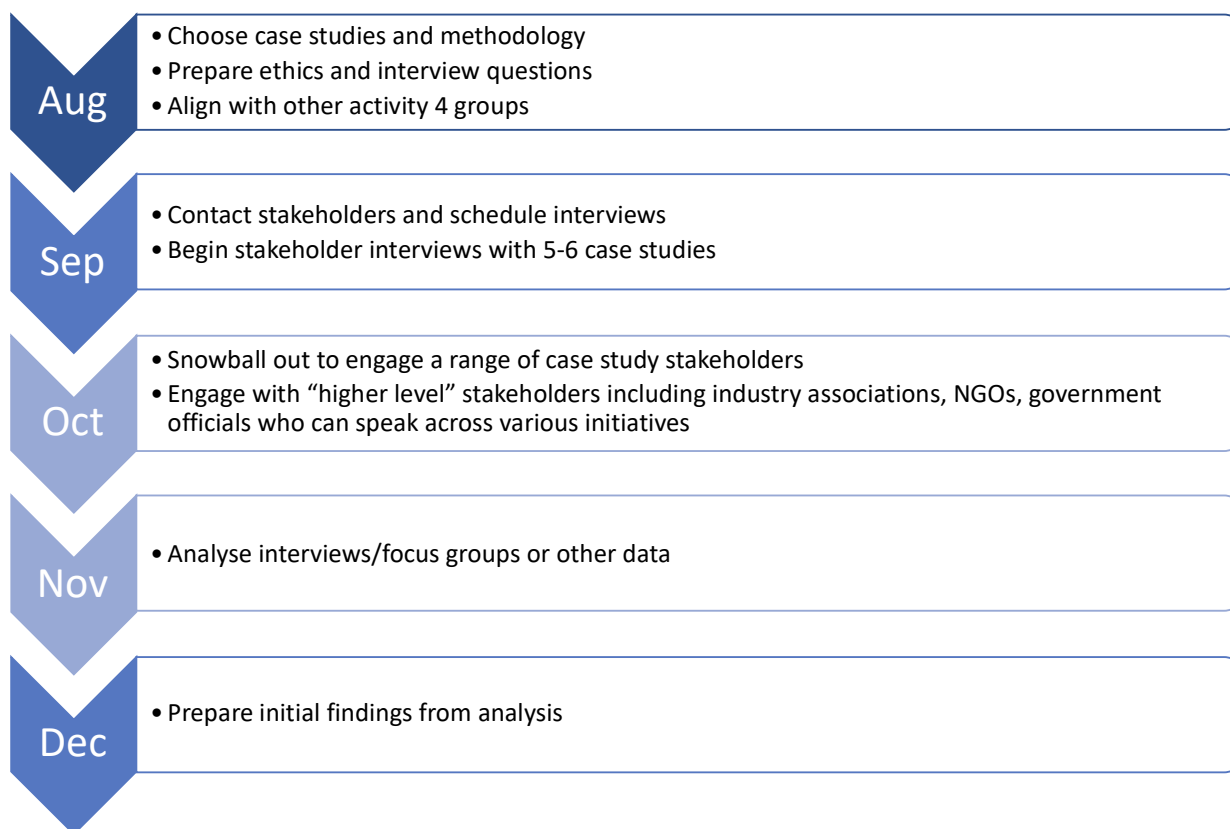


Figure 3 Tentative research process and plan until end 2021

7.3 Case study selection

In this section, a few case studies have been selected based on the following criteria and rationale. These case studies will be analysed further through stakeholder engagement. This activity will help in exploring the drivers and challenges faced by industry, community, and the public sector when implementing plastic management initiatives. The cases are selected from diverse geographies within India and each highlight a different circular economy strategy for waste management, as well as different stakeholders (e.g community, industry and ULBs).

The considerations for selection of the case studies are as follows:

1. Initiatives involving one main proponent, continuing for a longer period, scaled up and having firm impact on ground:
 - Initiatives like ‘Alag Karo’ fall under this criterion. It is a systematic waste segregation initiative in Gurgaon, now moved to second phase due to successful implementation of the pilot.
 - ‘Well-being out of waste program’ by ITC is another example of a small city waste management initiative that has scaled up to 22 cities of the country. These initiatives have high penetration potential in other geographies as well.
2. Initiatives involving multiple stakeholders, continuing for a longer period and having firm impact on ground: This is important for the sustainability of any initiative.

- ‘Clean stations, Green stations’, an initiative by the Indian railways in Delhi, has been running successfully since 2010. This initiative was jointly started by Indian Railways (PSU), Chintan (NGO) and industrial units.
 - Collection and safe disposal of waste by HUL is another initiative involving a diversity of stakeholder groups. It was rolled out in the city of Pune and is now functional in 100 towns of the country with successful participation from NGOs, local government, and industry associations.
3. Initiatives that have the potential to address a diverse range of problems or specific aspects of the plastic supply chain:
- Suchitwa sagaram – Sundara sagaram initiative, for collection of marine litter by fisherfolk, was highly successful initially but was phased out due to a lack of funding and other logistical support from the local government or private organisations. These types of innovative examples need to be studied further to understand barriers and enablers to sustain community-owned and community-led initiatives. This type of initiative, having direct impact on mitigating marine litter pollution, has immense potential to be replicated along the entire coastline of India.
 - Zero waste Mayapur – This initiative in a small village in Kolkata is a good example of community mobilisation for creating awareness and use of eco-friendly alternative material. This initiative will help in identifying driving factors towards using sustainable alternatives and studying the impact of incentive-based models for inculcating lifestyle changes within the community.
 - Shop with your waste is an initiative by Panjim Smart City which was launched six months ago and is a good example of partnership between local government, small businesses and recyclers. It facilitates segregation, collection, and recycling of plastic waste.
4. Initiatives at the community level in rural areas to incentivise collection and recycling as well as education and awareness:
- Initiatives like ‘Akshar School’ in Assam have a very innovative approach to generate awareness among the community and the children about plastic pollution and education. Most importantly, this initiative is based in a rural setting, from where maximum leakages happen through rivers and rivulets in the country. The plastic pollution in rural areas is increasing day by day and the management of plastic waste in rural areas needs innovative solutions to address the challenge. This initiative also resonates with the ‘waste bank’ initiative in Indonesia. With most industrial initiatives focused on urban geographies due to poor visibility in rural locations, such niche initiatives are important to study as they have potential replicability for scaling up incentive-based models in rural locations.
5. Initiatives to create markets for sustainable alternative material:
- The Taj Group of hotels has banned the use of single-use plastics in the form of cutlery and straws across all their properties in many tourist destinations in India. Plastic wrappers were replaced with oxo-biodegradable wrapping. Plastic cutlery was

replaced with corn starch or wooden items, and paper straws introduced, thereby creating a market for eco-friendly alternatives to plastics. The Taj group has four properties in Goa. A stakeholder consultation with the managerial staff at these hotels will be done to understand the scale, issues of supply chain and impact of these initiatives.

Industry associations also play a very important role in driving change amongst industry; this includes FICCI, CII and AIPMA. They have implemented a number of initiatives to educate industry and encourage circularity, as such they will be the next tier of stakeholders that we will engage with beyond the initial set of case studies. For example, the Un-Plastic Collective and Waste to Worth initiatives led by CII help industries to identify entry points/strategies in the plastic manufacturing system to encourage circularity. A stakeholder consultation with CII would assist in examining the impacts of such initiatives across India and allow the enablers and barriers to be understood in detail. Training workshops are being conducted by the All India Plastics Manufacturers Association (AIPMA) on circular economy and extended producer responsibility to create awareness amongst industry and the general public. An interaction with key members of AIPMA would help in understanding the industry perspective.

Table 2 Case studies selected for data collection phase

NO.	NAME OF INITIATIVE	TYPE	INITIATIVE	CE STRATEGY	GEOGRAPHY	CURRENT STATUS-SCALE	WILL HELP TO ANSWER RESEARCH Q #
1.	'Akshar School'	Community	Recycle of plastic collected	Recycle	Assam	Small scale- Pilot, Scaled up	1,2
2.	'Alag Karo'	Community	Source segregation and disposal	Recycle	Gurugram	Mature, scaled up	1,2,4
3.	'Suchitwa sagaram- Sundara sagaram'	Community	Recycling of marine litter	Recycle	Kerala	Small Scale- Pilot, Finished	1,2,3
4.	<i>Plastic free railway station</i>	Community	Collection and disposal of waste from PSU (Indian Railways)	Recover	New Delhi	Mature, Scaled up	1,2
5.	'Well-being out of waste'	Industry	Energy recovery from MLP	Recover	Multiple Geographies in India	Mature, Replicated	1,2
6.	Collection and disposal of packaging waste	Industry	Recycling and recovery of energy from waste plastic	Recover	Multiple Geographies in India	Mature, Replicated	1,2
7.	'Zero waste Mayapur'	Community	Repurpose of plastic waste for value creation, shift to biodegradable alternatives	Refuse, Repurpose	Kolkata	Small scale pilot	1,2,5
8.	<i>Eliminate SUP</i>	Industry	Replacing SUP with greener material	Reduce	Multiple Geographies in India	Mature	1,2
9.	'Shop with your waste'	ULB along with Community and recyclers	Promoting segregation, collection and recycling of plastic waste	Recycle	Panjim, Goa	Small Scale Pilot	1,2

7.4 Criteria for evaluating case study initiatives

We have reviewed extensive literature to establish an evaluation framework that will enable us to assess the effectiveness, sustainability and circularity of individual niche initiatives, along with their potential to contribute to regime shifts.

As our focus is on initiatives facilitating the emergence of a circular economy for plastics, we started by considering evaluation frameworks related to the Circular Economy (CE), as well as literature identifying success factors of CE initiatives. CE initiatives have been studied at various levels, such as policy, industry, sectoral, firm or corporate level, as well as local grassroots levels (Roos Lindgreen, Salomone and Reyes, 2020). However, these studies and assessments of CE initiatives have mainly focused on understanding the costs, benefits, trade-offs or value-add of initiatives from a product, resource, energy or economic perspective (Kyriakopoulos *et al.*, 2019), rather than on the effectiveness, sustainability and transformative potential of initiatives. A study by Aloini *et al.* (2020) goes in that direction, by identifying various factors of success of CE initiatives classified according to five categories: i) technological, ii) economic and financial, iii) institutional, iv) strategic, and v) external. This provides us with some criteria relevant to niche market innovations and our industry initiatives.

As our emphasis is on community-oriented initiatives, we also identified literature focusing on community-based social innovation (Castro-Arce and Vanclay, 2020), community-based initiatives related to waste management (Anschutz, 1996; Colon and Fawcett, 2006; Indrianti, 2016); and sustainable consumption (Grabs *et al.*, 2016). To enable transformative innovation that leads to more sustainable livelihoods and lifestyles and better socio-economic outcomes, Castro-Arce and Vanclay (2020) argue that community-based social innovations must have the ability to scale up and need linkages within a multi-level governance system. They can influence the regime and effectively diffuse through several avenues, including scaling up; replication and aggregation within the niche; or by translating niche ideas into the mainstream (Seyfang and Haxeltine, 2012). Castro-Arce and Vanclay (2020) also argue that ‘bottom-linked’ governance is critical for success, where bottom-up initiatives are linked with top-down governance through ‘bridging institutions’. Bridging institutions build connections between social groups, industry sectors and political arenas and can be channels for collaboration as well as mediators and promoters. These bridging institutions can link niches with higher-level policies, capabilities and infrastructures and can enable a middle ground to share decision-making (Castro-Arce and Vanclay, 2020). In addition to scaling up and connecting with bridging institutions, other key success factors for bottom-linked governance in community-based social innovations include flexibility to change over time, and sharing of power and decision-making (Castro-Arce and Vanclay, 2020). While these are important characteristics to facilitate transformative change, they are not explicitly developed to evaluate initiatives, so we have sought to combine these with existing evaluation frameworks.

In the recent literature (2018–2020), we identified five evaluation frameworks used for the evaluation of a diversity of types of initiatives related to development, sustainability and/or adaptation to climate change (White, Menon and Waddington, 2018; Celata and Sanna, 2019; Gharesifard, Wehn and van der Zaag, 2019; Dauenhauer *et al.*, 2020; McNamara *et al.*, 2020). Each framework offers four to five categories that can be used to assess the effectiveness and sustainability of a community-based initiative. The focus of the categories are as follows:

- Technical appropriateness and performance of an initiative
- Participation and social inclusion
- Governance and collaboration
- Economic sustainability and cost-effectiveness
- Institutional sustainability (ability to maintain human and business assets, and for the initiative to continue once the initial inputs have ceased)
- Innovativeness of the initiative, in the form of development of new products or services
- Degree to which an initiative has met its objective
- Environmental, social and economic outcomes and impacts of the initiative.

In addition, we also identified literature focusing on the success factors for community-based initiatives on waste management (Anschutz, 1996; Colon and Fawcett, 2006; Indrianti, 2016) and sustainable consumption (Grabs *et al.*, 2016); while they do not constitute evaluation frameworks per se, some of the success factors identified closely align with criteria identified in various evaluation frameworks for community-based initiatives (e.g. inclusion of women, ownership of the project by the community, etc.).

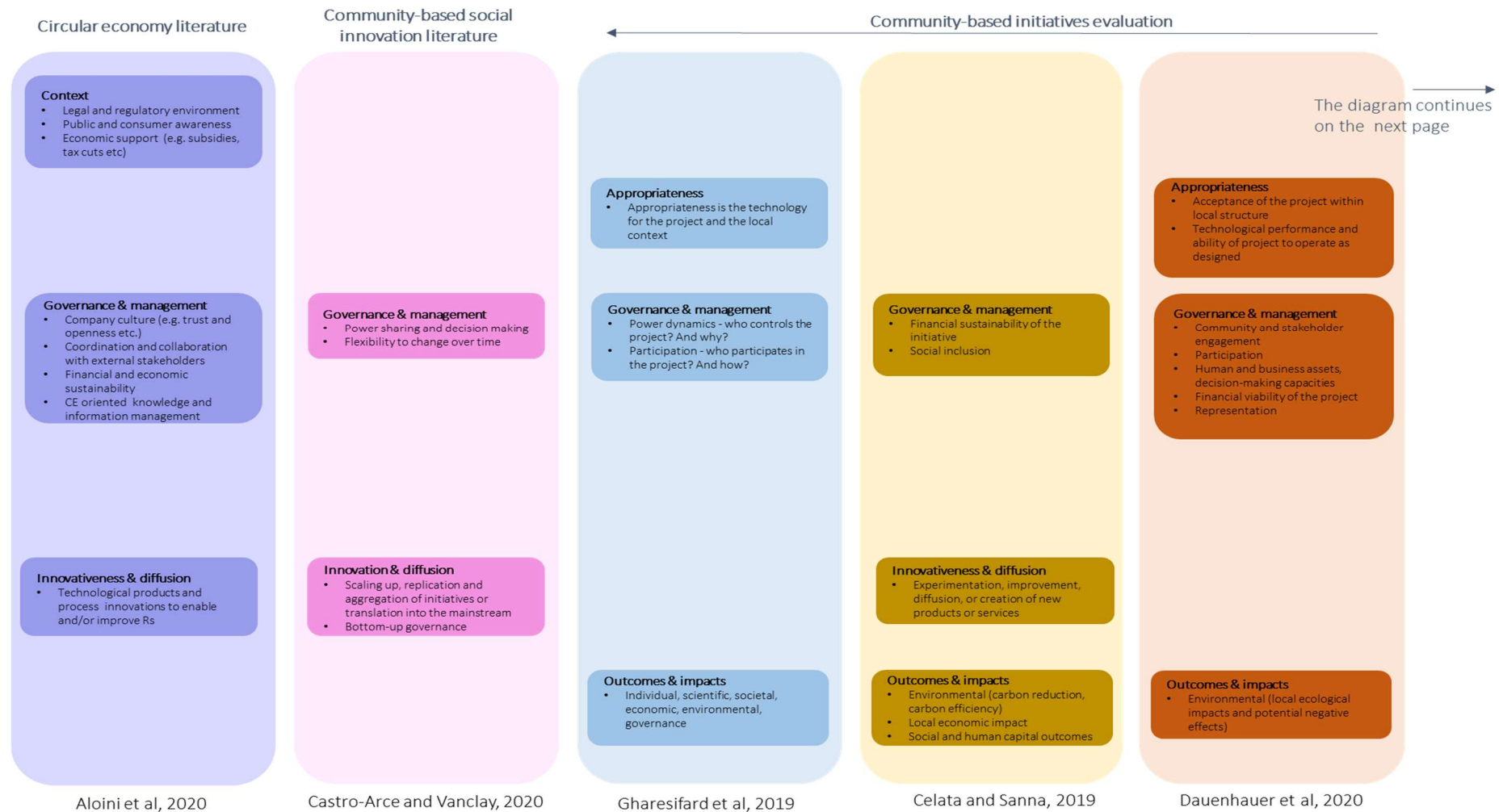
To develop the framework on which we will base our analysis, we identified the overlaps and complementarities between the factors of success and failure identified in the literature on circular economy (Aloini *et al.*, 2020), community-based social innovation (Castro-Arce and Vanclay, 2020), community-based initiatives related to waste management (Anschutz, 1996; Colon and Fawcett, 2006; Indrianti, 2016) and sustainable consumption (Grabs *et al.*, 2016), as well as the five frameworks identified in the recent literature on community-based initiatives (White, Menon and Waddington, 2018; Celata and Sanna, 2019; Gharesifard, Wehn and van der Zaag, 2019; Dauenhauer *et al.*, 2020; McNamara *et al.*, 2020) (see Apex Figure A.1 in Appendices). Based on this analysis, we developed a composite framework composed of five categories: i) Context, ii) Appropriateness, iii) Governance and management, iv) Innovation and diffusion, and v) Outcomes and impacts (see Table 2 below).

Table 3 Composite framework to evaluate initiatives led by industry, community or implemented at community scale

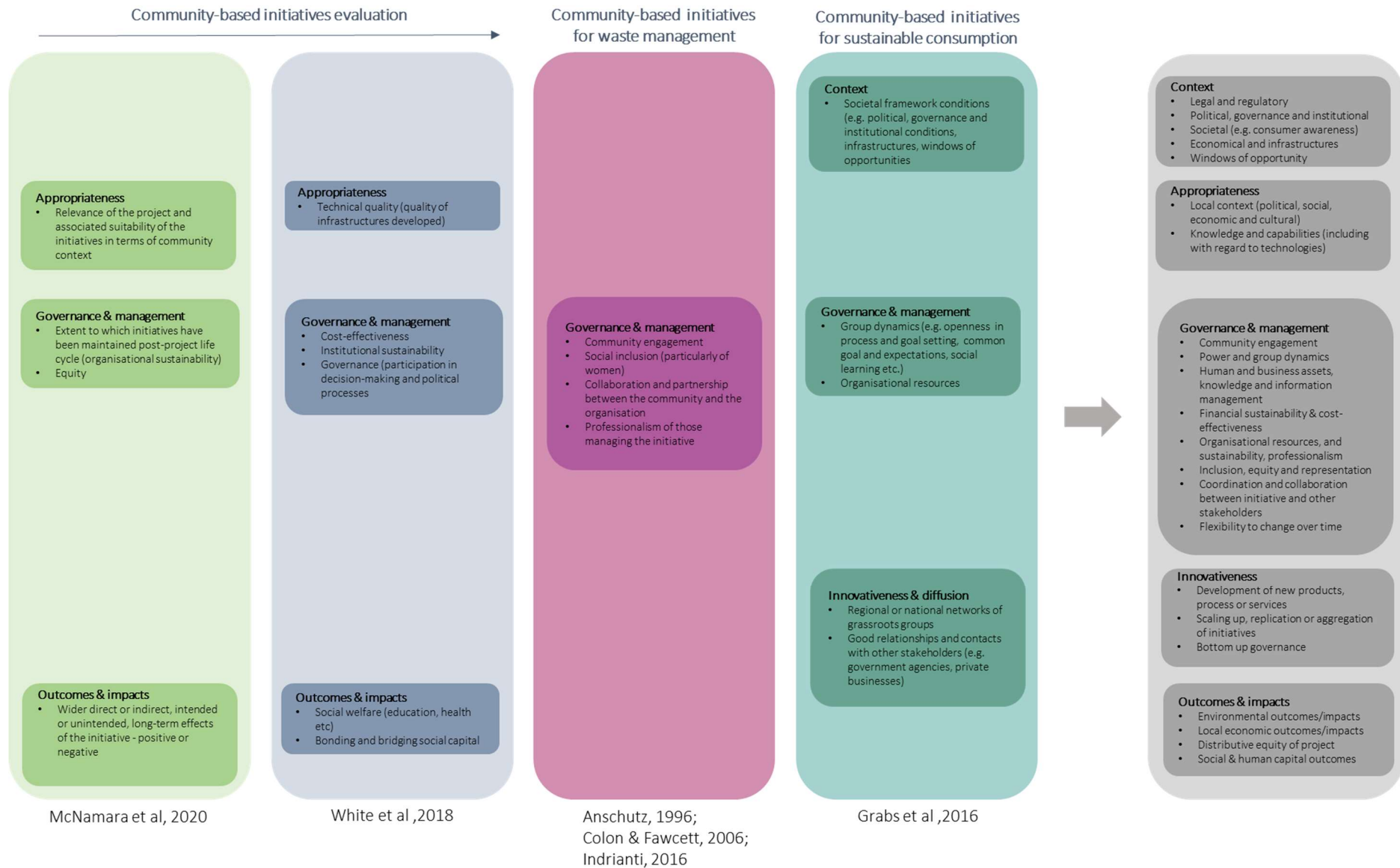
CATEGORIES	DESCRIPTION	TYPES OF QUESTIONS ANSWERED
Context	Elements of the context (social, political, economic etc) that enabled or hindered the emergence and development of an initiative.	<ul style="list-style-type: none"> • What are the elements of the social, political, environmental or economic context that facilitated the emergence and continuity of the initiative? or hindered the initiative? • What was the driving force initially and did it emerge from an individual or a group?
Appropriateness	(In)adequacy of the project with the local context.	<ul style="list-style-type: none"> • Is the initiative accepted/supported by the people it targets (consumers, community members etc)? • Does the initiative meet the needs of the people it targets? • Are the technologies/services/products proposed by the initiative in adequation with the local context? • Are they used by the people they target?
Governance & management	Governance and management structures that enabled or hindered participation, social inclusion, financial and organisational sustainability of the initiative.	<ul style="list-style-type: none"> • Has the initiative led to successful community engagement or collaborations with other stakeholders? • Is the initiative socially inclusive and equitable? • Is the initiative financially sustainable? • Is the initiative able to attract and retain human assets? • Is the initiative able to 'survive' once initial sources of funding have ceased? • Has the initiative facilitated bottom-linked governance? • Is the initiative flexible enough to change over time? • Is the decision-making power shared?
Innovativeness & diffusion	The degree to which the initiative develops innovative products and services, and its ability to diffuse them.	<ul style="list-style-type: none"> • Is the initiative developing a new product or service, or implementing a new technology? • Is the initiative well connected to a network of similar initiatives and/or to other relevant government or private stakeholders? • Has the initiative been able to scale up, replicate or translate? • Where is the initiative situated on the circular economy strategy framework?
Outcomes & impacts	The ability of the initiative to meet its objectives as well as the environmental, social and economic impacts of the initiative.	<ul style="list-style-type: none"> • Why has the initiative achieved/not achieved the objectives it set for itself? • How has the initiative positively/negatively impacted the environment? • How has the initiative positively/negatively impacted the local economy? • Did the initiative have a positive social impact, such as development of social and/or human capital, raising awareness, led to changes in practices etc.)?

We will use the evaluation framework developed in Table 2 to evaluate the case study initiatives and the questions will help inform our approach to stakeholder consultation. The five categories for evaluation are deliberately broad, as our analysis will encompass a wide range of initiatives. Our aim was therefore to develop a framework that would be comprehensive – to get a full understanding of the effectiveness of the initiative, its circularity and sustainability impacts as well as its ability to lead to regime shifts – but also flexible, to be able to provide a relevant frame of analysis for diverse initiatives.

Appendix A Figures



Apx Figure A.1 Success factors and evaluation criteria identified in relevant publications



Appendix B Tables

Apx Table B.1 Examples of plastics and circular economy related initiatives conducted by community organisations in India

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF ORGANISATION	TYPE OF ORGANISATION	DESCRIPTION	TYPE OF ACTION	PARTNERSHIP/ COLLABORATION
Refuse	'Bring your own bag' campaign	iamgurgaon	NGO in Gurugram, Haryana	The objective of this educational campaign is to raise the awareness of the residents of Gurgaon on the impacts of plastic waste on the environment. It also aims to encourage them to refuse single-use plastics, notably bags, bottles, and to use eco-friendly alternatives instead, such as cloth bags, glass bottle, etc (iamgurgaon, 2021).	i) Awareness raising	Residents, municipality, local NGOs, school students
Refuse	'#nosup' campaign	Arannya Environment Research Organisation	Community Group in Goa	The aim of this educational campaign was to raise the awareness of small business operators in the regions of Goa about the need to say 'no to single use plastics' including plastic straws (Arannya Environment Research Organisation, 2021a). The campaign was also conducted with school students (Arannya Environment Research Organisation, 2021b)	i) Awareness raising	Informal sector including vendors, shopkeepers, school students
Reuse	'Cloth bags instead of plastic' campaign	Asoka Trust of Research in Ecology and Environment (ATREE) Vembanad lake protection forums	Research organisation community group in Muhamma Island, Kerala	This initiative aims to encourage the (re)use of cloth bags, instead of plastics bags. Two stitching units were developed where women, mostly from the fishing community, make cloth bags from waste clothes, as an alternative to plastic bags. The cloth bags are sold under the name 'Muhamma cloth bags', which is now a brand in itself in Kerala and brings good business opportunities for sustainable tourism (Rajendran, 2017).	i) Using alternatives to plastic ii) Community awareness	panchayat members, and teachers, parents and students from a local high school
Refuse and Repurpose	'Zero Waste Mayapur'	ISKCON	Religious organisation in Kolkata, West Bengal	Unique community clean-up project with the main aim to inculcate the value of Zero waste within the community (Dasi, 2018). Ever since 2018, Plastic cutlery has been replaced by sustainable material like dry leaves or wood cutlery items that are further converted to bio compost after use. Plastic waste generated is converted to hard pressed bricks and baskets while incentivising widows, the handicapped and women.	i) Clean up project ii) Awareness raising ii) Social initiative	Community, pilgrims and visitors

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF ORGANISATION	TYPE OF ORGANISATION	DESCRIPTION	TYPE OF ACTION	PARTNERSHIP/ COLLABORATION
Repurpose	'Eco-bricks' project	Autopin community (Bal Panchayat)	Community group in Haryana	This children-led initiative is aimed at training children to collect plastic waste from their community to form eco bricks - a 500gm weighing PET bottle stuffed with plastic – which are used in the construction of structures like benches. The initiative involves 30 children aged 11 to 17 who collect plastic waste door-to-door, and make the eco-bricks(George, 2021).	i) Awareness raising ii) Developing low-cost building materials	Local community, NGO, municipal authorities
Repurpose	<i>PET bottles in construction</i>	Samarpan Foundation	NGO in New Delhi	In this initiative, PET bottles are collected, sorted according to size, filled with mud, and used as a substitute to conventional bricks in the construction of houses. The Samarpan foundation started with the construction of a school in Delhi, using 6,000 PET bottles (Muralidharan, 2016). The model was then replicated in other geographies like Chennai (Paitandy, 2016) and Nepal (Samarpan Foundation, 2021) for affordable construction.	i) Awareness raising ii) Developing sustainable building materials	Local community, school students, informal sector for collection of PET bottles
Recycle	'Suchitwa sagaram-Sundara sagaram'	Kollam community	Fishermen community in Kollam, Kerala	In 2017, the community reached out to the state fisheries minister to set up a way to recycle the plastic hauled in by the fishermen. With support from various government agencies, a recycling system was set up and was run by women., (Singh, 2018). However the project has phased out in 2020 due to lack of collection facilities, a dip in the quantity of plastic amidst lockdown, and lack of funds and support from the government (Sudhish, 2020).	i) Advocacy ii) Collaborating with government agencies	Harbour engineering department, marine product export development agency, NGO
Recycle	'Akshar school'	Akshar Foundation	Community group in Assam	Set up in 2016,the aim of the Akshar School is to provide quality education to students from low-income families, by collecting school fees in the form of plastic waste (Moses, 2020). The waste is segregated and recycled into eco-bricks used for construction (Lal, 2020). The school started with 20 students. There are now over one hundred students registered. The Akshar Foundation aims to open 100 similar schools in India (Moses, 2020).	i) Awareness raising ii) Incentivising collection and recycling	Local community

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF ORGANISATION	TYPE OF ORGANISATION	DESCRIPTION	TYPE OF ACTION	PARTNERSHIP/ COLLABORATION
Recycle	'Plastic free Siliguri'	Goethals Memorial School Alumni and Nishkam Khalsa Sewa	Local community group and NGO in Siliguri, West Bengal	This initiative, conducted by Goethals Memorial School Alumni and Nishkam Khalsa Sewa in West Bengal's Siliguri district, aims to incentivise the collection of plastic waste by providing a free meal to individuals who bring 500 grams of waste. The waste is then sent for recycling (ANI, 2019)	i) Exchange scheme ii) Working with informal sector and local community	Waste collectors, recycling facilities
Recycle	'Alag Karo' initiative	Saahas	NGO, in Gurugram, Haryana	Piloted in 2017, the objective of the initiative is to put in place and sustain three-way source segregation of waste – dry, wet and hazardous waste - and to build capacities of the waste collectors (The Economic Times, 2017). The program reached out to multi-stakeholders including households, commercial establishments, schools and waste pickers, in order to spread awareness on three-way source segregation. The first phase of the initiative has been successful and another phase has been rolled out in early 2021 (India CSR, 2020).	i) Partnership with recycling plants ii) Building capacity among stakeholders	Municipality (Municipal Corporation of Gurugram), formal and informal collectors, private sector and civil society members
Recover	'Plastic free Mulund' project	Nirbhaya Group	NGO, in Mulund Maharashtra	This initiative aims to facilitate the recycling and recovery of plastic waste, by collecting plastic waste from 90 residential societies daily. The team also gets help from educational institutions to collect waste. The plastic waste collected is then sent to an energy recovery plant (Shah, 2018).	i) Awareness raising ii) Working with informal sector iii) Collaborating with educational organisations	School students, energy recovery plants, local government (Brihanmumbai Municipal Corporation)
Recovery	<i>Plastic free railway station</i>	Chintan	NGO in New Delhi	This initiative aims to maintain the cleanliness of Delhi's railway stations (Chintan, 2015; Wangchuk, 2019). Between 2009 and 2015 700 waste pickers have been trained and incentivised to collect, and segregate waste (Chintan, 2015; Wangchuk, 2019). The segregated plastic waste is sent to a material recovery facility(Chintan, 2015; Wangchuk, 2019).	i) Working with informal sector ii) Collaborating with public sector enterprises iii) Collaborating with energy recovery centre	Informal sector, Indian railways, recycling units and waste to energy recovery plant

ApX Table B.2 Examples of plastics and circular economy related initiatives by industry in India

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF INDUSTRY	TYPE OF ORGANISATION /INDUSTRY SECTOR	DESCRIPTION	TYPE OF ACTION	PARTNERSHIP/ COLLABORATION
Reduce	<i>Eliminate SUP</i>	Taj Group of Hotels	Hospitality	Taj hotels eliminated single use plastic items across the 100 hotels owned by them and replaced them by items made or other materials. For example, plastic wrappers were replaced with oxo-biodegradable wrapping, plastic cutlery was replaced with cutlery made of corn starch or wood, and plastic straws were replaced with paper straws. Other plastic waste that is generated at the hotel premises is sent for recycling through authorised scrap traders (Mishra, 2018)	i) Awareness among the consumers ii) Using alternatives to plastic and biodegradables	Leveraging in-house capabilities and expertise, authorised recyclers
Reduce	'#CutTheCrap' campaign	Mahindra Group	Industry and Hospitality	This educational campaign aims to raise the awareness of the public about the negative effects of plastic on the environment and encourages them to change their behaviours and to participate in on the ground actions. In addition to this campaign, the Mahindra group works on reducing the use of plastic, notably for packaging, and to recycle the plastic that cannot be eliminated (The Mahindra Group, 2019)	i) Awareness raising ii) Using alternatives to plastic	Waste collectors, processors and plastic recycling agencies
Reduce	<i>Eliminate SUP and improve recycling</i>	ITC Ltd	Hospitality	ITC hotels mapped the plastic items used across its hotel chain (Ali, 2019). Some of the key items were water bottles (15 million a year), straws (800.000 a year) (ET Hospitality World, 2020). These plastic items were then substituted with material like glass, steel or wood. In addition, in 2019, 99.7% of waste collected was recycled, which amounts to 709,244 tonnes in the year 2019–20 (ITC Limited, 2020)	i) Awareness raising ii) Using alternatives to plastic	Leveraging in-house capabilities and expertise

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF INDUSTRY	TYPE OF ORGANISATION /INDUSTRY SECTOR	DESCRIPTION	TYPE OF ACTION	PARTNERSHIP/ COLLABORATION
Reduce	'2025 packaging sustainability agenda'	PepsiCo India	FMCG	<p>PepsiCo India has committed to reach the following outcomes by 2025 (Pepsico India, no date):</p> <ul style="list-style-type: none"> -100% of its packaging should be recyclable, compostable or biodegradable. - Packaging should be composed of 25% recycled content. - Reduce The use of virgin plastic across the beverage portfolio should be reduced by 35%. <p>At the global level, 87% of Pepsico packaging was recyclable, compostable or biodegradable in 2020. With regard to recycled content and virgin plastic used, Pepsico beverage operations worldwide used 5% of recycled content in 2020 and reduced the use of virgin plastics by 3% in 2020 compared to 2018 (Pepsico, 2021b, 2021a).</p>	i) Using alternatives to plastics	
Reduce	<i>Reducing the use of plastic in packaging</i>	Flipkart	E-business	In 2020, Flipkart piloted an initiative that aimed at reducing the use of plastic packaging by replacing it with paper-based packaging in its supply chain in Maharashtra (Joshi, 2020; Our bureau, 2020). This initiative has then been implemented in 70 facilities in India. The second objective is then to enable the local sellers who work with Flipkart – more than 200,000 - to use alternatives to plastic packaging (Our bureau, 2020; Nandi, 2021)	i) Using alternatives to plastic ii) Collaborating with local sellers	Local suppliers, vendors, Policy makers in Maharashtra
Reduce/ Recycle	Packaging waste collection	Amazon India	E-business	<p>Since 2019, Amazon India, with the support of collection agencies, has been collecting and recycling an amount of plastic waste, which is equivalent to the plastic waste generated by its fulfilment network at the national level (Amazon, 2020).</p> <p>In addition, Amazon India eliminated single-use plastics from its fulfilment network, by replacing plastic with other material, notably paper. The remaining plastic material generated by Amazon fulfilment network is recyclable (Amazon, 2020).</p>	i) Collaborating with waste management companies and recycling facilities ii) Using alternatives to plastic	Waste collectors, processors and plastic recycling agencies

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF INDUSTRY	TYPE OF ORGANISATION /INDUSTRY SECTOR	DESCRIPTION	TYPE OF ACTION	PARTNERSHIP/ COLLABORATION
Recycle/ Restore	'Clean Coasts Drive	PepsiCo India	FMCG	In 2019, PepsiCo organised, in partnership with the not-for-profit Project Mumbai, a beach clean drive in Mumbai for collecting trash on nine beaches and four riverbanks. This was the city's largest clean-up drive ever conducted. It saw the participation of 5000 citizens and the collection of 16,000 kg of trash from Mumbai's waterfronts, including plastic. The plastic waste collected was then segregated, cleaned and recycled into new products, including t-shirts, bins, traffic cones and chairs (Daily Hunt, 2019; Pepsico, 2019)	i) Awareness raising ii) Partnering with citizens iii) Collecting waste	Corporates, educational institutions, NGOs, citizen groups including World Wide Fund for Nature (WWF), River March, Beach Warriors, Mahim Beach Clean Up
Recycle	'360 model for the valorisation of multilayer plastic packaging waste'	ITC Ltd	FMCG, E-business, Hospitality	The program, launched in 2018, encourages waste segregation by providing waste pickers with a financial incentive to pick and sell multi-layer plastic (MLP) packaging waste from households. The MLP waste collected is then recycled and converted into granules for use in other products. The program helps incentivise 3,500 waste collectors covering 810,000 households across the city (Athavale, 2019).	i) Working with the informal sector and local recycling partner Shakti Plastics	SWaCH (a waste-picker cooperative) and Pune Municipal Corporation
Recycle	'Plastic Safari' and 'Waste no more'	Hindustan Unilever (HUL)	FMCG	HUL partnered with Xynteo to develop a behaviour change curriculum ('Plastic Safari'), which was followed by a digital curriculum ('Waste no more'). The aim of these curriculum is to educate school children and residents of housing societies in Dahisar and Kolhapur district of Mumbai about waste segregation and disposal. (HUL, 2020). During the academic year of 2019, more than 150 government school teachers contributed to the initiative as trainers, and 100,000 participated in the initiative (HUL, 2019a).	i) Education	Xynteo (private company), residents' welfare association, academic institutions and government bodies (Municipal Corporation of Greater Mumbai and Maharashtra Pollution Control Board and Kolhapur Zilla Parishad)
Recycle	Sustainable Packaging	Nestlé India	FMCG	The initiative started in 2019, aims to collect and reuse and recycle its entire packaging by 2025 (Arnab Dutta, 2020).	i) Collaborating with retailers/suppliers ii) Collaborating with industries to develop effective recycling processes	Industries, policy makers and urban local bodies

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF INDUSTRY	TYPE OF ORGANISATION /INDUSTRY SECTOR	DESCRIPTION	TYPE OF ACTION	PARTNERSHIP/ COLLABORATION
Recover	'Well-being Out of Waste' program	ITC Ltd	FMCG, Hospitality, E-business	<p>This program encourages waste segregation by raising awareness and encouraging waste segregation at the household level, training waste pickers and providing them with a financial incentive to sell low value plastics (LVP) and multi-layered laminates (MLL) waste at Dry Waste Collection Centre. The LVP/MLL waste collected is then sent to a cement kiln for energy recovery (CII-ITC Centre of Excellence for Sustainable Development, 2020).</p> <p>The program has been implemented in 786 wards in 10 cities, covering over 3.1 million households and educating 5.2 million school children along with 2,000 corporates (ITC Limited, 2020).</p>	<ul style="list-style-type: none"> i) Working with informal sector ii) Partnering with other industry sectors (cement companies) iii) Awareness raising 	Municipal corporations, local NGOs, waste aggregators, recyclers processors and schools.
Recover	<i>Collection and disposal of packaging waste</i>	Hindustan Unilever	FMCG	<p>HUL contributed to the collection of plastic packaging waste from 100 towns across India (Joe, 2021). The waste is then recycled or recovered, notably in cement kilns (CII-ITC Centre of Excellence for Sustainable Development, 2020). HUL has also partnered with PROs and NGOs for residential waste collection (Example: Collaboration with Development Alternatives in Haridwar)</p>	<ul style="list-style-type: none"> i) Partnering with other industry sectors (cement companies) ii) Partnering with NGOs and social entrepreneurs for waste collection 	NGOs (e.g. Saahas, Carpe, Recykal, Planet Savers) and social entrepreneurs municipal corporations, and other industry sectors
Recover	'Plastic waste management EPR'	Dabur	FMCG	<p>Dabur collects, processes and recycles post-consumer plastic waste – including multi-layer plastics. The initiative was implemented in 45 cities in six states – Delhi, Uttar Pradesh, Maharashtra, Tamil Nadu and Uttarakhand – in 2018-2019, and was expanded to include 25 states in 2019-2020. Energy recoverable waste and MLP is sent to be processed at cement kilns or waste-to-energy plants, while recyclable PET is recycled into new products</p> <p>In 2019- 2020, Dabur collected, processed and recycled over 12,110 million tonnes of post-consumer plastic waste (CII-ITC Centre of Excellence for Sustainable Development, 2020).</p>	<ul style="list-style-type: none"> i) Working with informal sector ii) Collecting waste 	PRO companies and NGOs, waste to energy plants and recyclers, other industry sectors (cement companies)

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF INDUSTRY	TYPE OF ORGANISATION /INDUSTRY SECTOR	DESCRIPTION	TYPE OF ACTION	PARTNERSHIP/ COLLABORATION
Recover	Plastic waste to road initiative	Reliance Industries Limited	Construction/ FMCG/ E-business	<p>Reliance Industries used post-consumer plastic, packaging used by e-businesses and other flexible plastics to resurface 40 kilometres of road in their Nagothane Manufacturing Division (Anand, 2020; Munjal, 2020).</p> <p>It was announced in 2020, that Relianced Industries Limited would commercialise this plastic waste mixture for road laying under the brand name 'ReRoute' (Anand, 2020; Munjal, 2020).</p>	i) Using plastic waste in road construction	PRO for waste collection

ApX Table B.3 Plastics and circular economy related initiatives led by industry associations in India

NAME OR TYPE OF INITIATIVE	INDUSTRY ASSOCIATION	INDUSTRY SECTORS	DESCRIPTION	TYPE OF ACTION	SUPPLY CHAIN
Information	CII*	Plastic Manufacturers	CII provides information on regulatory and policy issues related to plastics management such as advice related to EPR (CII, 2021a)	Advocacy, Collaboration with companies and authorities	Across the supply chain
Data collection	CII	Plastic Manufacturers	CII collects scientific data on various aspects of plastics in India, including a national list of six major polymer resins. This data is used for life cycle assessment of plastics and identification of entry points in the system to enable circularity	Scientific data collection	Across the supply chain
Un-Plastic Collective	CII	Plastic Manufacturers	Voluntary platform for many stakeholders integrating consulting, research and commercial aspects of plastics uses and waste management (CII, 2021c)	Capacity building	Waste management
India's Plastics Distribution Economic Strategy	CII	Plastic Manufacturers	CII has recommended four broad strategies to support circular economy for plastics (Kumar Nandini, 2020)	Policy advocacy Awareness Technological solutions	All aspects of the supply chain
Waste to Worth	CII	Plastic Manufacturers	A working group has been convened to promote waste management practices and participate in the private sector across the country (CII, 2021d)	Collaboration with community, authorities, researchers and academia	Waste management

NAME OR TYPE OF INITIATIVE	INDUSTRY ASSOCIATION	INDUSTRY SECTORS	DESCRIPTION	TYPE OF ACTION	SUPPLY CHAIN
Advice and advocacy	FICCI**	Plastic Manufacturers	Assisting members towards achieving sustainability. Some of the recent influential publications by FICCI are 'Strategies for Sustainable Plastic Packaging in India' and 'Making Plastics Circular: Moving from Insights to Action'	Policy advocacy Creation of knowledge products Organisation of capacity building workshops and other networking events	Across the supply chain
Annual Events	CII and FCCI	Plastic Manufacturers	Both CII and FICCI organise annual events related to circular economy. These events bring together industry members, experts, and government. These events provide a platform to address all the stakeholder concerns and encourage plastic circularity (CII, 2021b)	Advocacy Collaboration with companies and authorities	Across the supply chain
Introductory courses on Circular economy, EPR	AIPMA***	Plastic Manufacturers	AIPMA organises training and skill development programs that encourage sustainability and circularity in the plastic value chain	Education/ awareness	Across the supply chain

* Confederation of Indian Industry

** Federation of India Chambers of Commerce and Industry

*** All India Plastics Manufacturers Association

ApX Table B.4 Examples of initiatives related to plastics and the circular economy undertaken by PSUs and ULBs in India

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF ORGANISATION	DESCRIPTION	TYPE OF ACTION	PARTNERSHIP/COLLABORATION
Reduce	<i>Ban on single-use plastics</i>	Airport Authority of India (AAI)	85 out of 137 AAI airports are free of single-use plastic (Sequeira, 2020). They do so by banning the use of single use plastic items, such as straws, plastic cutleries and plates, and promoting the use of sustainable alternatives. The aim is to progressively implement the ban at all the airports (Sequeira, 2020).	i) Using alternatives to plastics	Partnership with suppliers of sustainable alternatives
Reduce	<i>Ban on plastic use</i>	India Tourism Development Corporation (ITDC)	ITDC banned the use of single-use plastics in its hotels (ITDC, 2021).		
Reduce	<i>Ban on plastic use</i>	Goa Tourism Development Corporation (GTDC)	The GTDC announced that it will stop using plastic bottles, cups and straws in its offices and hotels. Instead, water will be provided in metal or glass bottles, and paper or glass cups. In addition, water dispenses and filters will be installed in GTDC offices and hotels (Department of Tourism - Government of Goa, 2019).	i) Using alternatives to plastics	Partnership with suppliers of sustainable alternatives
Reduce	<i>'Kulhads' to replace plastic cups</i>	Indian Railways through IRCTC	In this initiative, tea is sold in environmentally friendly clay ' <i>kulhads</i> ' to replace plastic cups at 400 railway stations across India (PTI, 2020). In addition to reducing plastic use, it also provide employment to potters (Dhillon, 2020). The aim is for this initiative to be progressively rolled out in all train stations across the country (PTI, 2020)	i) Using alternatives to plastics ii) Social initiative	Partnership with local potters
Recycle	<i>'Bottles for Change' program</i>	Indian Railways through IRCTC	In this initiative, a cleanliness drive was carried out by the Western Railways at its stations where 109 tonnes of plastic waste was collected. Some of the collected plastic bottles were then recycled into three benches (40 to 50kg of soft plastic per bench) and installed at two platforms at the Churchgate station in Mumbai, India (Mint, 2019).	i) Collecting waste	

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF ORGANISATION	DESCRIPTION	TYPE OF ACTION	PARTNERSHIP/COLLABORATION
Recycle	Plastic bottle crushers at railway stations	Indian Railways through IRCTC	Indian Railways aims to encourage the recycling of plastic bottles, by installing plastic bottle crushing machines in stations. In exchange for using the crushing machines, passengers are able to recharge their mobile phones. Around 160 machines were installed at 128 railway stations. The bottles were then collected by railway staff and sent for recycling (PTI, 2019).	i) Collecting waste ii) Incentivising collection and recycling	Partnership with local waste collectors and recyclers
Recycle	<i>Plastic bottle crushers at the airport</i>	Airport Authority of India (AAI)	Plastic bottle crushers are installed in airports to minimise littering and divert plastic bottles from landfill (The Hitavada, 2019a). Those plastic bottle crushing machines are in place at Indore airport (Paranjpe, 2018) and Raipur airport (The Hitavada, 2019b) notably.	i) Collecting waste	
Recycle	The 'Garbage Café'	Ambikapur Municipal Corporation	The Ambikapur Municipal Corporation in Chhattisgarh opened the Garage Café, where free meals to rag pickers and others for bringing 500 g to 1 kg of plastic waste. The waste collected is then used in construction of roads (Dhillon, 2019; Kaur, 2019).	i) Collecting waste ii) Incentivising collection and recycling	Working with the informal sector Partnering with road construction companies
Recycle	<i>Plastic waste for tea</i>	Prayagraj Nagar Nigam	Kumbh Mela, one of the largest religious gatherings in the world, happens each 12 years. At the last Kumbh Mela in Prayagraj, the Prayagraj Nagar Nigam in association with a popular tea brand installed kiosks with sensors to receive plastic litter in exchange for a cup of tea (<i>Tagline: 'Kachra le ao, muft ki chai le jao'</i>). The plastic waste was then brought to the city dumping ground for recycling (Barkha, 2019; HUL, 2019b; Mathur, 2019).	i) Collecting waste ii) Incentivising collection and recycling	Tea company, municipal body
Recycle	'Shop with your waste' campaign	Corporation of the City of Panjim or Panaji	In association with the Corporation of City of Panaji, shopkeepers are reintroducing a bartering system, where customers can exchange recyclable waste, including PET bottles against grocery or stationery items of daily use (Navhind Times, 2021). The aim is to progressively increase the number of shops involved in this campaign and to accept a broader range of recyclable items (TNN, 2020).	i) Collecting waste ii) Incentivising collection and recycling	Local shopkeepers, German Federal ministry, GIZ India, The Energy and Resources Institute

*Tourism Development Corporation at a State Level

ApX Table B.5 Community initiatives for plastics in Indonesia and Australia

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF ORGANISATION AND COUNTRY	TYPE OF ORGANISATION/ INDUSTRY SECTOR	DESCRIPTION	PARTNERSHIP/ COLLABORATION
Recycle	Waste banks, or 'bank sampah'	Bank Sampah, Indonesia	Community organisation	A system to collect and recover household solid waste. The first waste banks have emerged in 2008 in Yogyakarta (Schlehe and Yulianto, 2020). It has quickly gained in popularity, and, by the end of 2017, Indonesia counted more than 5,000 waste banks. The waste banks are developed and managed by community groups, who encourage members to separate their waste and bring it to the waste bank, weigh it and record credit. Once a year, an amount corresponding to the recorded weight of waste deposited by an individual is paid out. Some waste banks collect as much as 2 or 3 tonnes of waste, including plastics, per day (Rollin, 2019).	Organisation is now supported by the government and is an integral part of the national waste management strategy. The waste banks are also often supported by private companies as part of their corporate social responsibility programs.
Rethink	Indonesia plastic bag diet movement or 'Gerakan Indonesia Diet Kantong Plastik' (GIDKP)	GIDKP, Indonesia	Not for profit	Indonesian not-for-profit organisation which aims to contribute to phasing out single-use plastics in Indonesia, by targeting three types of stakeholders: civil society, corporations and governments (Li and Patton, 2021). They conduct education campaigns and outreach initiatives, including 'plastic tours' of polluted rivers and campaign for more ambitious single-used plastics policies through their '#pay4plastics' petition, which asked for the establishment of a tax on plastic bags. This campaign led to trials and adoption of bans of plastic bags in cities.	Beyond advocacy, they also partner with government agencies to advance the phasing out of single-use plastics. For example, they partnered with the City of Jakarta to trial a plastic-free traditional market in Jakarta.
Rethink/ reduce	Plastic Free Places' program ⁶	<i>Boomerang Alliance, Australia</i>	Association and charity	'Plastic Free places', launched in 2017, aimed at supporting communities wanting to phase out single-use plastics (Boomerang Alliance, 2021) by adopting alternatives (reusable or compostable items). They focus on six specific items that are most commonly littered: straws, coffee cups/lids, takeaway containers, food ware, bags and water bottles. As of January 2021, the combined impact in eight cities led to the elimination of 7,066,669 pieces of plastic.	The Boomerang Alliance works with food retailers, events markets as well as council, suppliers, manufacturers, waste transport operators and composters.

⁶ Case study also presented in: Australian Packaging Covenant Organisation (2020).

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF ORGANISATION AND COUNTRY	TYPE OF ORGANISATION/ INDUSTRY SECTOR	DESCRIPTION	PARTNERSHIP/ COLLABORATION
Recycle	Australasian Recycling Label National recycling week Business recycling Circular economy hub	<i>Planet Ark, Australia</i>	Not-for-profit organisation	Planet Ark is an environmental NGO in Australia that runs several relevant programs, including: providing best practice information on recycling to businesses (Business recycling) and the community (National recycling week) (Planet Ark, no date). They are also developing a Circular Economy Hub to share knowledge and information on CE. They are also helping to deliver the Australasian Recycling Label, which provides consistent clear instructions on product disposal and recycling and support to brands with regard the design of recyclable packaging.	Planet Ark collaborates with the packaging industry (APCO, PREP design), as well as governments, businesses, communities and individuals who want to reduce their environmental impact.

Apx Table B.6 Industry initiatives in Indonesia and Australia

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF ORGANISATION AND COUNTRY	TYPE OF ORGANISATION/ INDUSTRY SECTOR	DESCRIPTION	PARTNERSHIP/ COLLABORATION
Rethink, recycle	Bango recyclable PET bottles	Unilever, Indonesia	Consumer goods multi-national	Starting in 2019, Bango – an Indonesian soy sauce brand – has started to produce 100% recyclable PET bottles, made of 100% recycled plastics (Unilever, 2019a). This is expected to lead to a reduction of 500 tonnes of plastic waste per year.	
Recycle	Creasolv sachet recycling	Unilever, Indonesia	Consumer goods multi-national	Unilever implemented a pilot CreaSolv® facility in East Java to recycle single-use sachets from shampoos and other products (Unilever, 2017). This facility enables the recycling of high-value polymers by selectively dissolving the targeted polymers so that they can be separated from other materials. The pilot facility recycles 3 tonnes of polymers from plastics sachets per day, which are then be used to for new packaging.	Unilever, in partnership with the Fraunhofer Institute for Process Engineering and Packaging IVV, as well as waste collectors, waste banks, retailers and the Indonesian government ⁷ for the collection of sachets
Recycle	Waste banks	Unilever, Indonesia	Consumer goods multi-national	Unilever (along with several other companies) have supported the development of 2,800 community-based waste banks, which are a popular model in Indonesia (Unilever, 2019b).	
Rethink/ recycle	Danone-Aqua rPET	Danone-Aqua, Indonesia	Consumer goods multi-national	In 2019, Danone-Aqua commercialised its 100% recycled and recyclable plastic bottle (National Plastic Action Partnership, 2020). The bottle was made 100% recyclable by modifying its design. Pigments were eliminated and the label was replaced by embossed text directly on the bottle.	
Recycle		Danone-Aqua, Indonesia	Consumer goods multi-national	Developing a network of recycling drop boxes for Danone-Aqua bottles in Alfamart stores throughout the country (Danone, 2018). When returning Danone-Aqua bottles, consumers are provided with Telekomsel credit.	Danone-Aqua in partnership with Alfamart (one of the largest convenience store chains in Indonesia), and Telekomsel (Indonesia’s largest network operator)

⁷ Currently households do not separate their recyclable and non-recyclable waste. Unilever hopes that the Indonesian government will promote this practice.

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF ORGANISATION AND COUNTRY	TYPE OF ORGANISATION/ INDUSTRY SECTOR	DESCRIPTION	PARTNERSHIP/ COLLABORATION
Recycle	Bottle 2 fashion initiative	Danone-Aqua, Indonesia	Consumer goods multi-national	This initiative involves the recycling of bottles to create a children's clothing line. 129 tonnes of used plastic bottles were recovered from the Thousand Islands regency, an island situated north of Jakarta (Jakarta Post, 2020). The bottles were then carried to Danone-Aqua's recycling facility to be sorted, cleaned and shredded. The shredded plastic was then sent to H&M facility to be transformed into polyester. The collection is available on H&M online, as well as in various stores in Java and Bali.	Danone-Aqua partners with H&M Indonesia
Recycle		Danone-Aqua, Indonesia	Consumer goods multi-national	Developed education programs and videos on the importance of plastic waste recycling and advocated for those programs to be integrated into the national curriculum (Danone, 2018).	Danone-Aqua partners with NGOs, local government and schools for recycling programs, and with VICE impact to create videos
Recycle	PRAISE Packaging Recovery Organisation	PRAISE, Indonesia	Industry association, consumer goods	The Packaging Recovery Organisation (PRO) aims to encourage the adoption of the circular economy in Indonesia, with a focus on waste collection and recycling. Their three programs are: i) developing a system to recycle PET, ii) increasing collection rates of plastics packaging (flexibles and high-density polyethylene), and iii) an education program on recycling. Pilot projects started in 2020 in East Java and Bali.	The PRO (industry association) will collaborate with local governments
Rethink, Recycle, Recover	Barangaroo precinct	Lend Lease, Australia	Multi-national construction and development company	Lend Lease ⁸ redeveloped the Barangaroo precinct where they divert 100% of waste from landfill through waste minimisation, collection and recycling processes (Australia, 2018). Retailers at the Barangaroo precinct are required to use compostable packaging, plastic bags are prohibited, several offices have banned single-use coffee cups. Single-use cups and lids as well as soft plastics are shredded in order to be used as fuel for the cement industry. A macerator processes food waste and compostable packaging that is then converted into green energy and fertiliser.	The implementation of those reduction strategies or the identification of alternatives (compostable packaging) was supported by the presence of an educator whose role was to help tenant adopt compostable packaging

⁸ Case study also presented in: Australian Packaging Covenant Organisation (2020)

CIRCULAR ECONOMY STRATEGY	NAME OF INITIATIVE	NAME OF ORGANISATION AND COUNTRY	TYPE OF ORGANISATION/ INDUSTRY SECTOR	DESCRIPTION	PARTNERSHIP/ COLLABORATION
Rethink/ recycle	Removing carbon black pigment	Unilever, Australia	Multi-national consumer goods company	Unilever is resolving a waste sorting problem with carbon black pigments used in plastic packaging. Carbon black cannot be detected by Near Infra-Red sorting technology, so they have developed a black pigment that can be detected, so this packaging can be sorted and recycled. This new black pigment is being rolled out across all Unilever brands. Unilever Australia has been using it since 2020.	
Rethink/ Recycle	Improving recyclability of Tim Tam Packaging	Campbell's Arnotts	Multi-national consumer goods company	The black plastic used for the internal trays was replaced by a plastic that is accepted for recycling and detectable by material recovery facilities. The brand joined the REDcycle soft plastics recycling program. The Australasian Recycling Label is now visible on the packaging and provides consistent information. These design modifications have led to a 54% increase in the recovery of Tim Tam's soft packaging.	
Rethink/ recycle	Recycling soft plastics back to soft plastics	Kit Kat, Nestlé	Multi-national consumer goods company	Nestlé have demonstrated with their Kit Kat chocolate wrappers that soft plastics can be recycled back into soft plastics wrappers. Their prototype wrapper developed in 2020–2021 has 30% recycled soft plastic created to food grade quality via chemical recycling. Nestlé are also partnering with iQ Renew and CurbCycle to trial kerbside collection of soft plastics (Nestlé Australia, 2021).	Developed through a major collaboration between REDcycle, CurbCycle, iQ Renew, Licella, Viva Energy Australia, LyondellBasell, Taghleef Industries, Amcor and Nestlé

The publication on sustainable consumption (Grabs *et al.*, 2016) provides a comprehensive review of success factors in grassroots initiatives related to sustainable consumption at the personal and inter-personal, group and societal level. Our project will not scrutinise the personal and inter-personal dimensions. It will rather focus on the group and societal level, where the following factors have been identified as significant.

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