Earthwatch Australia

An insight to plastic waste reduction efforts

What's preventing scale?

earthwatch
AUSTRALIA

Acknowledgment of Country

Earthwatch Australia acknowledges the Australian Aboriginal and Torres Strait Islander peoples of this nation. We acknowledge the traditional custodians of the lands on which our company is located and where we conduct our business. We pay our respects to ancestors and Elders, past and present. Earthwatch is committed to honouring Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to the land, waters and seas and their rich contribution to society.

Authours and Working Group

Elizabeth Irvine, Earthwatch Australia

Anjali Nelson, GreenCollar

Stephen Smith, Aquamarine Australia

Cassandra Nichols, Earthwatch Australia

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Executive Summary

With the quantity of mis-managed waste and plastic leakage into the environment predicted to triple by 2060, rapid upscaling of pollution reduction efforts is critical for a healthy and safe planet. There is a global recognition for the need for action however how to rapidly scale existing approaches, and the barriers and enablers facing plastic waste removal are complex and vary globally. This research therefore sets out to reviewing existing approaches in order to increase our knowledge of best practice interventions for plastic waste, and help to accelerate plastic waste reduction at a global scale.

Through inviting organisations involved in environmental plastic waste collection, recycling and reduction projects to share their experiences, the overarching goal of this project is to improve the success of environmental plastic waste initiatives by providing a synthesis of experience and knowledge from existing projects. In doing so, we also provide a snapshot of the current level of understanding and appetite for a plastic offset market

Drivers

Personal passion and motivation for cleaner seas was by far the greatest driver of projects, as identified by respondents, regardless of organisation size and type.

Enablers and success factors

Successful plastic waste reduction programs take many forms, with success measured not simply by tonnes or bags of waste removed, but also the effort and engagement of community and the sense of pride and purpose of the organisations themselves.

The key enablers contributing or ensuring the success of these programs across the responded spectrum are largely non-financial. Education of workforce and community, and strong relationships with local, village and municipal governments including specifically - alignment or integration with their municipal waste management programs – are identified as key enabling factors. Trusted networks within communities who partner with and/or provide in-kind support to these programs are identified as key to the success of smaller operations in particular.

For some types of organisations, access to equipment and facilities was also stated as a key enabler, as was the establishment of a sound market or business model underpinning their project.

How is impact assessed

It is noted that very few projects measure the broader environmental impact of their efforts as part of their program and, consequently, as a measure of project success. Instead, this is generally 'inferred' by the quantity of waste collected from the environment or diverted from landfill. Whilst removal of plastic from the environment and diversion from landfill is intrinsically beneficial, when programs state a main objective is to improve environmental quality the lack of this type of monitoring means that the overarching objective cannot be properly assessed. There are numerous reasons why this may be the case including, cost, resources, lack of knowledge in monitoring procedures and lack of simple, standardised approach.

Barriers and limits to growth and scale

Constraints to growth and scale were largely found to relate to long term financial sustainability and the geographical and logistical barriers associated with transporting materials to either processing, recycling or disposal facilities. Smaller not-for-profit organisations in particular noted difficulties with funding, sharing that burdensome applications, accountability and reporting requirements limited their ability to focus expanding their operations. Conversely, enterprise-based organisations typically reported overcoming these initial scaling issues and instead limited in growth by the insecurity or difficulty in developing their supply chain.

Plastic Credit Markets

Environmental markets were largely perceived as positive schemes, though there was an evident lack of knowledge in relation to plastic offsets. This is perhaps reflective of the stage of development of these schemes. While there was broad awareness of plastic offsets, there was evident confusion about the various different schemes available and their relevance to specific programs. Lack of technical knowledge to access schemes and insufficient scale of existing capacity were the two identified reasons for organisations not partaking in offsets schemes.

With the plastic market only just initiated, this research flags some important target areas that will aid the future success of offsets. This includes increasing accessibility by focusing education of the schemes to the organisations doing the on-ground work. Theoretically, smaller organisations stand to gain most benefit from an offset scheme, providing them with a sustainable income stream and reducing the reliance on fundraising and grants. But barriers faced by small organisations include their capacity to scale, connect to supply chains and reach the volumes required by the offset schemes to cover the cost of validation and verification. Finding ways to connect the on-ground organisations to combine their 'catch' or to create strategic partnerships between players in the market could help overcome the scale/capacity issue. Creating a market place for buyers and sellers of recycled raw material could assist with connecting the supply chain.

Introduction

Amcor and Earthwatch Institute have partnered together for 21 years on environmental science and staff engagement, most recently focusing on the complex marine debris issue. Since 2015, Amcor staff have assisted eminent researchers in locations around the world specifically focused on understanding the flow of waste into the environment, quantifying the amount and types of waste entering the environment and considering management strategies to solve the issue. Amcor Earthwatch Fellows have undertaken scientific expeditions to the Whitsundays, Australia (2015), Bali in Indonesia (2016 and 2019), Cape Town in South Africa (2017) and to Peru (2018). Understanding local contexts for marine debris is a critical step towards best practice interventions to reduce plastic pollution of the environment.

With COVID-19 disrupting our ability to travel and continue our work in these scientific expeditions, we turned our attentions to other critical knowledge gaps. We know that plastic pollution continues to be a growing problem that requires action so we asked, what needs to be done to upscale environmental plastic waste collection, recycling and reduction efforts to create impact at the global scale and can plastic offsetting play a role.

Plastic offsets are identified as a key element in supporting the financial viability and longer-term sustainability of plastic waste reduction projects. By gathering insights from community groups involved in plastic waste initiatives, partners involved in developing pilot projects for the Verra 3R initiative and stakeholder responses to the emerging plastic offsetting market, this research aims to extend and share knowledge into plastic waste interventions.

Plastic Waste in the Environment

Globally, over 300 million tonnes of plastic are produced every year, of which between 19-23 million tonnes end up in the aquatic environment (Borrelle et al., 2020). Plastic debris is currently the most abundant type of litter in the ocean, making up 60-80% of all marine debris (Derraik, 2002, IUCN 2021). It is found at the sea surface, throughout the water column, on the seafloor and the shorelines of every continent, with the majority of plastic waste found near popular tourist destinations and densely populated areas (Leite et al., 2014, Hardesty et. al., 2016, IUCN, 2021). From floating rubbish islands (ocean gyres) to micro- and nano- plastic pollution, this waste is a significant threat to ocean health, with negative impacts to marine life, ocean ecosystems, human health and the economy through fisheries, shipping and tourism (Thushari and Senevirathna, 2020).

The main sources of plastic debris found in the ocean are land-based, leaking from urban and stormwater runoff, sewer overflows, littering, inadequate waste disposal and management, industrial activities, construction and illegal dumping (Jambeck et al., 2015).

Although high income countries generate more plastic waste per person it is the management of plastic waste that determines the risk of plastic pollution. High-income countries have more effective waste management systems and relative quantities of mis managed waste are typically lower than for middle and low income countries (Jambeck et al., 2015, OECD, 2018). Rapid growth combined with poor waste management across many middle- and low- income countries means that plastic pollution is typically concentrated in these locations (Smith., 2012, Ritchie and Roser 2018), impacting land, waterways shorelines and near shore environments. Once this waste enters the ocean, the problem escalates from local to global as ocean currents collect, redistribute and concentrate plastic waste; adding to the already large burden of ocean-based pollution originating from the fishing industry, nautical activities and aquaculture (Smith et al., 2018, IUCN, 2021).

What is the solution and where does this research come in?

The UN 2030 Agenda for Sustainable Development calls for action, by 2025, to prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution.

Globally, there is growing agreement that the theoretical roadmap to zero plastic pollution must involve both upstream (pre-consumption – reducing demand) and downstream (post-consumption- recycling) strategies (Lau et al., 2020, Smith and Bernal, 2021). Changes in product design, better waste management systems, clean up and remediation activities are all ways to reduce plastic waste in the environment. The greenhouse gas footprint of recycled plastics is a fraction of that of virgin plastics, and high quality waste management systems reduce the risk of plastics leaking into the environment (OECD, 2018). To achieve real and meaningful change, plastic waste should be diverted to landfill only as a last resort, with preference given to developing solutions for plastics reduction, reuse and recycling (IUCN, 2021).

Undoubtedly a suite of technical, legislative and behavioural solutions are required across the plastic life cycle and use spectrum (from refuse, rethink, redesign and conserve through to regulation of disposal) (Napper & Thompson, 2020).

Many regional and national governments are exploring national legislative frameworks on Extended Producer Responsibility and other innovative, low-cost solutions and policies to promote circular economies and reduce plastic pollution. However, many developing countries lack the infrastructure to prevent plastic pollution such as waste collection services, sanitary landfills and incineration facilities. These basic limitations in turn reduce recycling capacity and subsequently access to circular economy infrastructure and initiatives (IUCN, 2021).

Plastic credits or plastic offset markets are seen as one element to promote the circular economy, and long-term financial viability of environmental plastic waste-reduction efforts. Similar to carbon markets or offsets, plastic credits are designed to deliver finance to activities that make verifiable contributions to the circular economy. Credits programs can include a broad range of impactful activities, such as waste recovery from the environment, creation of waste collection infrastructure and development of new recycling processes thus enabling both developing and developed economies to participate for global action on plastic waste (Verra, 2021).

The success of debris reduction programs at the national scale are dependent on actions carried out at smaller scales (Smith & Bernal 2021). How to accelerate local solutions to meet the scale of this global problem however remains a critically unanswered question and with plastic credit schemes in their infancy, in this project we ask those at the forefront of plastic waste-reduction efforts to share what they have learned and to collate this information to provide suggestions about what can be done to meet this global challenge.

Research Objectives

The overarching goal of this project was to help improve the success of environmental plastic waste collection, recycling and reduction projects through a synthesis of knowledge, and on-ground experiences from various organisations actively working in this space. This research aimed specifically to increase our knowledge of best practice interventions for plastic waste and how plastic offsets can assist in scaling solutions.

Key research objectives were to:

- Better understand the drivers, barriers and opportunities for plastic reduction, removal and plastic recycling projects;
- Provide an overview of successful plastic reduction, removal and recycling programs and highlight reasons for success and limits to growth/scale;
- Explore the potential benefits of transitioning to the plastic credit system and the factors determining when a project is ready to enter the market (if appropriate);
- Share the on-ground knowledge and experience of organisations to provide broader education about offset markets; and
- Increase uptake and success of community-driven plastic markets/offsets, to help direct funding and enable viability of projects.

Methodology

Through social research methods, this research engages in the knowledge held by organisations undertaking plastic collection, recycling and reduction programs. The research utilised data collected via an online survey and in-depth interviews with lines of questioning developed by an expert working group. In the discussion of results, the data is complemented by expert knowledge and experience with plastic pollution and waste management.

Research participants (survey respondents) were identified primarily through organisational and private networks. Recruitment was targeted at individuals and organisations involved in environmental plastic waste reduction initiatives globally. A public online survey (Appendix A) was circulated through organisational networks, social media and targeted (paid) online advertising. The survey was designed to elicit quantified and qualified responses across the following thematic areas:

- Organisational arrangements (demographics) and motivations for undertaking their work;
- Barriers and enablers they have encountered; and the degree of impact these have had;
- Success factors and perceptions of success; and
- Knowledge, attitudes and practices with respect to environmental and plastic offset markets.

Semi-structured in-depth interviews (Appendix B) were undertaken for a sub-set of organisations. These interviews expanded on the themes in the online survey and typically took 30 min to 1 hr to complete. The interviews were undertaken by individuals skilled in social research methods, or specific language sets as required.

All survey participants and interviewees were advised that the information they provided would be presented in a publicly available document, and were able to contribute anonymously if they preferred. Where quotes, data and information are specifically attributed, this is done with explicit permission.

Data analysis of quantitative data was undertaken via standard descriptive statistical methodologies. Qualitative data were analysed via reflexive-organic thematic analysis and keyword analysis, supported by key participant insights (Braun and Clarke 2019). Discussion of the results is supported by the expert knowledge of the working group.

Results

A total of 51 individuals interacted with the online survey. From this total, 28 did not progress past the first question and further ten provided only partial data that could not be used for analysis (e.g. initial demographics only). Of the remaining 12 respondents, ten progressed through to completion of the survey and two provided useful data through partial completions. Screening (identification of aberrant/spurious responses) removed partial responses from two respondents. A breakdown of available data from the validated respondent set (N=12) across each section of the survey is presented in TABLE 1.

TABLE 1. Respondent data

Survey Section	Valid responses (i.e. working data set)	As % of validated respondent set (N=12)
Demographics 1 – initial	12	100%
Motivations	12	100%
Demographics 2 – scale and location of operation	12	100%
Indicators of success and impact	11	92%
Barriers and Enablers	9	75%
Environmental and Plastic Offset Markets	10	83%
Demographics 3 - additional	10	83%

The variety of respondent types (based on the demographic information provided), combined with respondent numbers, did not allow rigorous application of quantitative statistical methods, however, enough information was collected to provide information on high-level themes and results are interpreted on the basis of these.

A total of five organisations participated in-depth interviews. Two of these organisations had also contributed to the survey, and three of whom were unique to the in-depth interview process.

Respondent Demographics

Combined, data were obtained from 15 unique organisations. These originations were from across the globe including from India (2), Vanuatu (1), the Dominican Republic (1), Indonesia (2), and Australia (5) and the remainder did not specify. Organisations described themselves as Small to Medium Businesses (3), NGO or Community Groups (5), Large businesses or Multi-national Corporations (2), Local government or Municipal Authorities (2), University (1), or did not specify (2) (FIGURE 1).

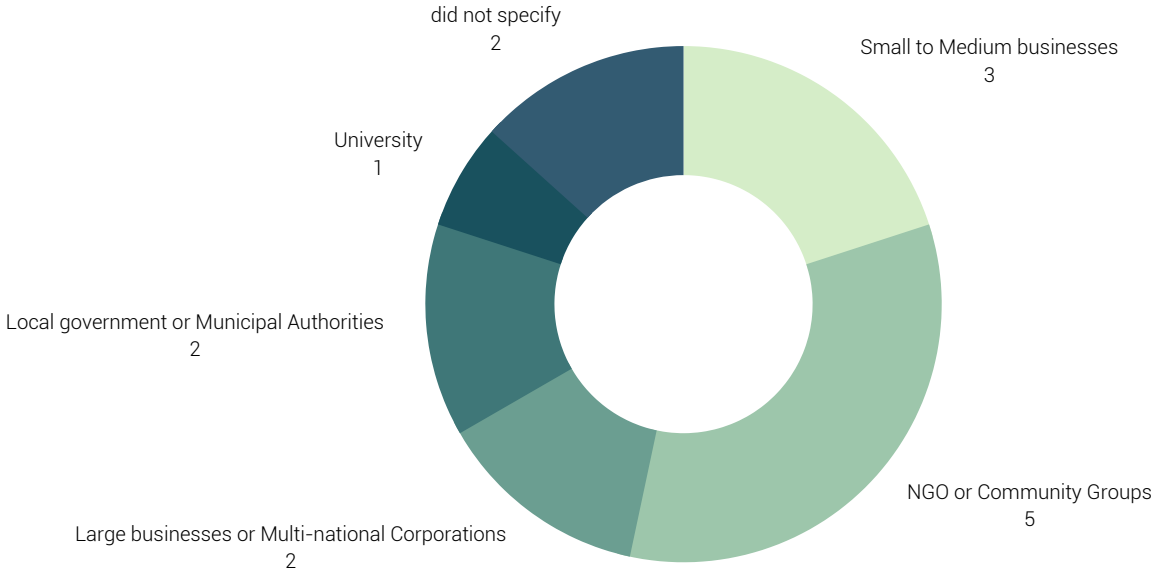


FIGURE 1. Type of organisation

Of the organisations that contributed to the survey, the majority are actively involved in plastic waste removal from the environment (83%): the locations of plastic waste removal or sourcing ranged across the environmental spectrum from the ocean to commercial properties (FIGURE 2). Secondary activities included: research and development of plastic recycling technologies (42%); processing of plastic waste into raw material for remanufacturing (33%); interventions to prevent plastic from entering the environment (33%); and monitoring of plastic waste in the environment (33%). One-quarter (25%) of organisations were involved in the sorting, storage and on selling of plastic waste products and/or the processing of plastic waste into new products. Two organisations (17%) indicated they were involved in the development of new municipal infrastructure.

Clean-ups from beaches, waterways and urban environments were listed as some of the key environments from which environmental plastic waste clean-ups were being undertaken.

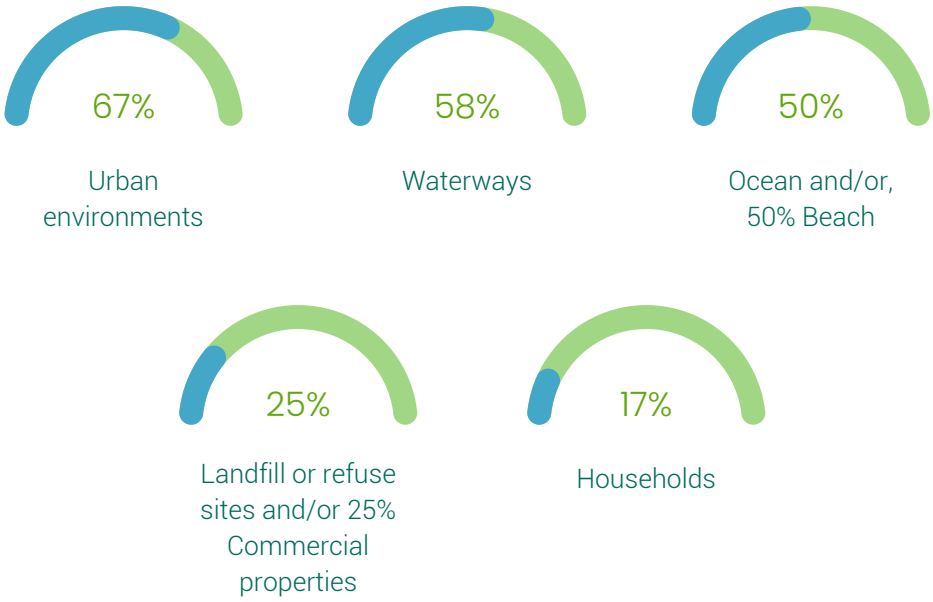


FIGURE 2. Where organisations source or remove plastic waste from

Based on tonnes of waste typically handled annually, the size of the respondent organisations were evenly spread across 3 of the 4 specified tonnage ranges, namely < 1 tonne (n=4), 1-50 tonne (n=4) and >100 tonne (n=4).

Motivation

From the online survey data it is clear that project genesis largely stems from the desire to clean up the environment with 83% of respondents (n=12) listing this as a primary motivating factor. In rank order, this is followed by laws & regulations, community drive (each 33%), financial incentives (25%), and third-party engagement (17%) (FIGURE 3).

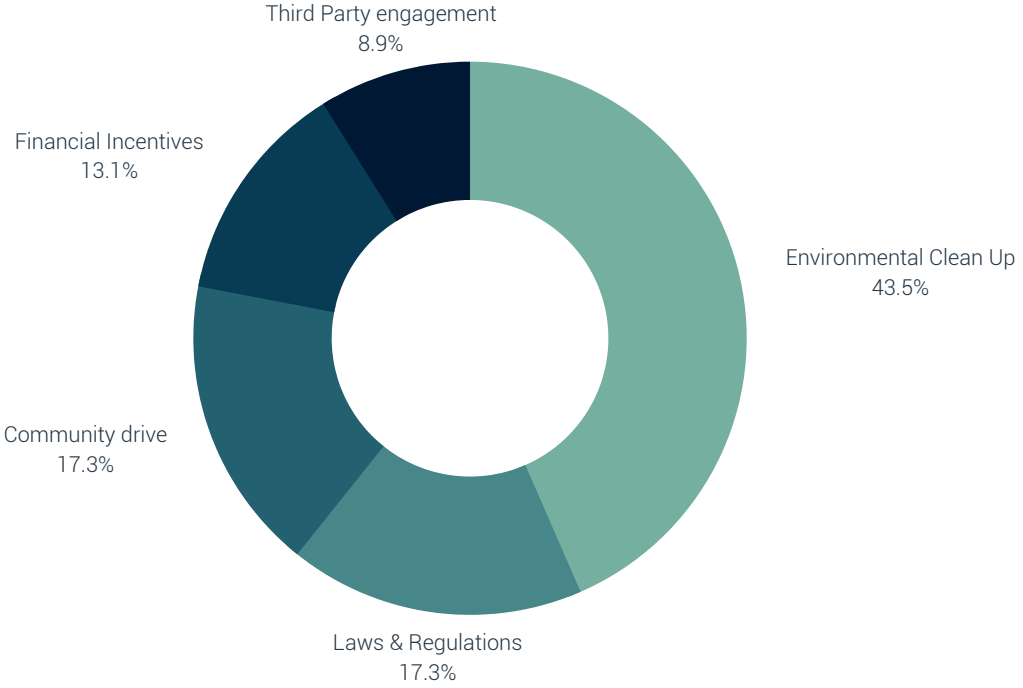


FIGURE 3. Motivating factors that drive program development

Passion and care for the environment as a motivator is supported by insights from in-depth interviews, where personal experience combined with a desire to make a positive environmental change culminated in environmental action.

> *I love the beach, snorkelling, diving, fishing. I realised when fishing that there is plastic and rubbish everywhere. This is a third-world (sic) country and through lack of education, people throw it everywhere. They don't know where it goes, so I realised that cleaning up wouldn't be enough, I wanted to educate, make people understand the issue*
>
> **Johann Beird Vasquez**
> Fundacion Oceanos Limpios (Dominican Republic)

> *I watched a marine debris documentary and was horrified – there was the same issue in my own backyard. My personal drive to protect marine life, drove me to start cleaning up the Whitsundays*
>
> **Libby Edge**
> EcoBarge (Australia)

For Sea Communities (Indonesia), their plastic initiative program evolved from the recognition that marine waste was smothering coral that was being grown to rehabilitate degraded reefs.

Although financial incentives were listed as additional motivators for many respondents, in no instance were they listed as the only motivator. Even social enterprises, such as SocialLab, an established business operating in 48 cities and 120 grampanchayat (village-based local governments) across India, the motivation to engage in plastic waste reduction has always been socially and environmentally cause driven. It was from this point that a viable business opportunity was identified and developed.

> *Many people have an innate desire in themselves to start something with social impact by default. I was introduced to the waste management domain by a friend through the not-for-profit sector. Exposed to unethical and dangerous practices in waste management; I came across evolving waste management guidelines. From here I identified viable business opportunity*
>
> **Rahul Juware**
> Social Lab (India)

Success & Impact

Online survey respondents were asked to self-evaluate their success and impact against four provided measures namely meeting objectives; financial position; long-term sustainability; and impact (FIGURE 4). Generally modest levels of success were reported with higher levels of perceived success were indicated for impact, followed by meeting objectives, then financial position (in rank order). Opinions of success regarding long-term sustainability were however mixed, suggesting that, although respondents considered their projects to be viable and worthwhile in the short or medium term, there was less confidence in project sustainability in the long-term.

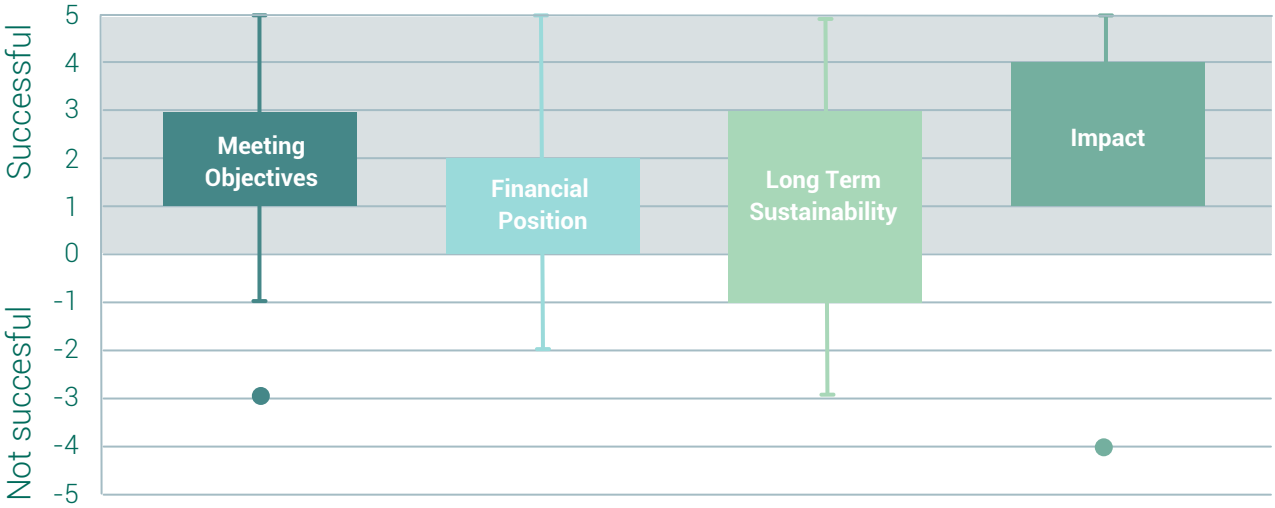


FIGURE 4. Measures of Success (n=11; 5 = successful; -5 = unsuccessful)

When asked to rate their projects on degree of impact, notably reductions in environmental plastic waste, respondents, however, were less certain. One respondent noted that their data had supported policy change, and that future data from street clean ups did show a reduction in plastic litter and type of plastic in the environment. Many were able to quote clear indicators regarding the amount of plastic waste removed e.g. tonnage, bags – and were comfortable associating these indicators with environmental impact. Others however indicated that their impact on the environment was "hard to tell", "not notable", "not yet established" or "unclear".

Further insights on indicators of success and impact with respect to meeting objectives were provided in the in-depth interviews. Again, participants referred to volume or tonnes of waste removed from the environment or diverted from landfill as primary measures of success and/or impact. Other indicators used also included the number of staff or volunteers engaged or upskilled and number of clean-ups. Again, respondents were less certain as to how these indicators translated to reductions of waste in the environment and thus their overall objectives of environmental clean-up. Any rigorous or broader environmental monitoring either was not in place or limited to casual observational indicators, such as noting that target locations are "infinitely" or "appear" cleaner.

In closing the impact gap, participants acknowledged that baseline data are essential for understanding impact, and where environmental impact monitoring schemes have been established for this purpose, the temporal sequence of these has been compromised by global events (COVID-19) and financial constraints.

The Australian-based OceanWatch is currently developing a monitoring-based methodology through remote-operated-vehicle benthic surveys, which may in future be used to establish local baselines, but recognises the limitations in closing the gap in indicator and impact reporting.

> *It would be nice if there was one methodology in impact reporting, however we work with different methodologies in areas that are complementary or overlap…We're reliant on what washes up as indicators.*
>
> **Simon Rowe**
> OceanWatch Australia

It was additionally commented that much of the ocean clean-up data is privately held (by organisations or restricted to member groups): and that this hampers a broader understanding of organisational impact and also impact at a broader space prevents the identification of trends, emerging issues and impact of interventions relative to the scale of the problem.

For the majority of respondents, there were few comments on financial position and long-term sustainability, beyond the mention of the growth or failure of certain initiatives within their projects. For those who did expand on these points, establishment of a sound market or business model underpinning their project was identified as paramount to success.

Instead of searching for grants for conservation programs, we package markets and find a market for them

Garri Nyoman
Sea Communities (Indonesia)

Barriers & Enablers

To further understand what enables the success and ongoing sustainability of programs, respondents were asked about the barriers and enablers they had or were currently facing. Quantitative survey results were inconclusive in this respect for the factors provided (FIGURE 5). Instead, some broad observations are discussed. Factors typically considered external to an organisation including the political environment and laws and regulations appear to have no, or marginal, enabling effect. The most significant enablers were those closer to the operation, with community engagement and organisational knowledge typically cited as "enablers". Strong internal governance and access to facilities & equipment were also typically described as enabling. Market demand was rated a strong enabler for organisations that primarily are involved with production of recycled materials. Laws & regulations and the political environment were described as having a slight enabling effect, but also forming some barriers. Finances, Geography & Logistics and Workforce were spread over enabling and barrier rankings, perhaps reflecting both the diversity in approaches to organisational structure and set up, and the high degree of diversity in respondent locations. In higher population and geographically dense areas geography and logistics are noted as enablers. Conceivably, this geographic element corresponds with other enabling factors such as proximity to facilities, workforce and access to community.

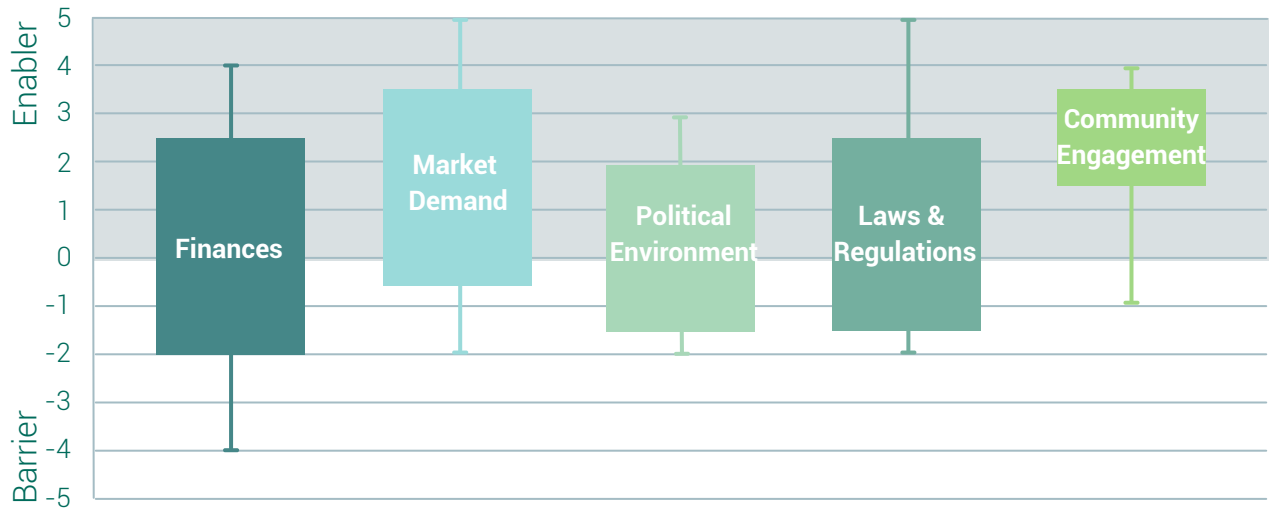


FIGURE 5a. Barriers and enablers (n=11)

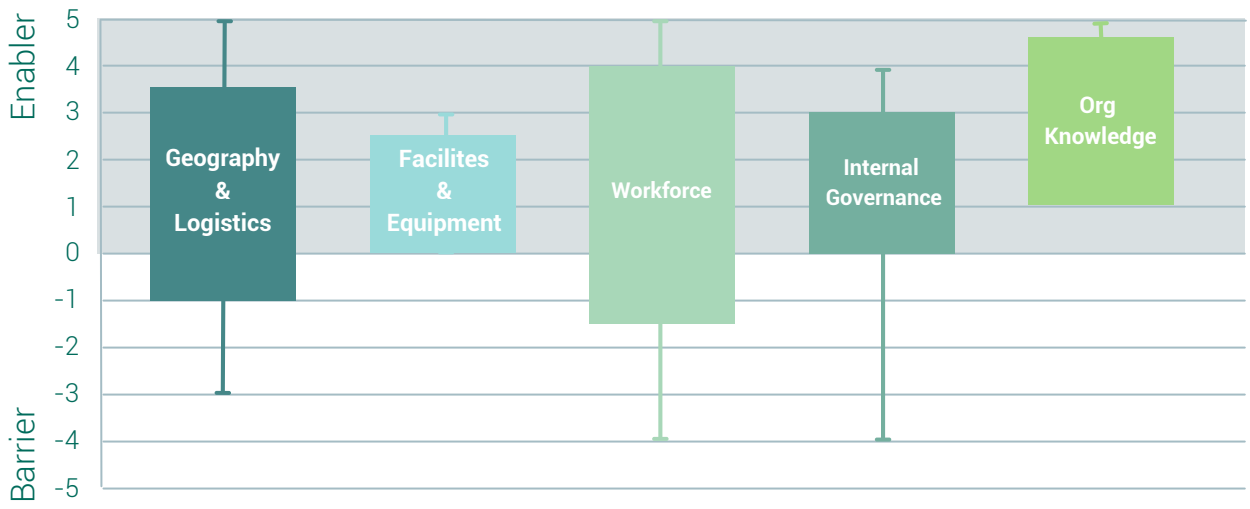


FIGURE 5b. Barriers and enablers (cont) (n=11)

Barriers

When asked to qualitatively describe key barriers faced however, laws and regulations (n=4) figured prominently. From comments it was clear that mostly the absence rather than the presence of these instrument formed a significant barrier.; Specific barriers identified included the absence of regulatory (and also financial) incentivisation, combined with a lack of overall accountability and responsibility for plastic waste. Comments pointed to an absence of leadership in the plastic waste management space.

> *[the absence] of accountability across organisations for litter (sic) leads to duplication and confusion. This is a huge barrier that hasn't been overcome.*
>
> **Survey Respondent**

> *[there is] no legislative responsibility across agencies for who leads*
>
> **Survey Respondent**

Finances, namely the absence of financial incentives, particularly during the start-up phase (n = 2); and securing a workforce (n=1), were identified as additional key themes.

Further insights into these results – and additional comments on key barriers - were provided by the in-depth interviews.

Smaller operations and not-for-profits tend to have their funding sources limited to contestable funds with restrictions in core funding agreements and high levels of reporting-based administration which do not offer stability, security or long-term sustainability. Lack of resources also impede ability to apply for my funds and meet funder or donor accountability requirements.

> *The reporting can be burdensome, administration is a massive barrier and the skill set to do this in a small community is difficult to find. There is a high expectation of funders, both grants and corporates.*
>
> **Libby Edge**
> EcoBarge (Australia)

Geography and logistics were also identified as playing a role in the success or failure of initiatives. Both distance and access to key infrastructure along the supply chain including for collection, storage, recycling or manufacturing facilities in addition to logistical constraints can have significant implications for program viability. In low-population density/geographically disparate nations such as Australia, or island communities, long distances between collection sites and processing or disposal, combined with high transport costs and high wages form critical barriers to program establishment or continuity.

> *Transportation is a huge barrier, the cost of this is quite substantial. Our locality is regional and materials need to be transported two hrs to Mackay for crushing, then taken to Sydney or Melbourne.*
>
> **Libby Edge**
> EcoBarge (Australia)

> *With our tangler bins the original [high value microfilament] product was to be recycled, however the logistics to visit bins and grab the refuse was too expensive – the distance and costs associated with servicing was a major barrier.*
>
> **Simon Rowe**
> Oceanwatch Australia

Moving beyond primary geographic constraints, the importance of establishing and maintaining a viable and secure supply chain is also highlighted, where steps to localise processing or increasing the security of supply chains forms next steps for growth of larger programs, but can be difficult to achieve.

> *A regional processing centre will allow concentration and processing in Bali rather than shipping materials to Surabaya.*
>
> **Nyoman Garri**
> Sea Communities (Indonesia)

> *The challenges have evolved. Initially it was pricing volatility. Now the challenge is to ensure the supply chain is operating smoothly.*
>
> **Rahul Juware**
> Social Lab (India)

Where collected plastics are processed or remanufactured, connection with a market for recycled plastic products also impacts program success. Lack of local demand results in an oversupply of plastic product which either needs to be stored, or transported elsewhere for sale which reduces already minimal margins. Cottage industry solutions (such as woven product) are limited in their scalability and sellers must compete with virgin plastic product which is typically cheaper and of (real or perceived) higher quality.

Enablers

Community engagement and strong relationships with residents based on mutual benefit and trust were also volunteered as key enablers contributing to program success. Many of the initiatives either developed from strong links with industry (fishing industries particularly notable), or soon developed these to secure the support, continuity, sustainability and growth of their programs. The fishing industry is particularly noted for two reasons: 1) a vested reputational and operation interest in clean oceans; and 2) the provision of labour and equipment (boats and barges) for marine clean ups.

> *Our Tide to Tip program wouldn't be possible without the personal relationships between [Oceanwatch] and the oyster community.*
>
> **Siobhan Threlfall**
> Oceanwatch Australia

We were attracted to Les Village because there was already a willing and welcoming organisation of fisherman who have tremendous experience on the marine environment and have done fantastic work already and we think that we can build on that.

Nyoman Garri
Sea Communities (Indonesia)

I like to engage fisherman – it helps their income and they get out to areas off the beach and collect from the reefs. I have worked to educate them in saving the coral and not harming certain types of fish/turtles which they didn't care about previously.

Johann Beird Vasquez
Fundacion Oceanos Limpios (Dominican Republic)

Similarly, strong relationships and engagement with governments at the village, local and municipal levels are cited as key enablers, bringing municipal and/or mayoral support of projects particularly through integration with municipal waste management programs and initiatives.

We work closely with municipalities and other building supply chains from source, transporting to processing.

Rahul Juware
Social Lab (India)

There is now strong buy-in by the two levels of local government (Adat, Dinas) and so overall success in recognizing waste management (and marine debris) as a priority is gradually increasing.

Nyoman Garri
Sea Communities (Indonesia)

Interview respondents emphasised the importance of education in the broader community and the capacity building of staff in enabling their work from establishment, through to maintenance and to realisation of efficiencies that translate to improved feasibility and viability. This included educational programs aimed at: school students; development of English language skills for staff and affiliated businesses that support programs with an eco-tourism component; safety and materials management for sanitation workers; and waste segregation education for households and commercial operators.

The importance of community education is also noted, especially in programs that directly connect with business owners and residents. This has the ability to reduce plastic use, mis-management and pollution at the source, especially given the time-consuming nature of post-collection waste segregation.

> *A key limitation is getting buy-in from householders to segregate waste items. Sorting of waste at the TPST is time-consuming and stretches labour resources. As the project is run on a very marginal budget, this has major impacts for the total project.*
>
> **Nyoman Garri**
> Sea Communities (Indonesia)

Environmental and Plastic Offset Markets

Participant attitudes, knowledge and practices with regard to plastics and other environmental offset markets was explored in this section.

Knowledge of both markets was reported as equal ("moderately knowledgeable"), however a greater variance in the knowledge of plastic offsets was reported, specifically in both the positive (greater knowledge) and negative (lesser knowledge) bands (FIGURE 6).

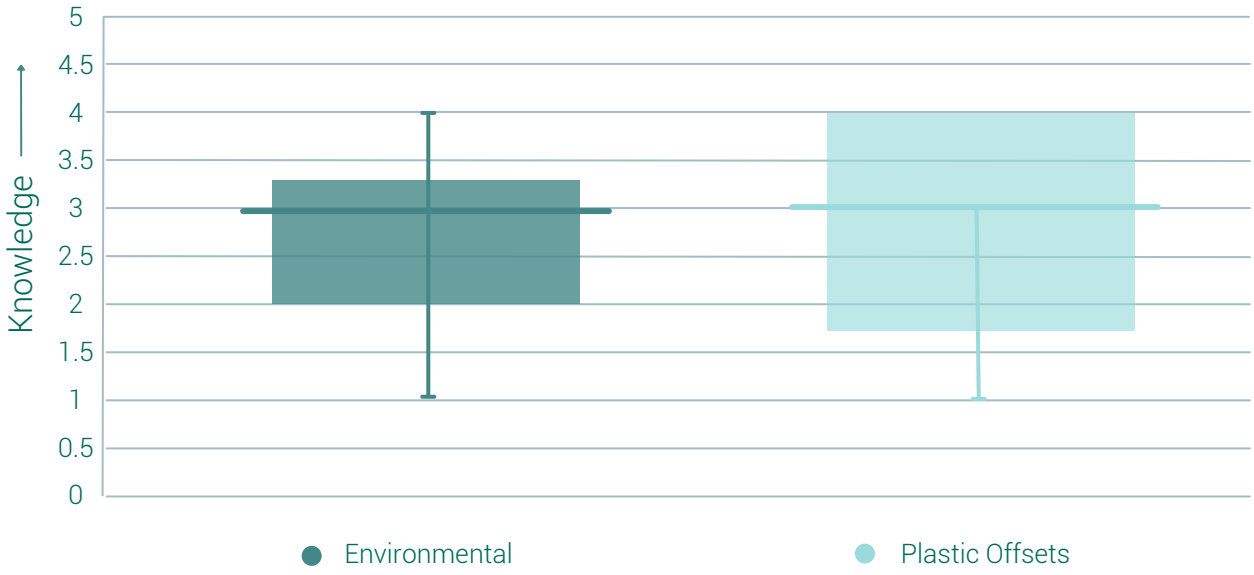


FIGURE 6. Knowledge (n = 9; 1 = not knowledgeable; 5 = very knowledgeable)

Regardless of their knowledge, the majority of respondents (n=9) cited a positive attitude toward environmental markets, agreeing they have value but require robust mechanisms and legislative frameworks to be successful and to ensure environmental benefit. The time and knowledge required to set up supply chains, as well as logistical and financial constraints were also listed as influencing respondent attitudes.

> *For small countries…markets offer a way to finance dealing with the plastic problem [conversely], business models don't demonstrate that a sustainable business can work due to the constraints of a small economy and geographically challenging environment.*
>
> **Survey respondent**

One respondent indicated that markets such as these were not worth pursuing in the absence of strong governance, legislative boundaries and real incentives for businesses.

> *Do not pursue. Offsetting in all other contexts does not deliver the outcomes desired and [requires] an enormous amount of governance. Need legislative boundaries, and if companies can't meet criteria, the project doesn't go ahead. 99% of business does not need the incentive that offsets allow.*
>
> **Survey respondent**

Despite the stated levels of knowledge and overall positive attitudes toward plastic offset markets, few organisations are actually participating in such schemes, with 7 of the 10 respondents indicating they were neither partaking in, nor working toward, plastic credits. Reasons for this included: a lack of technical understanding (n=2); insufficient volumes of waste (n=2); lack of capital investment or resources (n=1); no interest (n=1); and the absence of knowledge of such schemes (n=1). The remaining three respondents were equally split between currently working toward, contributing via an informal or self-verified scheme, or via a third-party verified scheme such as Verra.

Further insights into the advantages and potential barriers to entry into plastic credits was offered by the survey respondents. Despite a general consensus that plastic credits were a positive step, concerns about transparency and overall viability were voiced, as were understanding and interplay between the number of credit schemes available and how these differed in implementation. Hesitation in participating (either themselves, or based on observation of others in their networks) was also attributed to legislation which is considered a key component for driving the plastics credit market. The disconnect between the global nature of the problem, and largely nationalised (and westernised) credit markets, was also cited as an area of concern.

It seems like the verification process needs to be explored further for less developed countries. The … process is unwieldy and the more automated system[s] being developed … may be difficult to roll out. Currently, there is also confusion about who gets to claim the different types of credits. However, it has already generated an income stream. The Adat/Dinas now needs to develop a system to get payment back to individual households

Nyoman Garri
Sea Communities (Indonesia)

Scaled solutions

The main aim is to stop the plastics getting to the ocean, not removing them.

Johann Beird Vasquez
Fundacion Oceanos Limpios (Dominican Republic)

When asked what is needed to make a significant difference to reduce the volume of waste in the environment, education and behaviour change was most commonly referenced (33%), closely followed by legislation and legal accountability (22%) and innovation (22%) in both the ability to recycle products, as well as in development of alternate products to reduce the need for plastic materials. Incentives also featured (16%) as a positive way to accelerate reduction of waste in the environment and related to both individual incentives such as payments for waste segregation and for purchasing recycled products through to manufacturers' incentives like zero tax for production of recycled materials.

All interviewees work tirelessly and passionately to reduce the amount of plastic waste in the environment and, when they were asked the same question, answers unequivocally focused on reduction of plastic use and education, particularly from smaller operators. Most of these smaller operations are at capacity, limited by organisational or financial constraints in their ability to scale-up their delivery.

Increasing the scale of waste reduction and recycling efforts (customer base, infrastructure and supply chains), underpinned by strong business models was mentioned by those organisations with strong integrations into municipal waste systems.

There was the acknowledgement by both groups that plastic use is never going to stop, as its usefulness and versatility ensures its place in global society, but we need to use all avenues available to face the problem head-on and turn the tide on plastic waste pollution.

Discussion

Across the respondent base, it is clear that environmental plastic waste reduction efforts are led by passionate individuals motivated by social and environmental good. Whilst this individual drive is integral to plastic waste reduction efforts and to be commended, projects are often limited in their sustainability, scale, and ability to coordinate across regions in a manner sufficient to address the global threat of environmental plastic waste pollution.

Individual efforts need to be supported by waste policies and legislation that encourage innovation and ground-up solutions that can meet a highly decentralised, vast problem. As these mechanisms are still evolving in most countries, there is an opportunity to advocate for the development of higher-level mechanism solutions in way that considers behavioural and economic costs and incentives at all relevant scales.

A diversity of organisational types needs to be considered and supported

A common theme from the respondent data is that not-for-profit organisations and charities bound by donation rules have a harder time securing funding to continue their work and can be limited in their ability to scale because of this. Conversely, organisations set up as social enterprises or businesses are able to access more diverse funding streams and operate under conventional business models, which goes someway to securing long term sustainability and growth of their projects.

The altruistic origins of program establishment however do not necessarily exclude the desire to build sustainable enterprises or businesses that are both financially viable and work toward the common goal of a cleaner environment with less plastic.

What is important is that the motivational origins, type, or structure of an organisation – nor its size - should limit its ability to; contribute to meaningful environmental plastic waste reduction; participate in incentivising and supporting schemes; and be considered in regulatory decisions.

When considering policy, legislative and market development this broad organisational diversity needs to be recognised and any instruments or mechanisms developed should work to support – rather than discriminate against (intentionally or otherwise) organisations of all types and levels of development.

Legislation must work for, not against, plastic waste reduction

Whilst many respondents felt legislation and policy are needed for plastic waste reduction, it should be noted that legislative frameworks can also be a strong barrier to offset markets as they will regulate plastic collection/recycling/reduction making offsets non-additional and hence actions which organisations take to mitigate plastic waste reduction can no longer qualify for offset schemes. Furthermore, policies and legislative frameworks can often be developed in isolation and on economic values alone, with strong intent for environmental protection, but without consideration of behavioural costs and incentives, nor infrastructure and funding required for implementation. In Europe, the Extended Producer responsibility (ERS) scheme varies in regulation across different European member states and combined with fragmented collection and sorting systems, it in fact creates barriers for producers to take more responsible actions to reduce plastic pollution (Jia et al., 2019). They are not providing the incentives to ensure societal alignment with the legislation.

In the Caribbean restrictions were brought in in 2011 which meant ships must now offload all of their waste in ports, but the resulting increase in volume of waste now needing to be processed at ports means there is a risk of lack of infrastructure or reception facilities required to handle the increase. This is of particular concern for small developing states, which lack the finance to improve infrastructure, but their economy relies heavily on cruise ships. Additionally, the high costs of disposal charged by the ports can lead to ships illegally discharging into Caribbean waters (Associations of Caribbean States, 2017).

Getting the balance right of strengthening legislation, whilst building capacity to align to new legislation is critical. Offsets can speed and finance this transition where legislation enables market solutions.

It is recognised globally that more efforts need be made to adhere to and strengthen existing international legislative frameworks that address environmental plastic pollution, and that more funding should be made available to policymakers, manufacturers and consumers to develop and implement technological, behavioural and policy solutions (IUCN 2021). Policies which address jointly; market failures, policy misalignments, and status quo biases, on both the supply and demand sides of recycled plastics markets are likely to be more successful. Recycled plastic production is, for the most part, not economically competitive. Policies that level the playing field between virgin plastics and recycled plastics or support the market would be beneficial. Examples such as the development of globally recognised certification standards for recycled plastic to address the uncertainty about the availability and quality of recycled plastics (OECD, 2018) would also significantly support on-ground organisations in their ability to sell raw recycled product.

Partnerships with community, industry and local governments are vital

A key success factor identified across the board is the involvement of community, industry and local governments.

Community support – including from residents and local business – through direct action, behaviour change and advocacy all contribute to projects at various scales. Businesses that provide indirect support for programs such as accommodation for eco-tourists can also be a critical element of programs.

Engaging relevant industries is also imperative. This fishing industry is of particular note. With a sizable portion of ocean-derived plastic waste both originating from the fishing industry (Lebreton et al., 2018), and threatening fishing stock viability, interest from this industry is two-fold. Fishing groups bring not only ocean experience to projects, but also commitment and tangible resources such as barges and people power to not only assist but take ownership of clean ups and enhanced stewardship of their environment. Similarly, working with local industry and waste producers enables waste to be reduced and or intersected upstream, especially where extended product responsibility programs are in development or in place.

To access plastic offsets markets and the opportunity for long term financial sustainability through them, small operators need to have strong capability in data management to ensure high levels of data integrity for the measurement of the plastic waste they collect and recycle. This can be a significant impediment, but one that can be supported through strategic partnerships with partners who can support strengthened data management systems.

Taken together it is clear that all types of organisations working with plastic waste reduction efforts should be a consideration in the development of policies and legislations, so that their varied roles can be supported, sustained and enhanced. This may include industries who are typically considered to be plastic polluters and it is important that as legislation and markets are developed, mechanisms do not exclude or deter engagement.

Education is important

Education for both upstream and downstream waste stakeholders is critical to ensure a successful waste management system and a global reduction in plastic waste. Respondents in this study focused their education components largely on the end user and broader community, along with staff, however it is also noted the educating the business community could increase investment and lead to local innovations.

Combined with legislation and incentives, education can be a key measure in stopping, interception or reducing pollution upstream and enhancing downstream waste reduction projects viability. Where waste is intercepted or collected, segregation of plastic waste at the source can be a key contributing factor in project feasibility and viability.Where projects aim to divert plastic waste from landfill and this relies extensively on community education and for small scale community led recycling programs, increasing community knowledge in waste identification and segregation to enable pre-sorted materials to be collected from households is considered to be critical to addressing this barrier. This is a key finding of Guerrero et al., 2013 that identified that community awareness was one of the three most important components to efficient waste separation, and citizens that are informed of the benefits of recycling, how to sort waste and if they are able to participate in the design of the program, are much more likely to participate.

Respondents also identified education of staff and knowledge of decision makers at the municipality level as being critical to improving operational efficiencies. This complements previous studies which identified the ability to set up effective waste management systems is dependent on comprehension of new and appropriate technologies, best practices and the environmental need (Guerrero et al., 2013).

The workforce matters

Plastics waste is typically dispersed geographically, and usually comingled with other types of waste such as food residue, paper and other materials (OECD 2018). Aggregating the waste materials into economically viable quantities incurs considerable collection costs and the separation of the plastics fraction for reprocessing can be technically challenging and involves considerable labour costs.

With volunteer labour increasingly difficult to engage and sustain, the makeup and wage-structure of workers plays a vital role. Smaller not-for-profits and charities often rely on casual or volunteer labour which can be limited by circumstance including location and seasonality. For SMEs and business this form of labour is important in start-up phases when cash flow is limited, however the transition to a paid workforce appears to be critical in ensuring ongoing success.

Across higher income countries, worker wages can prohibit labour intensive practices of waste sorting or segregation. This is commonly seen in small locally led recycling projects in Australia and was the experience of some of the interview respondents. This can be a real barrier for transitioning to a sustainable business. Similar to developing countries, mechanisms to overcome this could include better informed communities and improved waste management systems that support the separation and collection of plastic materials at the household as mentioned above, as well as improved technology and infrastructure for sorting. (Guerrero et al., 2013).

The experiences recounted in lower-middle income countries can be different. Here, the value of the sorted product makes payment of wages feasible – even if this is through casual labour - thus securing a vital element of the waste recovery chain. In many developing countries, an informal waste sector exists whereby a fee for waste collection is based on the waste type, volume or weight. Organizing the informal sector, promoting micro-enterprises and integrating the sector into waste management planning is an effective way to extend affordable waste collection services. (Wilson et al., 2006, Guerrero et. al., 2013) and has been critical in enabling success of some of the respondent projects.

Geography and Logistics can work for, or against, program success

Depending on location, geography can form a barrier or enable these programs. Population density, distance between sites, distance from collection points to storage, disposal or recycling facilities are all critical aspects.

In low-population density/geographically disparate nations such as Australia, long distances between collection sites, processing, recycling or disposal create logistical and financial complications that form critical barriers to program continuity. Smaller operations tend to be constrained by these issues, where larger projects work to overcome these constraints by constructing and securing supply chains that support them. Here the plastics offsets market has the potential to provide the necessary capital and sustainable long-term financing to address key barriers.

Regardless, aggregating waste materials into economically viable quantities can incur considerable capital, collection and transport costs. Developing cooperation and coordination between on-ground organisations and logistical companies (standing agreements with recognition of environmental benefit) is of great importance.

There is a lack of clarity regarding the role of Plastic Offset Schemes and lack of established supply chains are a barrier

Whilst many of the organisations who responded to the survey and interview questions were familiar with plastic credit schemes, some still had not heard or had no knowledge of this. This is perhaps reflective of the stage of development of these schemes that remain very much in their infancy. One observation from participant responses is that there is no clear "one-scheme-fits-all" credit scheme available with the structure of the schemes in development reflective of their origins and capabilities (e.g., technological advancement) of their home audience, without necessary consideration of constraints or norms in other locations globally.

There is much more education needed in the sector to enable broad scale uptake of plastic credits and targeting the education to the on-ground organisations is also necessary. As the number of plastics credit projects grow and partnerships with well-known corporate partners and governments grow, this may well change. As with other environmental markets, supporting small operators to understand their roles, responsibilities, but also opportunities for self-determination in such schemes is critical to ensure that localised solutions remain local and that plastics offset projects provide benefits for the local populations where they operate.

Considerable thought also needs to be given to the interplay between initiatives working toward the same goal. For example, does participation in larger recycling initiatives (e.g. remade in Australia) that are supported by government and industry preclude participation in plastic credit schemes, and how does this affect overall viability of both the project and the scheme?

Support for supply chain development and access to a readymade market place for buying and selling raw recycled materials for manufacture would also go a long way to assisting organisations trying to enter the plastic offset market. The resources and time required to develop supply chains is proving difficult for small-medium sized organisations.

There are a number of recycled plastic marketplaces that have very recently been launched, or are soon to be, including, Cirplus, MikaCycle, RPNDEX. This study did not ask respondents about the knowledge of these platforms or their ability to partake, and hence further research would need to be undertaken to determine if these would in fact aid them in their ability to sell their raw materials or not.

Clarifying environmental outcomes through monitoring and accounting will aid decisions for scaling

Although most organisations cited reduction of environmental waste as their primary motivation, few were collecting suitable data to determine if they were having a positive impact on the environment beyond collection volumes. For example, there is an inherent assumption that recycling efforts reduce waste leakage to the environment by diverting waste destined for landfill, but the scale of this effect is unclear without targeted, downstream monitoring. Credits can be awarded for recycling efforts that simply divert waste that was destined for municipal land-fill due to the positive impact this has on reducing the amount of virgin plastics in use, but the environmental impact is unknown. Similarly, waste collection projects may remove plastic waste from one environment but, if this waste is diverted to landfill (rather than recycled or reused), there may be very little net waste removal, and the possibility of leakage back to the environment due to mis-management. Without targeted, downstream monitoring, the scale of impact and effectiveness of efforts is unclear and the understanding of progress toward reduced plastic waste in the environment at all scales is hampered.

At the other end of the scale, programs that include community education could have effects well beyond waste diversion if they generate willingness to engage in environmental clean-up activities and change littering behaviours. It follows that greater and more diverse investment can be achieved if the environmental benefit can be clearly articulated. This is a consideration that should be factored into offset schemes when awarding payment for credits and setting price points.

Undoubtedly, the primary impediments for including environmental monitoring relate to the choice of method (so many are being used across the globe with little standardisation), training of staff in field methods and data processing, and the added costs of implementation. The lack of data sharing, so that organisations can better understand the significance of their impact, also impedes measurement of impact. Given that many countries, and administrative jurisdictions within them, are now setting targets for plastic waste reduction (e.g. phase-out of single-use plastics, container deposit schemes), ability to deliver data on environmental trends to administrators is likely to be advantageous for operators, increasing the intrinsic value of their programs. Use of simple, standardised methods across these operations would provide information that facilitates management at a range of relevant scales, from local to national (Smith and Bernal, 2021). It would also allow individual operations to determine how effective they are in achieving their key objective, and provide feedback to optimise waste-reduction and recycling activities.

Monitoring the broad environmental impact of a program is critical for determining which activities should be scaled and where investment should be made. Targeted monitoring is also needed to identify effective interventions and can be used to motivate mitigation actions at the community level.

How and what to scale?

To grow to the scale needed to meet the global issue of plastic solutions, two important step junctures are noted. Sole or small charity or not-for-profit operators recognise the need to scale their models, but constrained by limited or short-term financing simply cannot secure the personnel or invest in the resources required to achieve this.

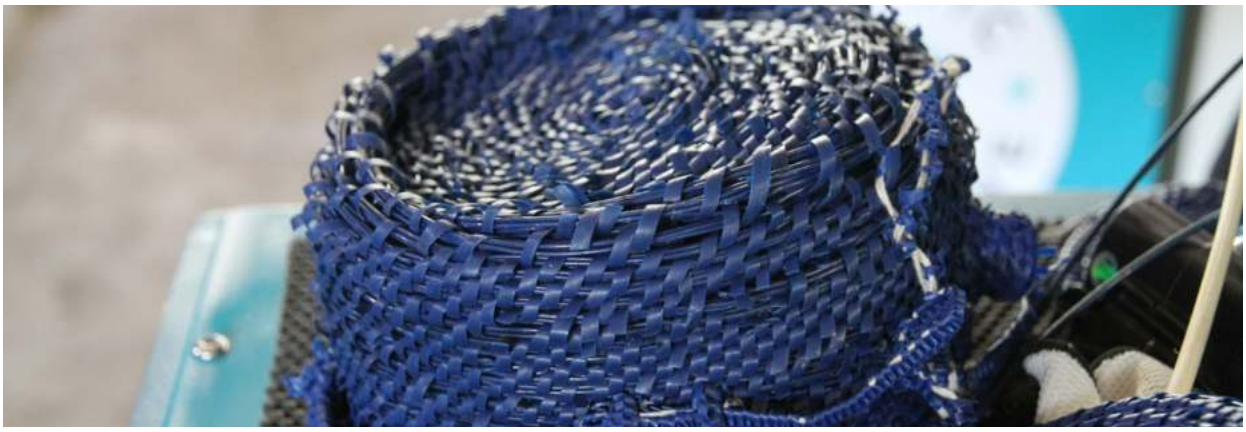
For small to medium enterprises and businesses, the challenge lies in securing supply chains and constantly adapting – or proactively growing – elements of their businesses to stay operational, including resilience to local markets, responsiveness to global challenges (from COVID to legislative and global price fluctuations) and securitisation of supply chains.

One option to improve the power and scalability of small organisations may be through the development of plastic waste cooperatives, where smaller programs can amplify their reach and minimise their administrative burdens through combining resources, labour, administration and knowledge. Local cooperatives would allow pooled collection of raw plastic waste and enable smaller organisations to reach the scale required to access markets. Whether the price point of plastic credits would support such a system would need to be determined.

Across the board, support could be given to growing supply chains and connecting these with the onground programs. This may include connecting or networking programs (in this case the supply) with purchasers (demand). Whilst credits and legislative mechanisms may go some way to creating a theoretical demand for plastics purchase, a tangible link between waste reduction programs and end purchasers cannot always be identified.

Whilst plastic offset markets are one mechanism that may result in providing additional funding to support scaling of projects, they are currently too immature to determine just how effective they might be in supporting projects to become circular. Additionally, the identified lack of knowledge regarding plastic offset markets, particularly in smaller programs, is in itself a fundamental barrier to access and credit market success.

In determining which organisational models to support to scale, it is noted that key success factors to programs are largely non-financial. From the data presented and the experiences of organisations working at the 'coal-face' of environmental plastic waste reduction education of workforce and community, along with strong relationships with local, village and municipal governments are key enabling factors. Specifically, alignment or integration with their municipal waste management programs is identified as key enabling factors. Further enquiry would help to confirm whether these are common to a broader set of organisations and help to address the question of where, and toward what programs, scaling efforts should be directed.



Limitations

It is acknowledged that this research is limited in its interpretation due to the small respondent sample size and the overrepresentation of smaller, not-for-profit organisations in the respondent pool. Thus, the findings largely represent only one part of one sector and the views and conclusions may not be representative of broader plastic waste-reduction operations, which include larger not-for-profits, governments, industries and commercial enterprises.

It is additionally recognised that this report does no fully explore the 'demand' side of the plastic markets equation, nor does it explore some of the more technical or financial aspects of recycled plastic use, including price (virgin versus recycled) and quality: these would be useful, complementary areas of research.

Conclusions

Environmental plastic waste is a vast and highly decentralised global problem. Globally, a number of mechanisms designed to address this burgeoning issue – including legislation and markets – are in various stages of development. At the local scale, numerous dedicated and passionate individuals are working directly to reduce plastic waste in the environment through clean-ups and plastic waste diversions. Through the sharing of personal experience of those involved in these projects and experts in plastic waste research and credit development, it is clear that on-ground action is not necessarily connected into the broader global initiatives which may provide financial or regulatory incentive. Many plastic waste-reduction programs are also limited in their sustainability and scalability by this disconnect.

It is similarly identified that on-ground projects are limited in scale and sustainability by financial and administrative burdens, labour supply and economics and connection into secured appropriate waste-management chains. In some cases, legislation designed to support environmental plastic waste reduction hinders success.

From our sample, larger waste-reduction, removal and recycling programs tend to be more sustainable, are typically integrated in some form with municipal waste management systems, and have greater knowledge of, and involvement in, plastic credit markets.They do, however, face significant challenges in securing, and minimising uncertainty in their supply chains.

It is acknowledged that there is an absence of knowledge within this report on the demand side of recycled plastic material/products and that further exploration of markets and purchaser behaviour and knowledge is required to understand what barriers and opportunities exist from the buyer's side that may drive further engagement. This could be undertaken with a view to connecting those who are looking to purchase plastic products and credits more directly with suppliers.

Whilst it appears involvement with a plastic credits system generally confers benefits to plastic waste programs, a lack of knowledge or understanding of these programs presents the primary barrier to entry. This is especially true for smaller programs which have no or limited knowledge of credit markets. A targeted plastic credits education and awareness package may help in addressing some of these barriers, as would research into standardising a credits scheme and evaluating the impacts these organisations are having. It is possible that the development of cooperatives, or local or regional networks, could improve the viability of small projects, facilitating entry and participation in these schemes.

Smaller projects could also be supported by a network, or industry body, that was willing to create and provide guidance around building successful programs and achieving long-term sustainability.

What is most apparent from this research, is the willingness of many operators to share their experiences, including where projects and programs might be limited in their success. Driven by altruistic motivations to make a positive change, this audience would likely be receptive to measures that work to improve project sustainability including improved opportunities for connection, building technical and market knowledge, and working to remove legislative and financial barriers. There is, however, a broader need to improve measures of impact and value projects accordingly.

Finally, it is imperative that legislation, policy and markets are developed in parallel to provide complementary rather than prohibitive outcomes or unintended consequences. In achieving this, financial, social or behaviour levers might also need to be considered. Ideally, instruments and solutions should consider the diversity of organisations working toward plastic waste removal to best support and scale global initiatives.

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Libby Edge, Ecobarge (Australia)

Johann Beird Vasquez, Fundacion Oceanos Limpios (Dominican Republic)

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Contact

Earthwatch Institute Australia
T (03) 9016 7590
E earth@earthwatch.org.au
W earthwatch.org.au
Suite G-06, 60 Leicester Street
Carlton VIC 3053

ABN 25 875 253 851

Connect with us

@EarthwatchAustralia

@earthwatch_aus

Earthwatch Institute Australia

@EarthwatchAus

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The report was prepared by:
Elizabeth Irvine - Earthwatch Australia
Anjali Nelson - GreenCollar
Stephen Smith - Aquamarine Australia
Cassandra Nichols - Earthwatch Australia

Design: Monisha Alexander & Tanaya Joshi
Photos: Earthwatch Institute Australia, Unsplash

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