



# Games for Change

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# Executive Summary

Bengaluru has faced challenges with disposing of waste sustainably over the last several decades due to its rapid population growth. The Bengaluru government has introduced a method to handle municipal waste more sustainably, waste segregation, and they depend on the public to help implement it. Despite progress by the government and NGOs in increasing community participation, there are still many citizens who do not segregate waste properly.

To increase community waste segregation, we are introducing Games for Change, an organization that designs and implements educational games for students to help NGOs increase community awareness and participation in proper waste segregation. By educating students of all ages, the message will spread to students' families, and the community as a whole will segregate more of their waste properly.

## Introduction

Bengaluru generates 5000 MT of municipal solid waste daily [1] and is currently facing significant issues in managing its waste due to pre-existing disposal methods of the citizens and the local government agency. In 2015, local NGOs got an order from the High Court to mandate the adoption of 2Bin1Bag throughout Bengaluru [2]. The 2Bin1Bag system was designed to create a way to increase the number of materials that could be reused and recycled, overall reducing the amount of waste going to landfills. The system requires waste to be segregated into three categories during disposal; wet waste, dry waste, and reject waste. Although this system has been in place for nearly 9 years, we have gathered from many conversations with local waste division workers that improper waste segregation is still one of the largest issues they encounter. Local NGOs and Bruhat Bengaluru Mahanagara Palike (BBMP), the administrative body responsible for civil amenities, have been working to address the issues around mixed waste. Still, they are facing challenges in reaching and influencing citizens. The city is projected to be the fastest growing in the Asia-Pacific region in 2023 [3], so the amount of waste generated in the city will only grow. Any inefficiencies and issues currently present in the waste management system in Bengaluru will be exaggerated by this growth if nothing is done about this sooner. One of the essential steps of action outlined by waste experts in the city is for citizens to segregate their waste properly at the household level so that waste can move through the collection and segregation system without issue and the city can move towards a sustainable future.

## Problem

Many people in Bengaluru do not segregate waste properly, meaning they do not use the three-category system of wet waste, dry waste, and reject waste outlined on the [handout in Appendix 7d](#). Of the municipal solid waste that Bengaluru generates every day, 70% is mixed

waste [4]. Some of the mixed waste is delivered directly to landfills, where it remains and is responsible for leaching toxic chemicals into the local waterways and soil, as well as releasing methane into the atmosphere. Landfills are also capable of catching fire when this methane is trapped, releasing other toxic chemicals into the atmosphere as well from the burning waste. The mixed waste which is not directly sent to landfills, is first delivered to dry waste collection centers (DWCCs). When the mixed waste makes its way into the DWCCs and blends with the dry waste, it lowers the dry waste's economic value and makes it almost impossible to recycle [4]. Lowering the economic value of dry waste directly impacts the livelihoods of waste pickers by reducing the amount of money the DWCC operators can pay them for their work. In addition to the impact on the waste pickers' livelihoods, their health and safety are jeopardized when rejected waste, such as sharp objects and bodily fluids, makes its way into the waste sorting piles that they manually sort.

NGOs who work with waste pickers, including Hasiru Dala, have tried different outreach approaches to spread awareness and education about proper segregation to the public. However, due to the reality of their organization's size and resources, they have not been able to make the impact necessary to reach a city with a population of nearly 12 million people. Additionally, citizens can still generate mixed waste even if they have been advised about waste segregation. This can be attributed to multiple reasons. One is that people believe they are segregating properly when they are actually segregating improperly due to a lack of understanding about the waste categories. Through our experiences of living in Bengaluru, we have also seen poor waste segregation firsthand, where residents either don't have a complete understanding of the segregation system or are not willing to prepare their waste properly for disposal.

## Solution

Our solution is Games for Change, an organization that creates and implements educational activities and tools for children that are fun, engaging, and interactive. The goal of the games is to help NGOs working in the waste sector spread their messages to more citizens in the city effectively. By working with each NGO closely, we customize the games to be age-appropriate and to align with the NGO's missions. As we also implement games and activities in schools, we offer more than just a product; we offer an educational experience as our value proposition. As we offer services for educating children of all ages, we have also identified four categories of activities which we have identified to make learning fun and engaging: demonstration games, board games, card games, and role-playing games. Demonstration games would likely include activities where students practice waste segregation by sorting game pieces of simulated waste. Board and card games may focus more on the various roles of waste workers in the management system. Role-playing games would allow students to play different members of the waste management system to understand how their actions impact others and their environment.

## **Customers and Beneficiaries**

An example of an ideal customer for Games for Change are NGOs such as Hasiru Dala, which work in the waste segregation sector and are looking for ways to increase awareness about their missions and initiatives among the citizens of the city. Hasiru Dala advocates specifically for waste pickers' livelihoods and dignity, including aiding waste pickers in finding official employment and providing support for the other aspects of waste pickers' lives. One impact that Hasiru Dala is working towards is to decrease the amount of improperly segregated waste being generated in Bengaluru and to increase awareness about the three-category segregation system in households to improve the working conditions and livelihoods of waste pickers. One approach they are currently pursuing is to complete outreach visits to schools to spread awareness to children instead of adults. Still, their teaching materials are limited to lecture-style presentations only meant for Grade 6 students and above. Hasiru Dala has expressed that they do not have the time and resources to devote to improving their educational materials to make them engaging and appropriate for all ages, especially for Grades 1 through 5. Saahas, another waste management NGO in Bengaluru, has similar missions to Hasiru Dala and has identified a zero-waste reality as one of their missions [5], so we have identified them as another potential customer, along with other NGOs that work in the waste sector in Bengaluru.

The beneficiaries of our services include the students interacting with our games and the waste pickers that will come across less mixed waste in their work, based on our theory of change. Children that attend schools connected with Games for Change will be able to participate in activities to educate them about proper waste segregation. Since the games are designed for specific age groups, students will be able to learn effectively. On top of that, we ensure that the games are fun for students, offering them an exciting experience while learning about waste segregation. Waste pickers will also benefit from these activities through the larger theory of change below. After more families are mindful of their waste and rates of mixed waste begin to decrease in the city, waste pickers will come across less mixed waste in their workdays and will be less at risk for contracting diseases and injuries from mixed waste. Their work environments will also shift to being cleaner and more comfortable as less wet and reject waste will be present, decreasing bug and rodent infestations and strong smells. Additionally, decreased amounts of mixed waste in DWCCs will lead to higher revenue for the centers and increase livelihoods for the waste pickers, as less dry waste will be ruined for sale by mixed waste.

## **Theory of Change**

If NGOs were able to reach more citizens in an effective way about the importance of proper segregation and how to implement it into their daily lives, their missions could be furthered, and there could be a decrease in the amount of mixed waste generated every day in the city. This is the aim of Games for Change, except that instead of targeting adult citizens, we target the children of citizens.

By targeting children with educational activities and tools to explain the importance of segregation and how to implement it in their homes, they can spread what they have learned to their families to be more mindful of their everyday waste. Once enough families have been

influenced this way, the general rates of mixed waste generated in the city will decrease. A more detailed explanation of our theory of change is outlined in [Appendix 9](#). Research suggests that children acting as agents of change is an effective way to influence household attitudes and behaviors [6], [7] [8]. There is also evidence to suggest that education can change a person's behavior [9], [10].

There have also been programs in the past that have focused on educating children for the purpose of increasing awareness about proper segregation practices. One program run by BBMP in February 2020 involved BBMP Marshalls visiting one school a week to educate children about waste segregation as an afterschool program [11]. While the success and the duration of the program are unknown, the program involved students by segregating bags of mixed waste into categories and was implied to be engaging for students. One fault of this program was that the program only taught about two categories of waste, wet and dry. It did not include reject waste as a separate category, showing how our solution will differ from past programs such as this one. Another similar program was run by the Association for Promoting Social Action (APSA) and concluded in 2018 [12]. While this program involved educating both schools and communities about topics relating to sanitation and waste through multiple efforts, one main action of the program was to facilitate education sessions around the importance of waste segregation and disposal. After the program was concluded, follow up work showed that 70% of the families involved in the program were continuing proper waste segregation practices [12], showing the effectiveness of the educational program.

We also consulted with waste management experts working with Hasiru Dala that have experience with developing educational tools and programs for waste segregation awareness. These experts supported our theory of change as well as our initial prototype of an engaging educational game, outlined in [Appendix 7a](#). The results of testing our prototype in an actual classroom are outlined in [Appendix 8](#), where we found that our prototype of an interactive game increased waste segregation knowledge in children, supporting our initial step of our theory of change of educating children about segregation with our games and activities.

Based on the evidence listed above, we are confident that the desired impact for Games for Change is feasible and will be able to be observed and proven further through our Minimum Viable Product.

# Business Model

## Costs and Payment

We determine the costs of our service on a case-by-case basis with each NGO. We allow them to customize certain attributes of our service, such as how many schools they want to reach and how complex of a game they want us to design, and we give them a quote based on how much costs we expect to incur. We created a price calculator that our organization can use to give

quotes to each NGO we work with. This calculator takes several variables into account, and the value of these variables is agreed upon between our organization and the NGO during our initial meetings. For example, one of the variables is the number of hours required to design and build the game. After the first meeting with the NGO, the design-builders will determine an estimate for the amount of time it will take to make the game. They will base their quote on this value, and payment for additional hours taken to design and build the game at the end of the process will be reflected in the final payment by the NGO. For more details, the detailed revenue model is located in [Appendix 6](#), and the price calculator is located in [Appendix 7](#).

## Our Team

Our organization's human resources are split into three roles: Design-Builders, Facilitators, and a Manager. Design-Builders meet with the NGO to ascertain their preferences for the game, design the game, order materials, assemble the game materials, and design the protocol to facilitate the game at schools. We will primarily try to hire design degree graduates in Bengaluru. However, we will also hire candidates with craft work experience or who otherwise seem like a good fit, and we will pay them at the common entry-level creative designer rate in Bengaluru of 4.2 lakh INR per year. Facilitators take the games to schools and run the games based on protocols outlined by the Design-builders. This job does not require as much education as design-builders, but these professionals should be fun-spirited and very good at working with children. We will primarily look for professionals with experience in child care or other kinds of experience that would make them a good fit. They will be paid according to the average daycare worker salary in India of 1.7 lakh INR per year. The Manager keeps track of other employees' activities, manages finances, reaches out to schools to run activities, and contacts NGOs to be potential clients. We expect this individual to have management, communication, and accounting skills, so an MBA is preferred. We will pay them the average entry-level manager rate in India, 11.8 lakh INR per year. All average salary data is sourced from the Ambition Box website [13].

## Minimum Viable Product

Our Minimum Viable Product is to work with an NGO in the waste management sector in Bengaluru. We will begin by meeting with the NGO to discuss what previous efforts relating to waste segregation awareness have been made, if any, and to understand their mission. During the initial meeting, we will gather information regarding the type of game they would like designed and the age group they would like to target. Following the initial meeting, our design team will begin building the game. Our game developer will hold additional meetings with the NGO at certain game-developing milestones to continuously receive their feedback.

After the game is developed and the NGO feels satisfied with the product, our manager will build a schedule for our facilitator to visit 15 schools. Once the school visit schedule is confirmed, our facilitator will visit each school and implement the game. For each implementation of the game, our facilitator will conduct a before and after survey to assess the



knowledge of the children and gather data on the impact the game had on their awareness of the waste subject. After the game has been conducted in all 15 visits, the NGO will receive a financial statement for our services and all the compiled data.

To test that our MVP succeeds at educating students and changing community behavior, we will conduct two RCTs during this NGO partnership. These RCTs are outlined in [Appendix 2](#).

## Scaling

Our overall plan to scale our organization is to partner with more NGOs and expand our portfolio of game types. To reach more organizations, we will contact other NGOs in Bengaluru focusing on waste segregation in India, including Saahas. Once we have successfully partnered with multiple waste segregation NGOs in Bengaluru, we will start reaching out to all NGOs in the waste and sustainability sectors in Bengaluru to be our customers. Once we have established ourselves in working with NGOs in Bengaluru after 3 years, we will reach out to organizations in other cities in India and expand across the nation. In particular, we have identified Green Worms, a waste management NGO in Kerala, as another potential customer. Over time, we may add bases of operation in these other cities to mitigate the costs of shipping and travel. We hope that as we interact with more NGOs working in a given community, the name of our business will spread, allowing us to find customers more readily.

As we partner with more NGOs, we will expand our portfolio of game types we offer, including diversifying to other media formats to make online games. An online format would have the potential to reach more children and adults with proper advertising channels, and it would eliminate material, transportation, and facilitation costs. However, we would have to consult or hire an online game developer. As multiple game types are developed, some could be reused with other organizations, reducing the time to develop games as our business scales.

We see Games for Change as having an influential impact on the waste segregation awareness sector and even including other issues across the waste sector in cities across India. At Games for Change, we change the game to empower NGOs to change the world.

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# Appendices

## Appendix 1: Description of RCT

We have two RCTs that we will implement to test our theory of change: (1) a short time-scale test of whether our games educate students better than previous methods, and (2) a long time-scale test of how our games impact segregation practices in communities.

### Short-term effectiveness RCT:

**Assumption:** Our games are more effective at teaching students waste segregation than traditional lectures and media.

RCT: Group A: plays the game, Group B: does not play the game. Test both groups on segregation knowledge after group A plays the game. Compare results. If group A does better on the test than group B with all other conditions held reasonably identical, then we can conclude that the game improved understanding of waste segregation practices among the children.

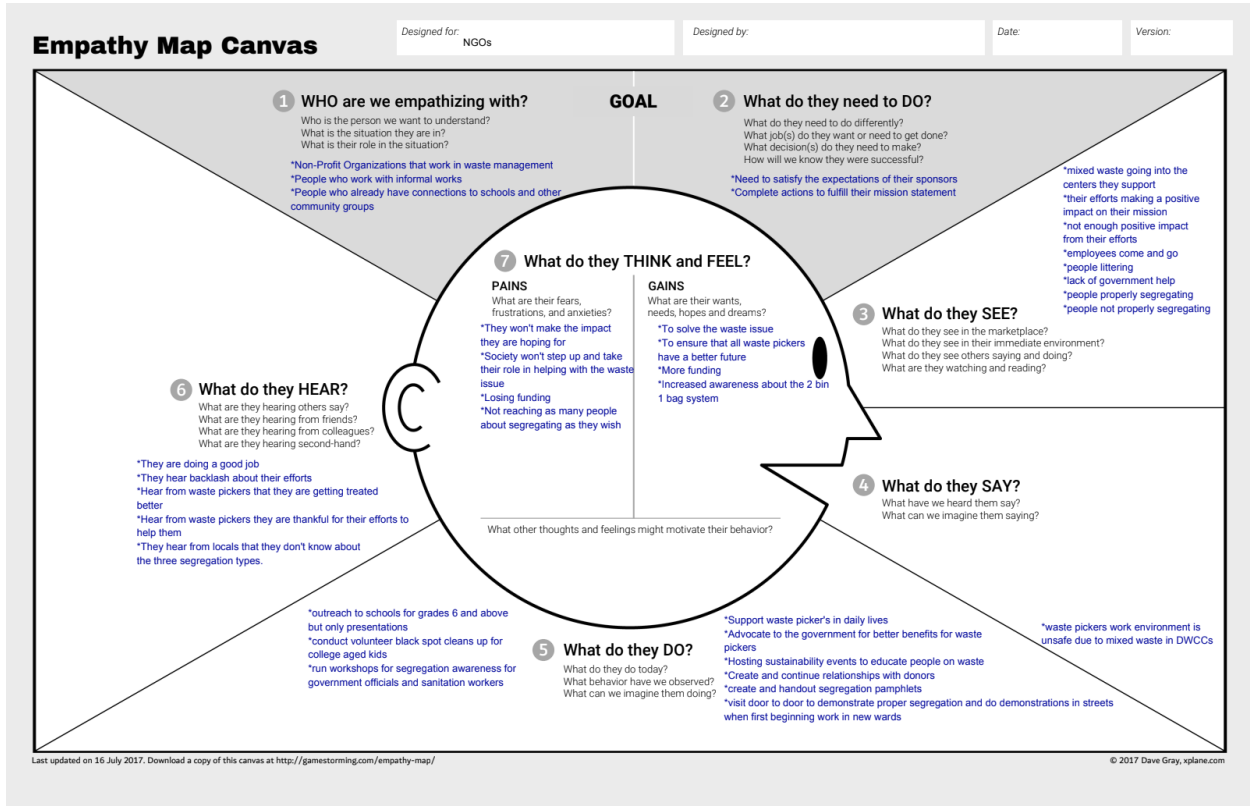
### Long-term effectiveness RCT:

**Assumption:** Facilitating our games in schools improves segregation in communities.

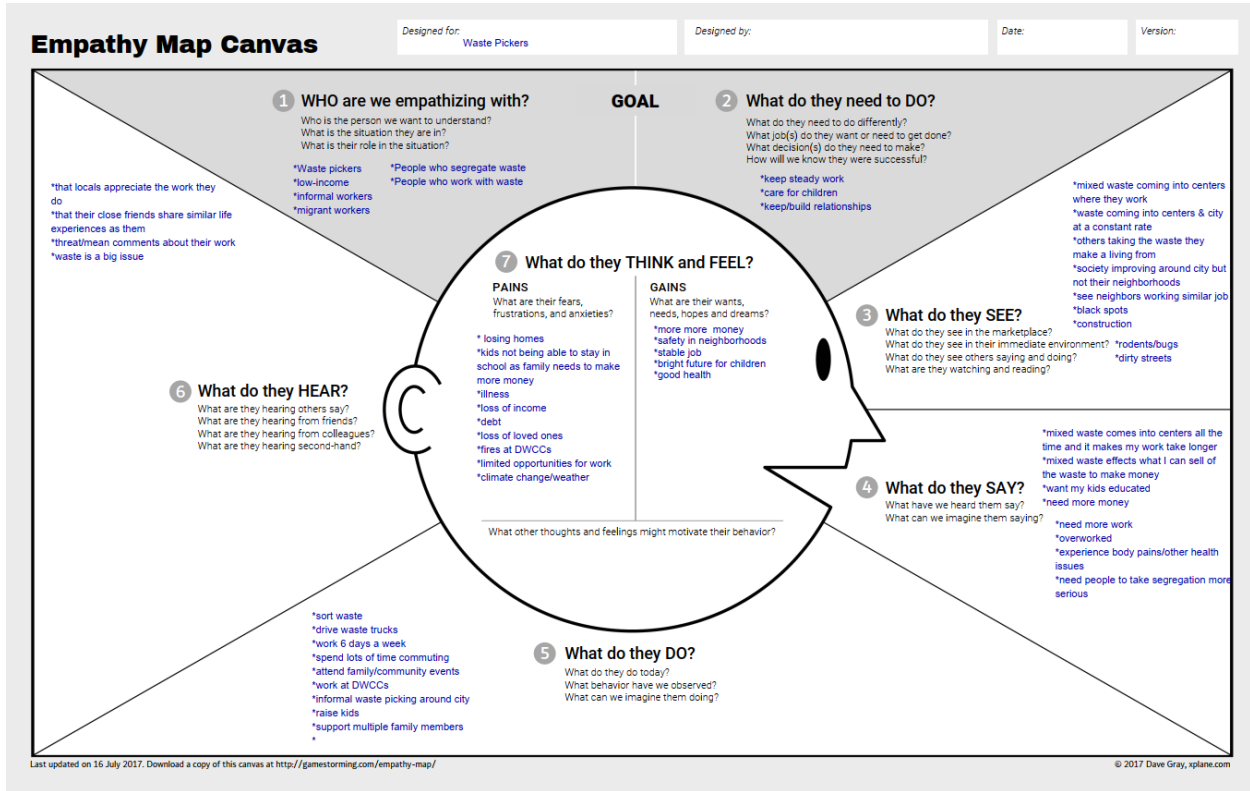
RCT:

1. Find 20 wards in Bengaluru with diverse income levels and locations across the city.
2. Contact DWCC operators in each of these wards, and ask for data on the total amount of waste sorted at each center, and the amount of waste sent to landfill from the center over the previous 12 months. We will refer to this 12-month period as Period 0.
3. Choose 10 wards at random to implement game activities in. Leave the other 10 wards uninvolved.
4. For a six-month period, implement the sorting game activity at 20 schools in each of the ten wards once.
5. After the end of this six-month period, collect the same waste data as in step 2 for this 6-month period. We will refer to this six-month period as Period 1.
6. Repeat steps 3 through 5 for two more six-month periods, measuring the same ward's data and facilitating at schools in the same ward. These six-month periods will be called Periods 2 and 3.
7. Compare the data between the two sets of wards.
  - a. For each DWCC and time period, divide the amount of waste sent to the landfill by the amount of waste sorted to get a proportion of waste sent to the landfill for the DWCC and time period.
  - b. For the change during Period 1, calculate the difference in the proportion of waste sent to landfill for each DWCC between Period 0 and Period 1, average these differences for the ten wards with games and the ten wards without games, and compare the average differences.
  - c. Repeat step 7b for the differences between Period 0 and Periods 2 and 3.
8. If the before-and-after differences for the average proportion of waste sent to landfill are more negative for the wards with the games than wards without games to a statistically significant degree, we can conclude that our theory of change is supported by empirical evidence.

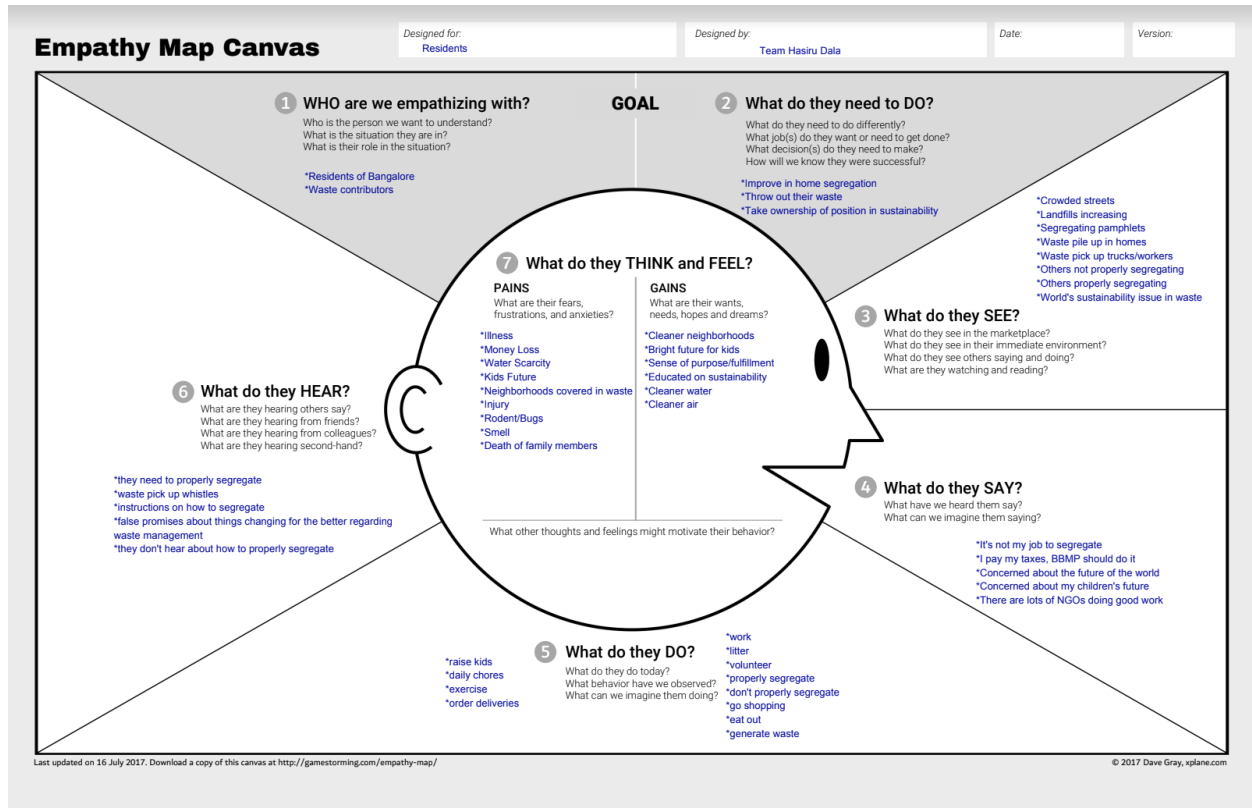
# Appendix 2a: Empathy Map - NGOs



# Appendix 2b: Empathy Map - Waste workers



# Appendix 2c: Empathy Map - Bengaluru residents



## Appendix 3a: Story in 7 Sentences - NGOs

Once upon a time, segregation of waste was a major issue in India

And every day, NGOs in waste management desired a way to educate children on the importance of proper segregation

Until one day, Games for Change came along and offered their services to develop and implement interactive educational tools to children to educate them on proper segregation methods to help spread the NGOs mission

And because of this, the knowledge of the 3 different segregation categories spread throughout the communities of children who then spread their knowledge to their families and their societies

And because of this, a decrease in improper segregation was noticed by the waste management sector and lowered the amount of waste going to landfills

Until finally, all members of society were educated and given the tools to properly segregate their waste

And ever since that day, all waste was properly segregated, waste pickers were able to safely conduct their work and sell more of their waste for profit making the NGOs jobs more successful in their efforts and the city was less polluted by waste



## Appendix 3b: Story in 7 Sentences - Bengaluru resident

Once upon a time, a student named Lakshmi lived with her family in Bengaluru.

And every day, they would generate waste through their activities and throw it away into their trash can without thinking about it.

Until one day, Lakshmi went to school and learned about the concept of waste segregation through an interactive activity with her classmates, and how improper segregation harms the environment.

And because of this, she went home and told her parents that she wanted to help the environment by segregating their waste into three categories.

Until finally, Lakshmi's parents got two bins and one bag to start sorting their waste properly.

And ever since that day, all of Lakshmi's family has been segregating their waste properly into three categories.

# Appendix 4: Business Model Canvas

(link to [Business Model Canvas document](#))

		Business Model Canvas		Date: 2023
		Games for Change, not Pure Paani		
<b>Key Partners</b> <ul style="list-style-type: none"> <li>Optimization and economy of scale: NGOs are our key partners because they are our customers and come to us to outsource the creation and development of educational materials. They may not have the resources or opportunities to focus on these tasks themselves.</li> <li>Game developers (to help design the games)?</li> <li>Web developers (to help produce online materials)?</li> </ul>	<b>Key Activities</b> <p>Production:</p> <ul style="list-style-type: none"> <li>Designing engaging educational materials and activities for NGOs to spread awareness about their desired topic to students of all ages in schools</li> <li>Facilitation of game</li> </ul> <p>Problem Solving</p> <ul style="list-style-type: none"> <li>Iterating on designs to ensure they are as effective as possible.</li> <li>Working with NGOs to understand their previous efforts in spreading awareness and their design issues.</li> </ul>	<b>Value Proposition</b> <p>Customization, Cost reduction</p> <ul style="list-style-type: none"> <li>Creating educational materials and activities based on the NGOs mission and what they want to spread awareness about.</li> <li>Ensuring that these materials and activities are engaging and interactive for students of all ages.</li> <li>Implementing games at schools for NGOs</li> <li>Providing data on the results of the game of pregame and postgame awareness</li> </ul>	<b>Customer Relationships</b> <p>Personal Assistance:</p> <ul style="list-style-type: none"> <li>We work very closely with each NGO during our development and evaluation phases and communicate with them regularly, especially when they reach out due to concerns or design requests.</li> <li>Communication through in-person and online means for customers, and communication with beneficiaries through the NGO and their connections.</li> </ul>	<b>Customer Segments</b> <p>Niche market</p> <ul style="list-style-type: none"> <li>NGOs working in the waste management sector. In particular, Hasiru Dala has agreed that they would be a direct customer initially. We also plan to involve other waste NGOs in Bangalore and across India afterwards.</li> </ul>
		<b>Key Resources</b> <ul style="list-style-type: none"> <li>Human: Designers to develop educational materials and games while collaborating with NGOs.</li> <li>Game facilitators to implement the games at schools once developed</li> <li>Manager to handle all staff operations, scheduling and finances</li> <li>Physical: Materials and software needed to create educational tools/activities.</li> <li>Intellectual: Brand name after establishing ourselves as a resource among NGOs.</li> </ul>	<b>Channels</b> <p>Awareness:</p> <ul style="list-style-type: none"> <li>Word of mouth between NGOs, social media, and outreach to NGOs directly that work in Bangalore.</li> </ul> <p>Development &amp; Implementation:</p> <ul style="list-style-type: none"> <li>Consistent communication with NGOs during game development to get continuous feedback and provide survey data post implementation</li> </ul> <p>After sales:</p> <ul style="list-style-type: none"> <li>Continued work with the NGO to understand the effectiveness of materials, continue iterating on designs and potentially continue to work with new schools for them</li> </ul>	
<b>Cost Structure</b> <p>Value driven:</p> <ul style="list-style-type: none"> <li>Materials required to create educational tools/activities</li> <li>Service Variables: Numbers of schools visited, time required at schools, staff transportation cost</li> <li>Daily Staff Rates</li> </ul>		<b>Revenue Streams</b> <ul style="list-style-type: none"> <li>Usage Fee: We are hired by the NGOs to design and implement the games. The NGOs pay us for our services and the materials to make the games.</li> </ul>		

## Appendix 5: Revenue Model

Our organization will obtain revenue by charging our customer NGOs for the price of each game we make and facilitate at schools for them. The price is determined from a price calculator we developed.

### The Price Calculator

Our price calculator is an excel file that takes into account several variables that determine the cost to produce and facilitate one game that the NGO requests. These variables include:

- Service Variables
  - Number of school visits
  - Average duration of school visits (hr)
  - Average distance of school visits from Games for Change office (km)
  - Estimated time to design game (hr)
- Staff Rates
  - Manager Rate (INR/day)
  - Designer-Builder Rate (INR/day)
  - Facilitator Rate (INR/day)
- Materials
  - Number of games made
  - Materials cost per game(INR)
  - Material Delivery costs (INR)
- Assumptions
  - Cost to drive 1 km (INR)

The calculator function includes the following components:

- The estimated time to design and build the game is multiplied by the Manager pay rate and the Design-builder pay rate multiplied by the number of Design-builders to determine the cost of labor for design and build.
- The duration of each school visit is multiplied by the number of school visits, the pay rate of a facilitator, and the number of facilitators to determine facilitation cost.
- The cost of facilitation and the cost of design and build are both multiplied by two so that additional business costs, including overhead, insurance, scaling, and benefits, can be supported in addition to employee salaries. We will call this number the adjusted cost of labor.
- Cost to drive a kilometer on average is multiplied by the average distance of a school trip. This value is multiplied by 2 (there and back) and the number of school visits to determine the cost of transportation.
- Cost of materials and delivery are added together and multiplied by the number of games to be made to determine the cost of games.
- The cost of games, transportation, and adjusted cost of labor are added together for the total price of our service that will be quoted to the customer NGO.

## Appendix 6: Price Calculator

We produced our Price Calculator in Google Sheets. The interface is displayed below. The exact function we used to determine our quote is shown in green in the bottom-right corner of the screen shot.

	A	B	C	D
1	<b>Variable</b>	<b>Input</b>		
2	<b>Service Variables</b>			
3	Number of school visits	30		
4	Average duration of school visits (hr)	2.5		
5	Average distance of school visits from GforC location (km)	12		
6	Estimated time to design game (hr)	20		
7	<b>Staff Rates</b>			
8	Manager Rate (INR/day)	1000		
9	Designer-Builder Rate (INR/day)	750		
10	Facilitator Rate (INR/day)	500		
11	<b>Number of Staff on Job</b>			
12	Designer-Builders	2		
13	Facilitators	2		
14	<b>Materials</b>			
15	Number of games made	5		
16	Materials cost per game(INR)	2000		
17	Material Delivery costs (INR)	200		
18	<b>Assumptions</b>			
19	Cost to drive 1 km (INR)	30		
20				
21	<b>Total price (INR)</b>	63850		$(B16+B17)*B15+B5*B19*2*B3+(B6*((B8/8)+(B9/8)*B12)+B3*(B4)*(B10/8)*B13)*2$
22	<b>Total price (USD)</b>	778.6585366		$B17/82$ (82 INR:\$ exchange rate)
23				

## Appendix 7a: Description of Prototype

Our prototype consisted of an interactive sorting game and directions to facilitate the game at schools. We implemented this prototype at Parikrma school with a class of 7th graders.

### Description of game components

The game materials included the following for a class of 30 students:

- square foam pieces with pictures of fake waste glued onto them - 5 sets of 30 pieces
- buckets, with labels - Five sets of three buckets labeled “Dry”, “Wet”, and “Reject”
- Quiz cards - 2 sets of 30 (for before and after the game)

A set of three buckets is lined up for each team, and a pile of 30 waste pieces is placed 3 meters away from these buckets. The students run to pick up the pieces and carry them back to their bins.

### Game rules

For each group, no more than one student at a time must run to collect a piece from their pile. Only pieces sorted in the correct bin will receive a point. Reject waste pieces that must be handed in separately in real life must be placed beside the reject bin in the game to receive a point.

### Facilitation Steps

1. Introduce selves and why we're there
2. Explain waste segregation to make sure everyone knows what we're talking about
3. Hand out a segregation quiz and ask students to take it - 2 minutes
4. Collect the quiz, and explain how the game will go
5. Split students into equal teams of 4-6 students, and have them line up behind their buckets.
6. Give each team a waste segregation handout.
7. Begin the game.
  - a. Tell each student they have 5 minutes to sort all of the waste, and say, “ready? Go!”
  - b. Time the students and tell them when they have one minute left.
  - c. If any students are breaking the rules, tell them, and ask them to return to their team without a waste piece and start over.
  - d. If the students are going much faster than expected, reassess, and announce a new stopping point if momentum and energy are starting to decrease.
8. When the game is over, gather students back into one group and ask how they liked the game while other facilitators count the waste sorted correctly
9. Collect the waste pieces sorted incorrectly, take them to the group, and explain where each waste piece should go and why.
10. Collect the waste segregation handouts.
11. Hand out a follow-up segregation quiz and have the students take that individually - 2 minutes
12. Collect the quiz and announce the winner
13. Express that the students did a great job, and hand them all back their waste segregation handouts to take home to their parents. Provide snacks as a participation reward.

## Appendix 7b: Prototype Media

Here is a link to a video of us running the prototype posted on Instagram:

[https://www.instagram.com/p/Cpiefmir10k/?utm\\_source=ig\\_web\\_copy\\_link](https://www.instagram.com/p/Cpiefmir10k/?utm_source=ig_web_copy_link)

Game materials:



Students taking the quiz:



Students playing the game:



Discussion after the game:





## Appendix 7c: Waste sorting quiz

This is a filled out waste segregation quiz that we gave to the Parikrma students before and after playing the segregation game.

Item	Wet	Dry	Reject
banana peel	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
plastic water bottle	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
tea bag	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Used tissues	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
paper	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
broken glass	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

# Appendix 7d: Waste Segregation Guide Handout

PDF found on the 2Bin1Bag [website](http://www.2bin1bag.in).

## Waste Segregation Guidelines

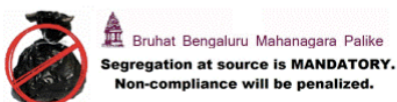
 <b>1. Organic Waste</b>	 <b>2. Dry Waste</b>	 <b>3. Reject Waste</b>
<p>(Do <b>NOT</b> use a plastic liner)</p> <p><b>Kitchen Waste</b>            Vegetable/fruit peels            Cooked food/Leftovers            Egg shells            Chicken/fish bones            Rotten fruits/vegetables            Tissue paper soiled with food            Tea bags/Coffee grinds            Leaf plates</p>  <p><b>Garden waste *</b>            (small quantity only; from Apt)            Fallen Leaves/twigs            Puja flowers/garlands            Weeds</p> 	<p>(Use only <b>reusable</b> bags for disposal)</p> <p><b>Plastic (Must be rinsed if soiled)</b>            Plastic covers/bottles/boxes/items            Chips/toffee wrappers            Plastic cups            Milk/Curd packets</p> <p><b>Paper (Must be rinsed if soiled)</b>            Newspaper/Magazines            Stationery/Junk mail            Cardboard cartons            Pizza boxes            Tetrapaks            Paper cups and plates</p>  <p><b>Metal</b>            Foil containers            Metal cans</p>  <p><b>Glass (handle with care)</b>            Unbroken glass bottles</p>  <p><b>Other dry waste</b>            Rubber/Thermocol            Old mops/Dusters/Sponges            Cosmetics,            Ceramics, Wooden Chips,            Hair            Coconut shells</p>  <p><b>E-waste (handle with care)</b>            Batteries            CDs/Tapes            Thermometers</p>  <p>Bulbs/tube lights/CFLs **            (hand over separately)</p> 	<p>(Do <b>NOT</b> use a plastic liner)</p> <p><b>Sanitary waste</b>            (Use a newspaper for wrapping)            Diapers/Sanitary napkins            Bandages            Condoms            Nails            Used tissues            Medicines            Swept dust</p>  <p>(Limited quantities of mixed waste is allowed, such as heavily soiled plastic or soiled paper)</p> <p><b>Sharps §</b> (small quantities only; wrap in newspaper and hand over separately)            Razors/Blades            Used syringes            Injection vials</p>  <p><b>Construction debris/Inerts x</b>            (Hand over separately)</p> <p>Rubble            Paints            Silt from drains            Cement powder            Bricks            Flower pots</p>  <p>Broken glass            (wrap in newspaper)</p> 

\* Garden waste from our campus grounds will be picked up separately.

\*\* Hand over your fused tube-lights and bulbs separately. There is a separate bin for these items in the basement.

§ There is a separate bin for the sharps items in the basement.

x Construction debris in large quantities will be charged extra per load.





## Appendix 8: Prototype Feedback

We received feedback on our prototype in two ways: (1) By asking teachers and students present at the activity what they thought and felt about the game, (2) by observing how the game went, and (3) by testing how student understanding of segregation changed with participation in the game.

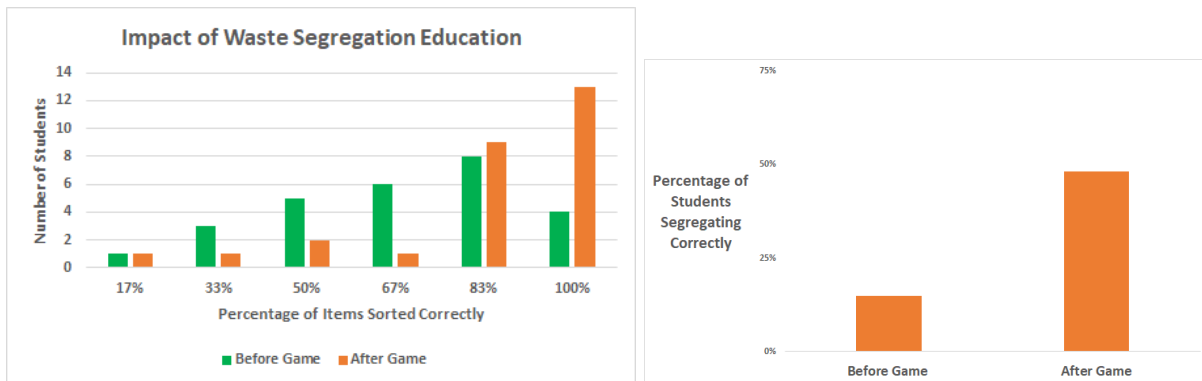
### Qualitative feedback:

- The students said they liked running during the game.
- Teachers liked the activity and wanted these students to tell students in other classes about this activity.

### Observations:

- The children sorted much faster than we expected. We initially expected they would need 15 minutes to sort the pieces, but they only took 6 minutes.
- Children did not stick to the lining up rule very well. We had to repeatedly enforce the one-at-a-time rule for the game, as students would start running to the pile at the same time in each group. In the future we would consider defining a method to better enforce the rules, or to simplify the rules.

### Testing results:



As shown in the graphs above, more students sorted 6 out of 6 waste objects correctly on the quiz after the game than before, showing that our game improved accuracy of waste sorting.

# Appendix 9: Theory of Change

(link to [Theory of Change document](#) as well)

I want to clarify my priorities  
by defining my goals and the path to reach them

## THEORY OF CHANGE

