



REFORM PLASTIC: ASSESSING ENVIRONMENTAL IMPACT

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1

Research highlights



Research highlights

01

ReForm Plastic conducted a life cycle assessment study to compare the greenhouse gas and particulate matter emissions between 2 options: converting low value waste plastics into boards, or turning it into refuse derived fuel (RDF) that would be burned to generate heat.

02

The study included all processes involved in the treatment of sachet waste and the final products at the end of the treatment process.

03

ReForm Plastic offers formwork boards that replace plywood, cement, or high-density polyethylene, while the RDF generates heat, eliminating the need for coal combustion in cement kilns.

04

The ReForm Plastic process leads to 30-50% lower greenhouse gas emissions than producing RDF, with the variation depending on the electricity consumption of the RDF facility's mechanical treatment process.

05

Compared to uncontrolled emissions from RDF production that is common in Asian countries like Bangladesh, Indonesia, and the Philippines, ReForm Plastic has 80% lower emissions of harmful particulate matter (PM2.5, NOx, SOx).

06

ReForm Plastic's 'plug-and-play' system has few requirements for starting up, making it accessible for adoption by communities. Additionally, it also allows for easy replication in other locations.

07

The payback period for investing in ReForm Plastic's solution is relatively short, ranging from 1 to 4 years. However, this timeframe significantly depends on the success of selling products made from the boards.



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ReForm Plastic Introduction



ABOUT REFORM PLASTIC

ReForm Plastic, a pioneering social enterprise, addresses the challenge of hard-to-manage plastic waste through innovative and affordable upcycling technologies. Our solutions transform these plastics into valuable construction and furniture products, including boards and sheets. We are constantly expanding our solution portfolio to encompass a wider range of waste streams, establishing ourselves as a one-stop shop for cost-effective waste management solutions.

ReForm Plastic's commitment extends beyond technological solutions. We foster social impact by operating a growing network of 14 social franchise factories across South Asia and Africa. These

factories not only remove waste from the environment but also create job opportunities within local communities. Furthermore, our dedicated initiative, The Collector Network, empowers informal waste collectors, predominantly women, by providing essential training, healthcare access, and support services that improve their livelihoods.

ReForm Plastic is dedicated to continuous innovation, actively expanding our solutions to tackle diverse waste streams. We also support businesses in achieving environmental compliance through tailored waste collection services. Join us in transforming waste into sustainable solutions and building a cleaner future for all.



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ReForm Plastic life cycle assessment



What is Life Cycle Assessment?

ReForm Plastic offers an innovative approach to handling low-value plastic waste, setting itself apart from traditional methods like refuse-derived fuel (RDF) production. To compare the environmental impacts of the ReForm Plastic process with RDF, we partnered with Bopinc and PXP Sustainability to conduct a Life Cycle Assessment (LCA) study. Beyond contributing to the LCA study, Bopinc played a crucial role in initiating our expansion into Bangladesh by connecting with ReForm to empower a local operator to recycle sachet waste for the first time in the country.

LCA is a globally recognized, science-based methodology that meticulously evaluates the environmental footprint of a product or service from inception to disposal, encompassing raw material extraction, production, utilization, and end-of-life scenarios (such as landfilling, incineration, or recycling). It stands as the most sophisticated tool for appraising waste-to-resource conversions, considering both the environmental impact of the process itself and the materials replaced by the recycled product.

Sachet Crisis: Unmanaged Waste in Developing Nations

In countries like Bangladesh, Indonesia, and the Philippines, single-use sachets are prevalent due to their affordability and convenience. However, these multi-layer plastics pose recycling challenges and frequently contribute to the escalating piles of plastic waste in landfills or seep into the surrounding land and water bodies due to inadequate waste management systems. While reducing sachet consumption and advocating for refill models are desirable solutions, their implementation faces hurdles, especially considering the reliance of many low-income groups on sachets. ReForm Plastic presents a pragmatic solution by repurposing low-value plastic waste, thereby mitigating environmental pollution.



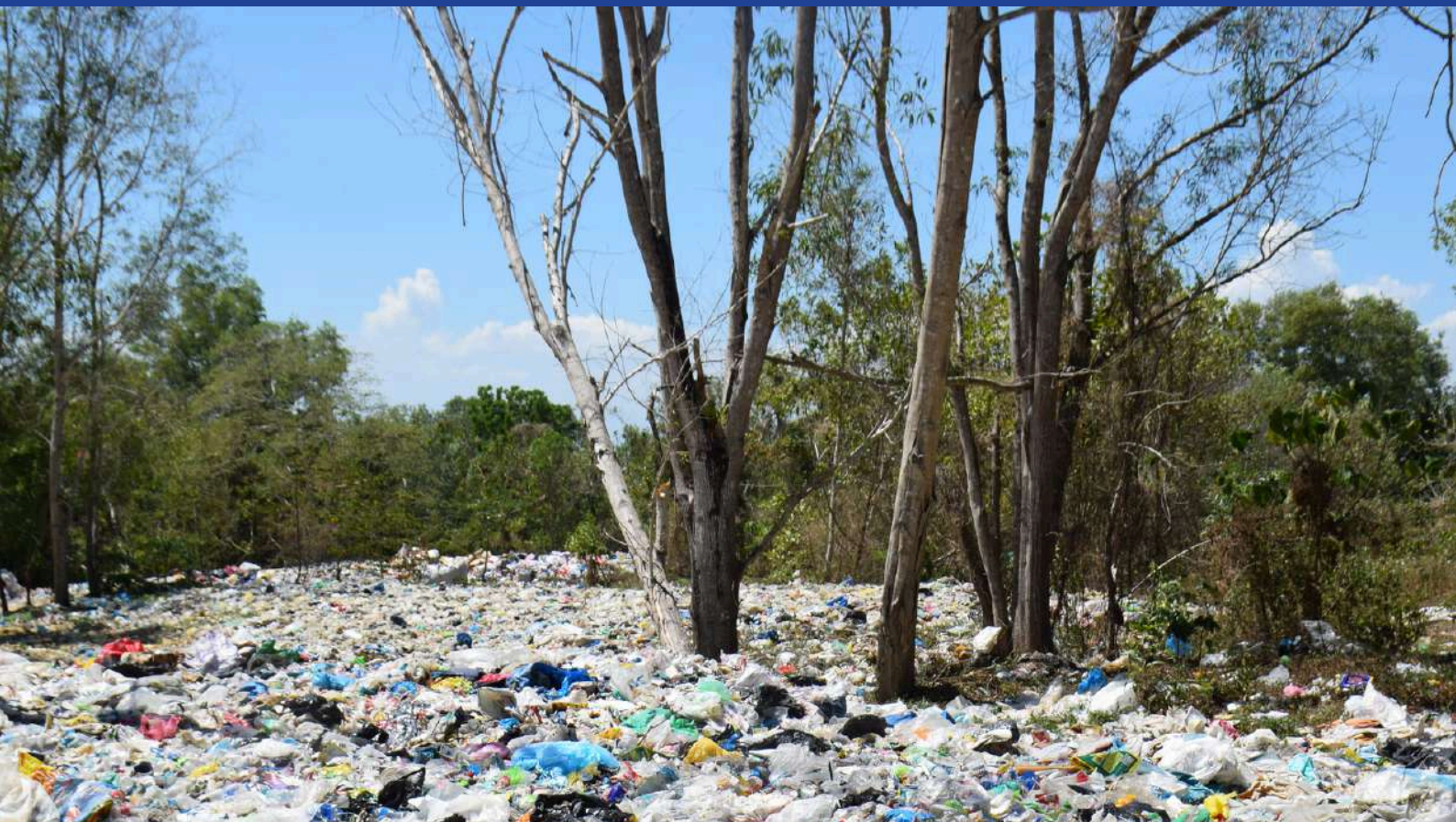
How we used the Life Cycle Assessment

The Life Cycle Assessment (LCA) study assessed the emissions of greenhouse gases (GHGs) and particulate matter, including PM2.5, sulfur oxides (SOx), and nitrous oxides (NOx), when treating 1 tonne of sachet waste using the ReForm Plastic solution compared to RDF production. It comprehensively examined all processes involved in treating the sachet waste and the resulting products (boards for ReForm Plastic and heat generation for RDF).

For ReForm Plastic, the end product is a versatile board suitable for various furniture and products, displacing traditional materials like plywood, cement, or high-density polyethylene (HDPE). Conversely, RDF produces heat through combustion, substituting the heat conventionally derived from coal burning in cement kilns. The LCA study also evaluated the environmental benefits of replacing products with those generated from the sachet waste treatment process.

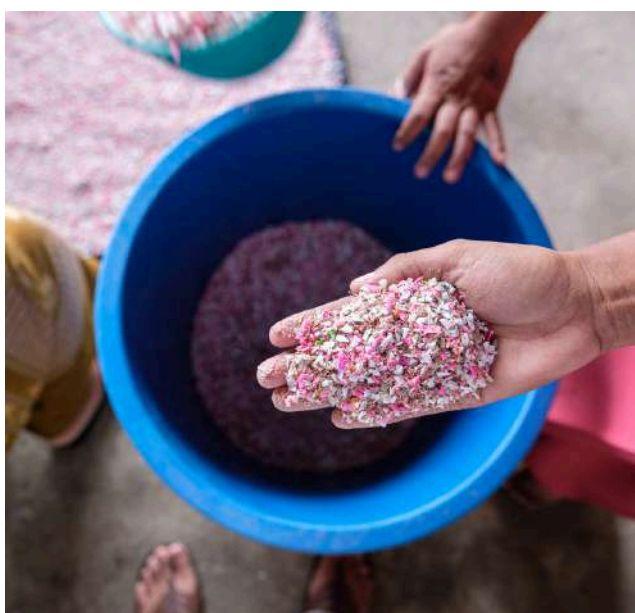
The study analyzed both controlled and uncontrolled emissions during RDF combustion, considering all inputs and outputs associated with ReForm Plastic and RDF treatment processes for sachet waste. Notably, the environmental impact of long-lasting equipment and facilities was excluded due to their extended lifespan of 20-30 years, resulting in minimal environmental contributions per unit of treated waste.

Through this LCA study, ReForm Plastic sought to understand the environmental performance of treating sachet waste with ReForm Plastic versus RDF, while identifying the key activities with the most significant environmental impact for both options.



The ReForm Plastic Board Production Process vs. RDF Production

ReForm Plastic employs a series of machines to transform low-value waste materials (such as plastic sachets) into durable boards. These boards offer versatile functionality, as they can be cut, screwed, and nailed similar to wood. Additionally, they possess the flexibility to be welded akin to high-density polyethylene, molded resembling metal or cardboard, and coated similar to cement. This adaptability makes ReForm Plastic boards suitable for a wide range of applications across various industries.



RDF production involves multiple mechanical processes, including trommel screening, hand sorting, magnetic separation, shredding, and air classifier spinning or wind shifting. Any materials rejected during these processes are usually disposed of. RDF is primarily utilized at cement kilns, where it is combusted (burned) to produce heat, thereby substituting the heat generated by coal combustion. This process not only helps in waste management but also contributes to reducing reliance on coal and lowering carbon emissions in the cement manufacturing process.

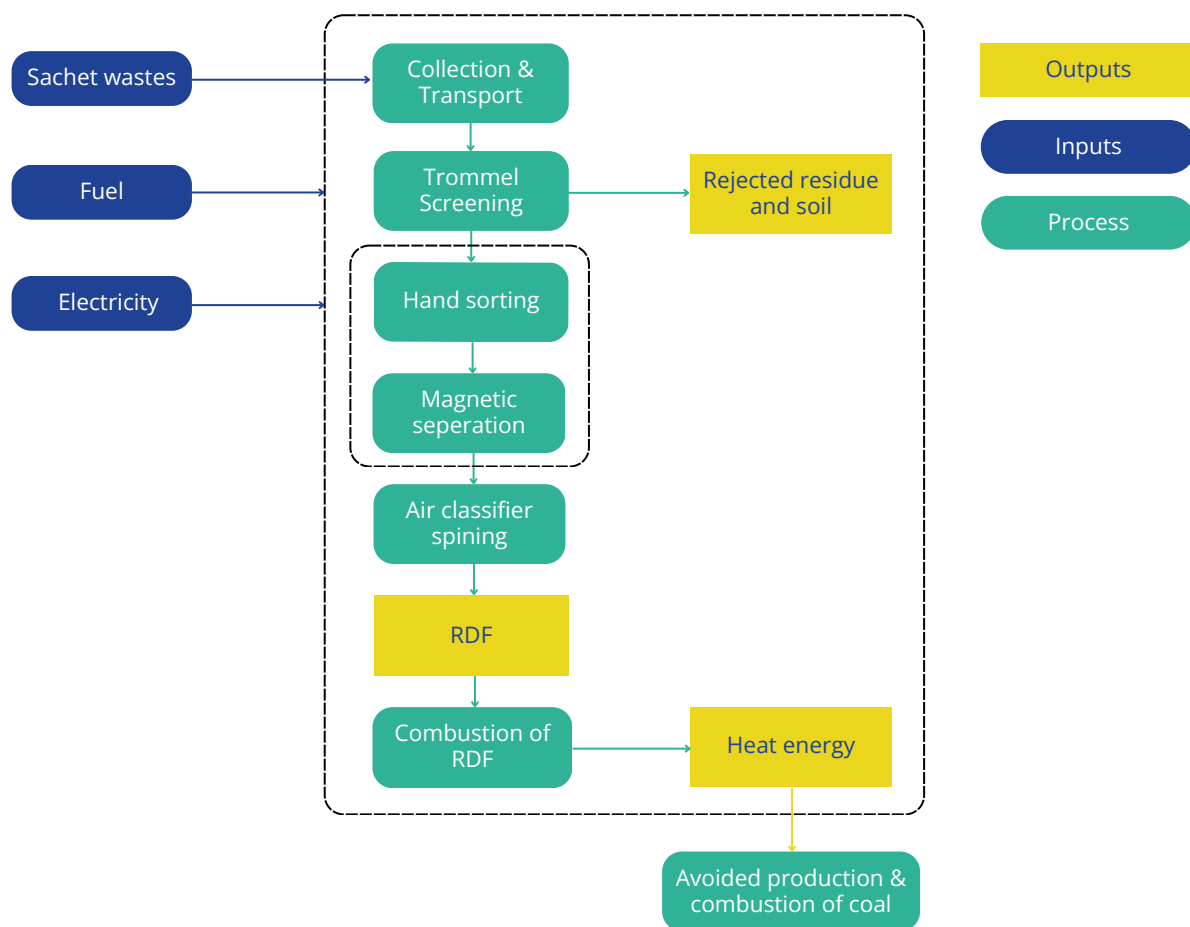


Figure 1.1: RDF Production Process



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ReForm Plastic's Environmental Performance



ReForm Plastic's Environmental Performance

Overall performance:

Using ReForm Plastic to treat sachet waste significantly reduces life cycle greenhouse gas (GHG) and particulate matter emissions compared to producing refuse-derived fuel (RDF). Further emission reductions are achieved when ReForm Plastic boards are used as alternatives to conventional construction materials like virgin HDPE plastic or cement boards.

Treatment process perspective:

This perspective considers all processes involved in treating sachet waste until the final product is produced (eco-friendly boards for ReForm Plastic and heat for RDF).



GHG Emissions: The ReForm Plastic process generates 30-50% lower greenhouse gas (GHG) emissions compared to RDF production, depending on the electricity needed at the RDF facility for mechanical treatment of sachet waste. Nearly all GHG emissions from the ReForm Plastic process come from the electricity used to run the machines.



Particulate Matter Emissions: ReForm Plastic significantly outperforms RDF production in terms of particulate matter emissions (PM2.5, NOx, SOx), particularly in developing countries like Bangladesh, Indonesia, and the Philippines, where uncontrolled emissions are common. Most of RDF's particulate matter emissions arise from the combustion process itself. While advanced emission control technologies can drastically reduce RDF's PM emissions (up to 30 times for PM2.5 in the US), such technologies are often lacking in developing nations, underscoring the environmental advantages of ReForm Plastic.



Factoring in avoided products:

This perspective includes all processes involved in treating sachet waste up to the final product, as well as the avoided environmental impacts from displaced products. The life cycle assessment (LCA) study calculates the GHG and particulate matter emissions from the treatment process and then subtracts the emissions associated with the production of the substituted products.



GHG Emissions: Replacing HDPE boards directly with ReForm Plastic on a 1:1 basis provides the greatest environmental benefit, resulting in net negative GHG emissions. ReForm Plastic boards also outperform plywood, cement boards, and RDF in terms of GHG emissions.



Particulate Matter Emissions: ReForm Plastic significantly reduces particulate matter emissions compared to uncontrolled RDF combustion, even when considering the avoided production of plywood, cement, and HDPE boards, as well as the avoided coal combustion for RDF. The uncontrolled PM2.5 emissions from RDF combustion were so high that the avoided coal combustion did not significantly reduce the total emissions.

Substitution/Replacement Considerations:

It's worth mentioning that this study operated under the assumption of a one-to-one replacement of ReForm Plastic boards versus boards crafted from plywood, cement, and HDPE. However, in practical terms, over the lifespan of a ReForm Plastic formwork board, there may be several replacements of the other board types, resulting in even greater avoided emissions.

Scalability of ReForm Plastic Solution to Address Packaging Waste Challenge:

The waste generated from single-use packaging continues to grow and plague land and water bodies in developing nations that lack reliable and robust waste management systems. ReForm Plastic's solution can divert the massive flows of packaging waste into usable products while reducing GHG and particulate matter emissions compared to other treatment options such as RDF production. ReForm Plastic's plug-and-play solution has low barriers of entry since it can be adopted at a community level and can be easily replicated. Furthermore, investment in ReForm Plastic's solution has a quick payback period of 1-4 years, which is largely dependent on the sale of products made from the formwork boards.

The scalability of ReForm's solution has already been demonstrated across Southeast Asia and countries in Africa.





Scaling Innovation with Social Impact: **ReForm Plastic's Franchise Model**

ReForm Plastic's impact extends beyond technology through our groundbreaking social franchise model. This model empowers local entrepreneurs or organizations to establish factories using our affordable upcycling solutions. With 14 factories already operational across South Asia and Africa, the model showcases its scalability and effectiveness in various settings.

ReForm Plastic offers comprehensive support throughout the franchise journey. We begin with a thorough feasibility assessment, ensuring the technology's suitability within a specific location. Following this assessment, we actively assist franchisees in selecting appropriate machinery, designing optimal factory layouts, overseeing installation, and providing ongoing training and troubleshooting assistance.

We harness technology to further empower our franchise network. We have developed a dedicated digital platform that facilitates communication, knowledge sharing, and the exchange of best practices among franchisees. This platform also serves as a valuable tool for gathering insights and learnings, enabling us to continually enhance our model and support services.

By merging innovative technology with a focus on social impact, ReForm Plastic's franchise model tackles plastic waste head-on while fostering economic development and generating employment opportunities within local communities. This collaborative approach lays the foundation for a cleaner and more sustainable future.



LCA Insights: ReForm Plastic vs. RDF



Environmental Win: ReForm Plastic Beats RDF in Emissions Reduction

The life cycle assessment (LCA) study revealed that ReForm Plastic significantly reduces greenhouse gas emissions and particulate matter compared to RDF production. This reduction is attributed to the innovative process of converting low-value plastic waste into durable boards, which displaces the need for traditional materials like plywood, cement, or high-density polyethylene (HDPE).



Resource Efficiency: ReForm Plastic's Waste-to-Product Triumph

Resource Efficiency: ReForm Plastic demonstrates resource efficiency by repurposing low-value plastic waste into valuable products, thereby diverting waste from landfills and contributing to circular economy principles. In contrast, RDF production relies on the combustion of mixed waste streams, which may not fully utilize the potential energy content of the materials.



Social Impact Success: ReForm Plastic Empowers Communities

Social Impact: ReForm Plastic's franchise model empowers local entrepreneurs and organizations to establish factories, fostering economic development and creating job opportunities within communities. This collaborative approach promotes sustainable waste management practices and supports social inclusion.



Scalability Showcase: ReForm Plastic's Franchise Model Goes Global

Scalability and Accessibility: With 14 factories already operational across South Asia and Africa, ReForm Plastic's franchise model showcases scalability and effectiveness in diverse contexts. By leveraging technology and digital platforms, ReForm Plastic facilitates communication, knowledge sharing, and best practice exchange among franchisees, further enhancing its accessibility and impact.



Sustainability Champion: ReForm Plastic Leads the Way for a Cleaner Future

Long-term Sustainability: The LCA study underscores the long-term sustainability of ReForm Plastic, as it offers a viable solution for treating low-value plastic waste while mitigating environmental pollution. By continuously improving its model and support services, ReForm Plastic paves the way for a cleaner, more sustainable future.

Overall, ReForm Plastic emerges as a promising solution for addressing the environmental and social challenges associated with low-value plastic waste, offering a pathway towards a more sustainable and inclusive waste management ecosystem.



BE PART OF THE CHANGE

Contact our team to explore how:



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