

A reflective report on the impact of ecobricking efforts by Bricking-it Bristol

Authors; Madeleine Severn, Francis Gordon, Clara Humphries (Bricking-it Team),

Rachael Hall (Writer and editor)



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1.Executive Summary

As part of the Our Data commission, the Bricking-it Bristol team has been monitoring and evaluating the impact of ecobricking across the city. Using both quantitative and qualitative data collection we have gathered information about; the total volume of single use plastic contained by Bricking-it, the size and quality of the bricks submitted and how these bricks were submitted. Throughout the process we have responded to participant responses to inform and develop our operations, and improve the viability of bricks collected.

With this data we aim to develop our educational programme, provide analysis about plastic waste across Bristol and promote responsible ecobricking. We were surprised how much data collection helped us; by collecting quantitative data about brick weight we were able to identify a problem with contaminated bricks and by collecting qualitative data from individuals submitting bricks via a questionnaire, we were able to determine why we were getting so many underweight and dirty bricks. We discovered that a lot of people didn't understand the process of constructing ecobricks and weren't aware that bricks with any debris or moisture in them were unusable. By educating ecobricker's we were able to reduce the amount of 'bad' bricks significantly by the third tier of collection.

2.Introduction

Bricking-it is a Bristol wide initiative seeking to reduce black bin waste by encouraging residents to contain their soft plastics in ecobricks. When compacted with soft, clean and dry single-use plastic PET bottles can be used as durable building materials for small structures. Ecobricks are PET bottles compacted full of single-use unrecycled/non recyclable plastic with a minimum target density/weight of 0.33g/ml (Ecobricks.org 2019).Single use plastic comprises the majority of the average bin liner and is responsible for a significant amount of plastic pollution globally.

We aim to help reduce the quantity of un-recycled or non recyclable plastics entering the biosphere by:

1. Raising awareness about plastic pollution so that on a consumer level residents buy less single use plastic.
2. Encouraging individuals to make ecobricks with their single use plastic taking responsibility for their own consumption and containing polluting plastics in pet bottles (ecobricks.org 2019).
3. 3. Distributing donated ecobricks to community build projects such as benches, stores and other outdoor projects.

Last year alone the people of Bristol threw away around 166 million kg of rubbish (about 368kg per capita) about half of which got sorted for recycling, the other found its way to landfill sites or the incinerator. Last year, 4 million kilos of plastic got sent to be recycled in Bristol, its popularity means that there are now 150 times more plastic in the city today compared to the 1960s. (Bristol Waste Company 2019

<https://www.bristolwastecompany.co.uk/learn-more-home/bristols-annual-recycling-in-pictures/>). Our community-centred initiative supports [Bristol City Council's aims in becoming carbon neutral by 2030](#) by encouraging a citywide reduction in waste transported to landfill or being incinerated. Steve Pearce, the Cabinet Member for Waste, Commercialisation and Regulatory Services, is currently working on a plan to reduce the impacts of single-use plastics within Bristol City Council premises as well as the wider environment. Stuffing small plastics into bottles reduces the total surface area 'containing' them, and enabling the individual to physically relate to how much plastic they are consuming. Furthermore, once used in earthen structures ecobricks prevent single use plastic from becoming toxins, microplastics or polluting the environment with CO2. It is estimated that per 1kg of ecobricked plastic, 3.1kg of CO2 is sequestered.

3.Aims and Objectives

We aim to collect both quantitative data about the amount of plastic contained by ecobricking, and qualitative data about the attitudes, awareness and behaviours of

participants. This data will enable us to develop our organisation's best practice and contribute our data in an open source manner to the wider plastic conversation.

Objectives

1. **Utilise and further implement the use of the Gobrik open source platform -** which provides the weight, size, quality and demographics of submitted ecobricks.
2. **Open 3 additional ecobrick 'deposit' bins-** make ecobricking more accessible to the wider public and gain demographic insight. By offering a range of drop off locations we wanted to understand how to support different parts of the community to tackle their plastic consumption.
3. **Create a data set** that can be used internally to develop the organisation and externally as an open source contribution.
4. **Gain a better understanding of the public's knowledge** about plastic and ecobricking in order to develop our educational platform and improve the effectiveness and impact of our initiative.

4. Methodology

Firstly we established the scope of our quantitative data by documenting the weight, size and quality of donated ecobricks (i.e in-weight, underweight, dirty, HDPE, logged, unlogged). We did this in order to identify how many usable bricks we had, the most common categories and sizes that were being donated and to measure the overall sum of contained plastic. This was done through:

1. Utilising the open source data platform Gobrik. We asked all those dropping off bottles to register their individual bricks on Gobrik before depositing it to us.
2. Manually recording all other ecobricks collected that hadn't been registered.

The quantitative data was harvested in three tiers to form three data sets. Tier one and two collections came from two sites and we were checking to see if they were in weight or underweight. We then applied qualitative methodology to this data in the form of content analysis to establish patterns in the brick deposits and discovered there was a lot of dirty, unusable bricks and we decided to apply further qualitative methods to determine why so many bricks were substandard.

As a direct result of our monitoring, we decided to close the two deposit points at the end of tier two and better develop our drop off mechanism. We then designed a

questionnaire to record the community's understanding of ecobricks, what they are and how to make them.

By the third tier of data collection, brick deposit points were manned and had to be checked before they could be donated. This led to a drastic reduction in incorrect bricks. Our third drop off point 'the scrap store' was set-up in a more direct way, and allowed participants to be given feedback before submitting their bricks. At the scrap store we developed a further narrative analysis mechanism and we were able to learn from the stories of those submitting the bricks.

5. Data Results

5a. Quantitative results

Figure 1.1 Deposit bin donations Combination Chart

Results; Gallimaufry / Canteen

818 Ecobricks Donated Compared To The Volume Logged, In-Weight & Under-Weight

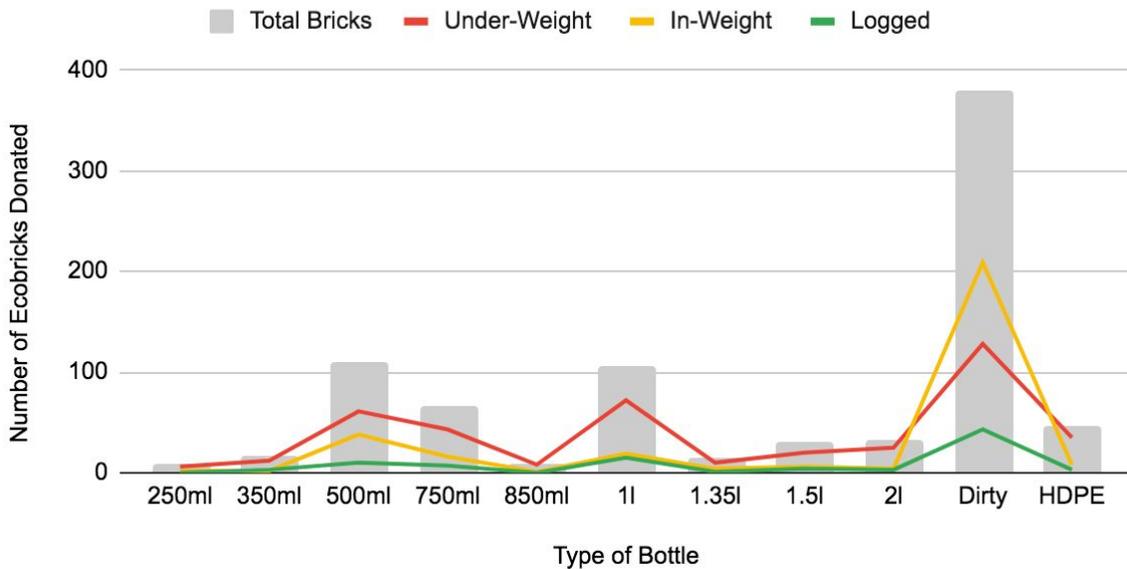


Figure 1.2 Number of results; Gallimaufry / Canteen

Type of Bottle	250ml	350ml	500ml	750ml	850ml	1l	1.35l	1.5l	2l	Dirty	HDPE	Total
Total Bricks	8	17	109	66	9	106	15	30	32	380	46	818
Under-Weight	6	12	61	43	8	72	10	20	25	128	35	420
In-Weight	2	2	38	16	1	19	4	6	4	209	8	309
Logged	0	3	10	7	0	15	1	4	3	43	3	89

This simple combination chart displays the data of two charts sharing the common category of measuring how many ecobricks donated were **in-weight** and **logged** onto

Gobrik; **In-weight, underweight, dirty** (contaminated) and **HDPE** bottles. Representing different scale of values for each type of bottle and size.

As shown in Figure 1.1 and 1.2, there is an exponential quantity of dirty (contaminated) ecobricks. Many of the dirty bricks were in weight, indicating a good level of commitment from the participants. We inferred from this that the problem might be a lack of understanding of the process required to make an ecobrick.

From this data set we also learned that Gobrik was not a viable platform for us to monitor the bricks on. Very few people were complying and logging their bricks and many of the bricks that were logged didn't meet the target minimum weight - one of the conditions of registering the brick. It seemed that participants were falsely representing the weight of their bottles to log their bricks, and thus automatically onboarding bricks in this manner was unreliable. As a small, volunteer led organisation we found that as we couldn't trust the integrity of data from Gobrik, it was too much for us to check all the bricks against the database and log the bricks ourselves. We decided to proceed by creating our own simplified data set.

Brick Quality

Figure 1.3 Tier 1 Brick Quality

Total % of Categorized Ecobricks

818 Ecobricks Donated from Gallimaufry and Canteen

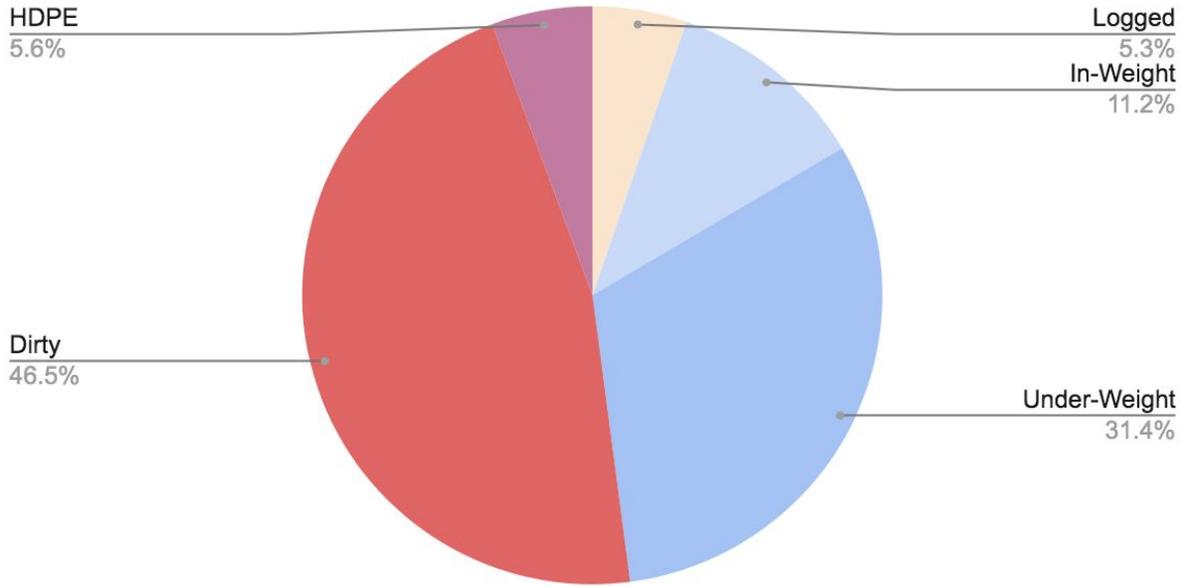


Figure 1.4 Tier 2 Brick Quality

Gallimaufry/ Canteen Results; Percentage of Bottle Types

725 Ecobricks Donated

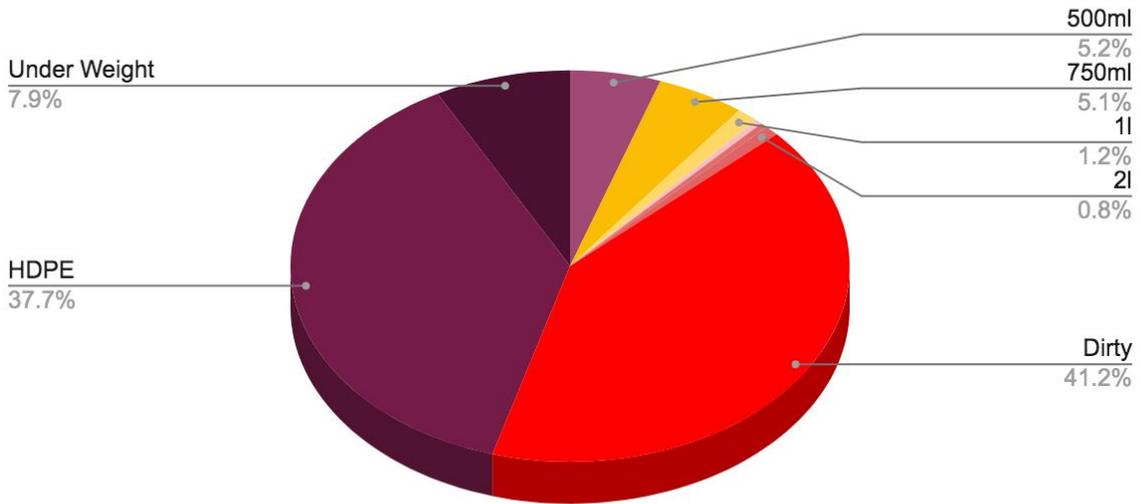


Figure 1.5 Tier 3 Brick Quality

Scrapstore Results; Percentage of Bottle Types

359 Ecobricks Donated

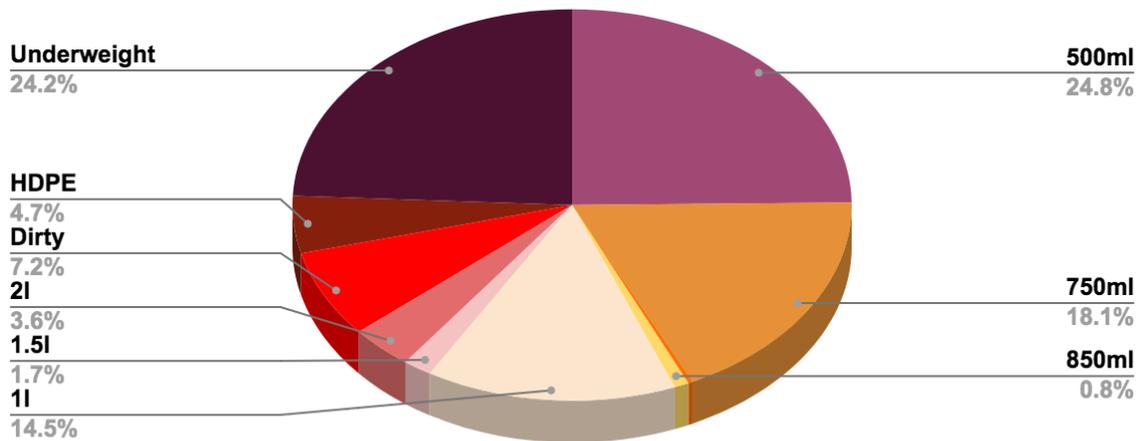


Figure 1.3 shows the percentage of bottle types from tier 1 of our data set, figure 1.4 shows the percentage from tier 2. These data sets were harvested from bottles collected at our two initial drop off points at the gallimaufry and the Canteen. After a staggering 46.5% of submitted bottles were found to be dirty from tier 1 Bricking-it ran a number of informational posts designed to help people create bricks that were in weight and clean. Unfortunately, by the time tier 2 was collected and logged the problem with dirty bricks had got worse, and over 70% were unusable. At this point, with an influx of sub-standard bricks we decided to halt collection and investigate the causes of the substandard bricks with a questionnaire.

We used open questions to find out exactly what individuals were struggling with when making ecobricks, whether they would attend a workshop and what they would want it

to be about and respondents relationship with their waste. We also allowed for personal comments so as to maximimise the feedback opportunity. We realised that in order to have greater interaction between the public dropping off bottles and the organisation, the drop off points had to be staffed somehow. Given the expense of having somebody stationed at five sites across the city to quality control bricks we took the difficult decision to focus all collection efforts on one site, a new site called 'the children's scrapstore'. Here we were able to ensure that most of the time there was somebody was there to check that the submitted brick was clean and in weight.

Figure 1.5 shows the total brick quality for tier 3 collection at the scrapstore. From the 359 ecobricks donated in tier 3 of our collection, 63.5% of ecobricks donated were clean and in weight with the bottle size. From redeveloping and changing the way we collected tier 1 and 2 data sets, we saw a marked improvement in participant bottle submissions. We also learnt a bit about the type of preferred bottle as 24.8% of the total bricks submitted were in 500ml bottles.

Total plastic contained

Figure 1.6 Tier 1 plastic contained

Tier 1 Results; Total Grams of single use plastic

818 Ecobricks Donated to The Gallimaufry and The Canteen Total = 113505.05g

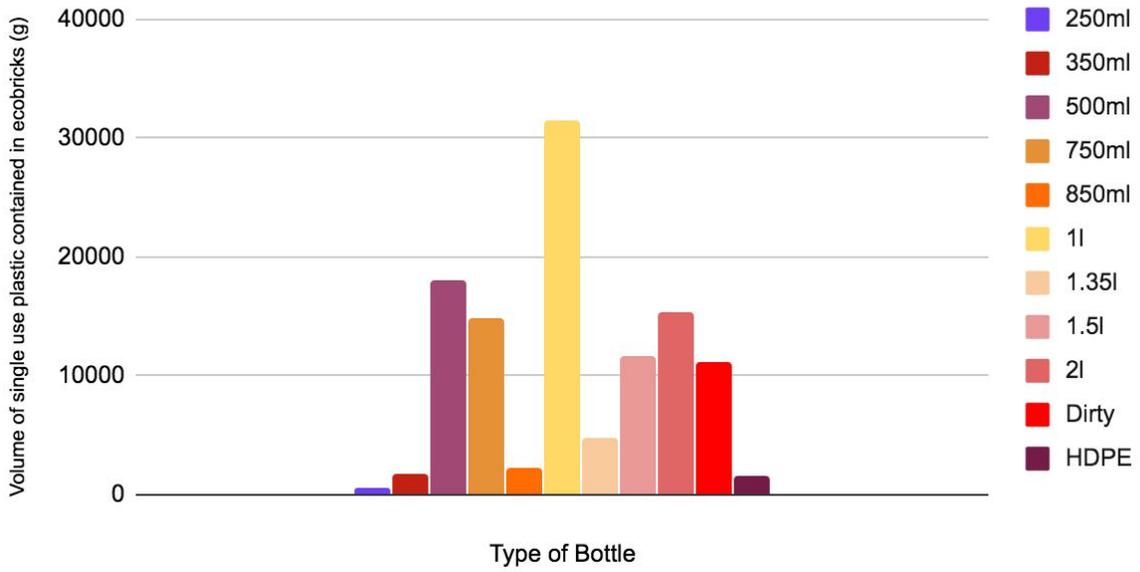


Figure 1.7 tier 2 plastic contained

Tier 2 Results; Total Grams of single use plastic

725 Ecobricks Donated To The Gallimaufry and The Canteen Total = 224428.11g

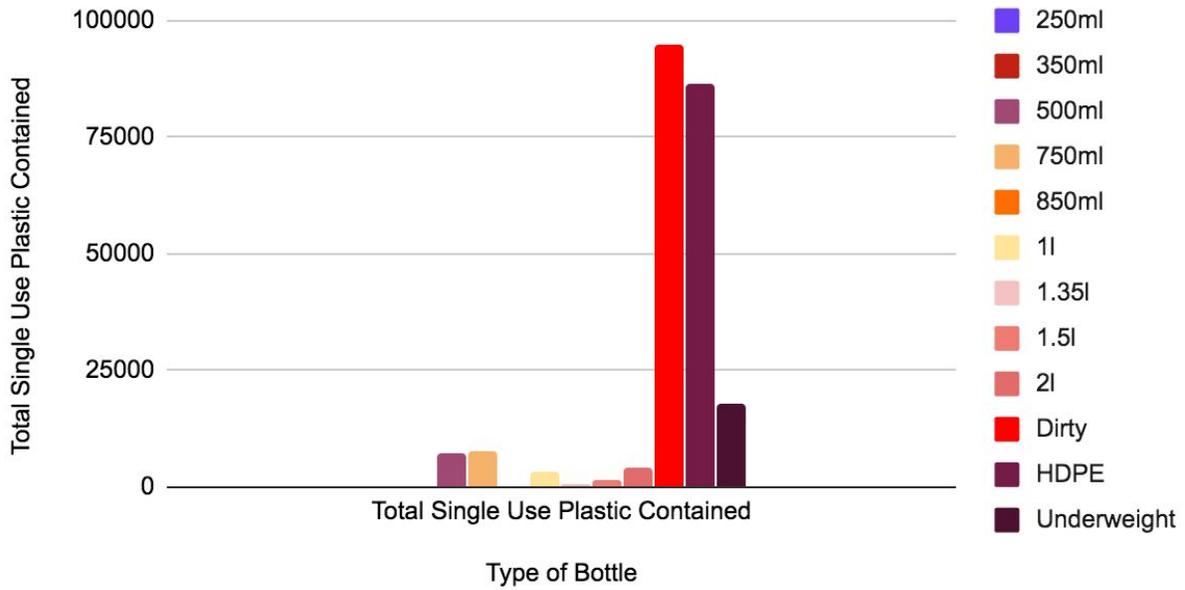
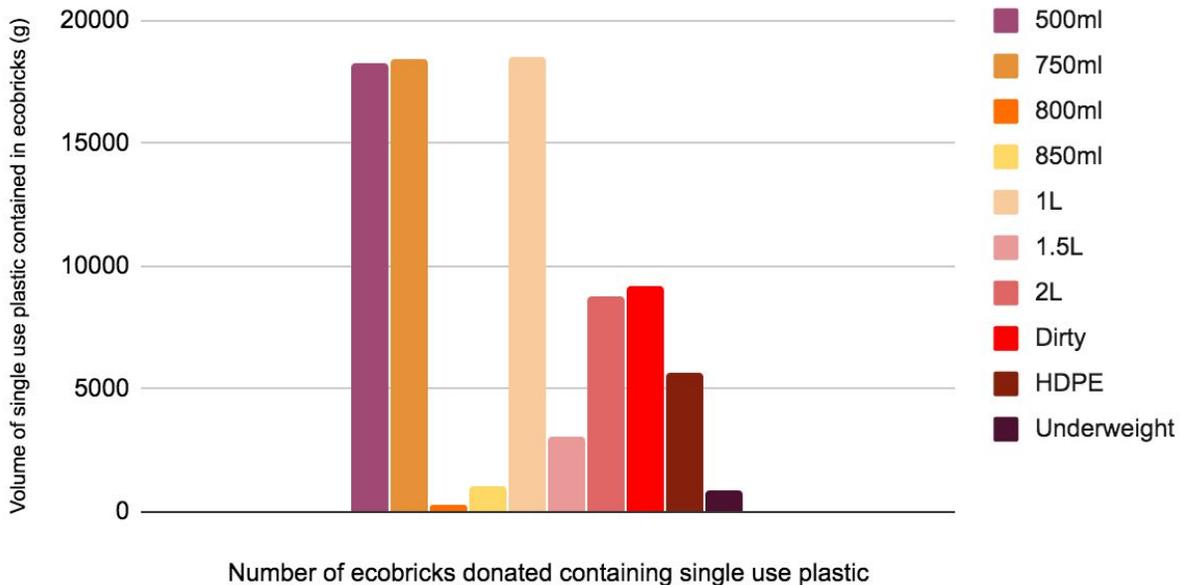


Figure 1.8 Tier 3 plastic contained

Scrapstore Results; Total Grams of single use plastic

359 Ecobricks Donated Total = 84109.74g of single use plastic contained



Figures 1.6 - 1.8 show the total single use plastic contained from each data tier. As illustrated, dirty bottles accounted for a lot of the total weight of plastic in the first two tiers, in the final tier the total quantity of dirty plastic was significantly reduced. From the tier two intake we noticed a lot of HDPE (milk bottles etc) ecobricks being submitted as we had developed relationships with a number of cafes across Bristol. When processing the bricks in the store we realised that a significant amount of HDPE bottles were underweight and dirty and we decided to stop accepting them by tier three which contributed to the reduction in contaminated bottles. Underweight bricks can be fixed by bricking-it team members, so long as the contents are clean. By the third tier there were less underweight bricks. One reason for the significantly better results in tier 3 may be

to do with the size of the data set. The number of bottles in the third cohort was significantly less than the previous two rounds.

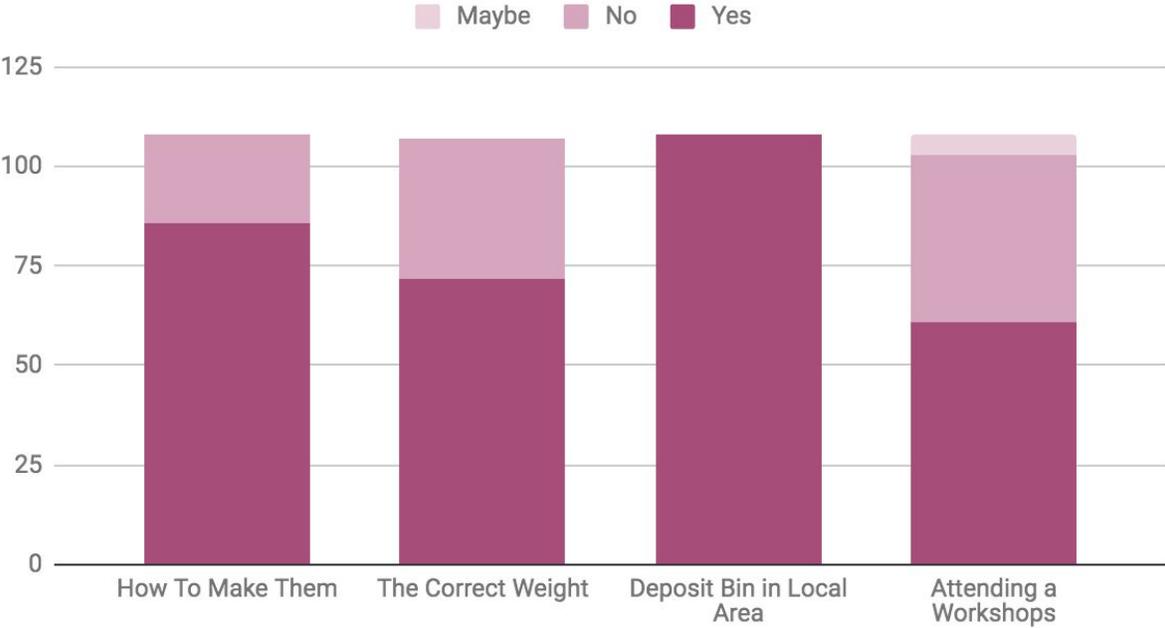
5b. Qualitative Results

The questionnaire was designed to give us feedback on the areas participants were struggling with and to develop our future volunteering programme. We used a mixture of multiple choice, check boxes, linear scales, paragraphs and open questions to try and get a variety of data types and responses. We hoped that the fusion of qualitative and quantitative data would give us insights when developing our educational platform. We asked people whether they were confident making ecobricks, quizzed them on their method of ecobricking and asked questions about their preferred deposit locations and the kind of interaction they wanted in the future. We also added open questions for individual responses to gain more personal depth and insight into feedback we would receive.

We shared the questionnaire on our facebook profile that has over 4000 followers and we received 111 responses. We were aware that, as the respondents who completed the questionnaire already followed our page, most of them were engaged with recycling and knew about ecobricks. In this sense the response to our survey represents the

attitudes and understandings of a particular demographic group and does not offer insight into general public awareness.

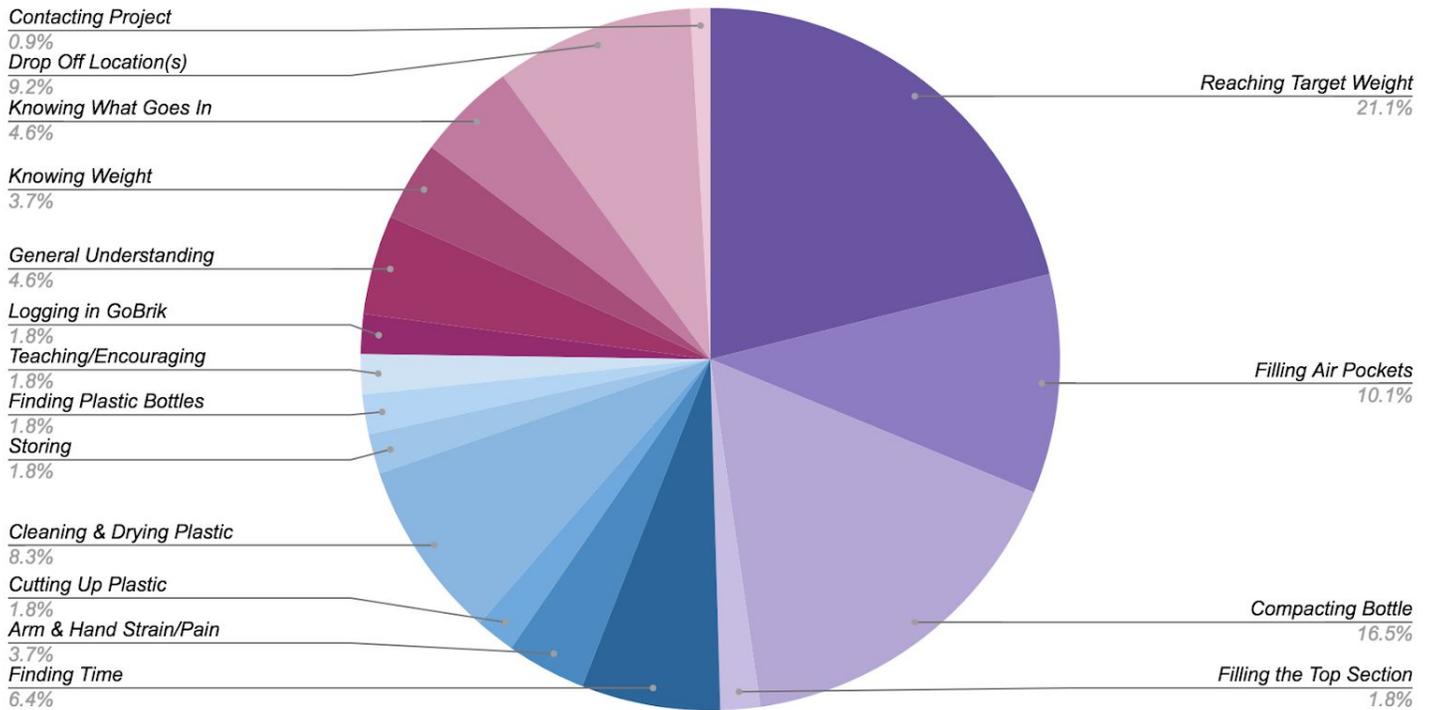
Responses to Questionnaire



The majority of respondents reported that they knew how to make ecobrick yet many didn't know what the correct weight for a brick is. This supported our hypothesis that many of the underweight bricks were coming from people who had not been informed as to how to do it. 100% of respondents wanted a deposit bin in their local area,

meaning among the people who took the survey all of them wanted to be able to drop off their bricks. A lot fewer wanted to to attend a workshop.

Most Common Difficulties

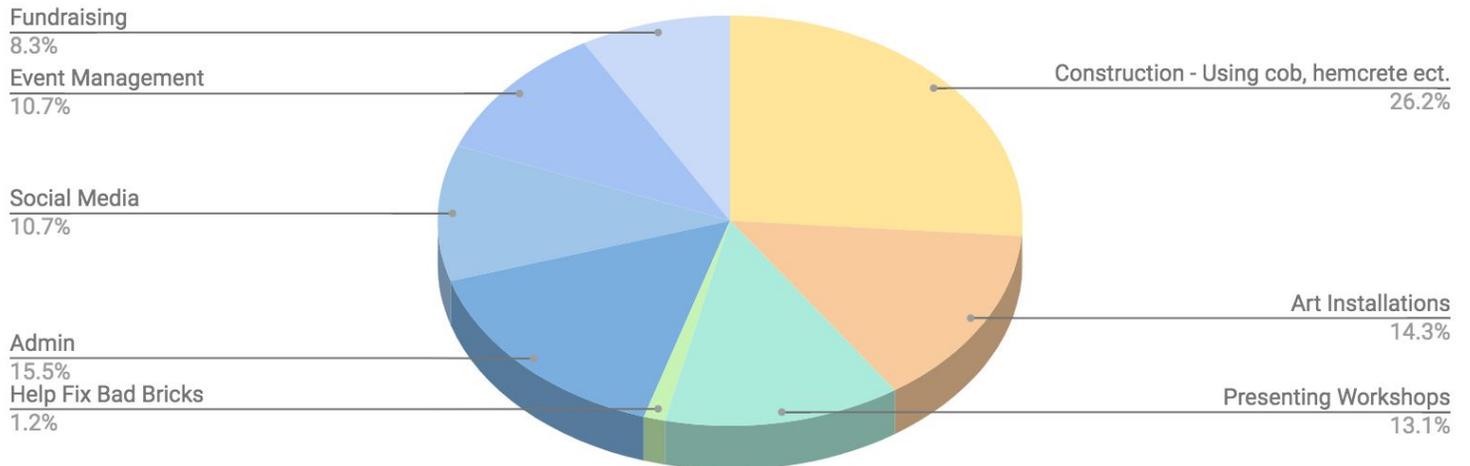


We asked a number of questions asking what people struggled with when making ecobricks. We used an open question to allow respondents to give feedback as freely as possible and we then sorted these responses into three main categories as seen above.

- 49.5% Struggled with technique problems.
- 26.6% did not have/know basic knowledge that should be available to them
- 23.9% struggled to apply the knowledge and make ecobricks, either due to time constraints or other personal reasons.

On the strength of these results we created an informational booklet designed to support people in their ecobricking efforts. "The art of making Ecobricks" Booklet is a step by step guide for making ecobricks detailing; what should go in and what shouldn't, practical tips and methods for refining the technique, the minimum weight per bottle and finally how to log them onto Gobrik. Since doing the booklet we have noticed a significant increase in brick quality.

Volunteering Activity Preferences



Another of our organisational aims was to expand our volunteer database. We decided to use the questionnaire to find out where and how people would like to get involved. As shown, the biggest area of interest was within construction using environmentally friendly materials such as hempcrete and cob. We were very happy to see that there was a large amount interested in creating art installations from them. This was really exciting for us as we are approaching the stage where we have enough useable ecobricks in a variety of different sizes to contribute them to building projects. The next stage of our operations will be construction, so it is good to see there is an appetite among volunteers for this part of the project.

6. Limitations of Research

As a grassroots and practical initiative, the concept of a 'data construct' felt daunting. Our confusion and fear of the dreaded data was a barrier to our early methods as we felt somewhat like we were scrabbling around in the dark. When we eventually established unscaled data collecting methods we were relieved. We came to understand that data collection could be simplified into just constructing columns of information that we needed/wanted to collect. I.e weight, quantity, quantity, logged through gobrick, underweight, dirty etc...The task of choosing the column heading wasn't easy in itself due to the diversity of ecobricks we were receiving but once we had identified the key categories of variation the whole thing felt a lot easier.

One of the main problems we had was a lack of workers. Sorting, checking and logging ecobricks is incredibly time consuming. When we started the project we envisioned using the Gobrik database to log all submitted bricks, assuming that participants would use the app and honestly/accurately record their bricks. As discussed, we were surprised at how many of the logged bottles with serial numbers were underweight or dirty. If we had a larger team we would have been able to log all of the bricks on the database ourselves however registering each brick is incredibly time consuming. Sadly we were forced to make the decision to stop using Gobrik. This was difficult for us as we enjoyed contributing our data set to such a large, open source database. Despite these difficulties we managed to record our own data set which we hope will be useful. Even

gathering the data set we did was difficult as we have collected close to 2000 bricks from all of our drop off points. In the future when we have more people to help we would like to start using Gobrik again however, we would need significantly more volunteers.

Another limitation to the research was our own operational structure, and confusion among participants about the changes to the structure between tiers 1 +2 and 3. We embarked on the Bricking-it journey with the aim of encouraging people to ecobrick and begin builds. There were a lot of practical hurdles to overcome. One of the most significant obstacles was finding a space big enough to sort and log the bricks. The lock up we managed to secure is small, there is limited space, and is half outside meaning weather can prevent volunteers from being able to mark and log the bricks. All of this meant we eventually got a backlog of bottles that needed sorting, and we were struggling to commit completed bricks to projects as we didn't have a coherent supply. Since embarking on this data gathering journey we have managed to create a good system for managing bricks and now have a good supply to offer to architects and build teams who have specific requirements ie size of bottles, number of bottles. Sadly due to time constraints and a lack of volunteers we weren't able to weigh all the dirty bricks and had to take an average instead. This was exacerbated by a backlog that built up due. If we could do the collection again we would weigh all of the dirty bricks to get more accurate results.

One of the biggest limitations with the qualitative data was the relatively small participant number and the fact that all participants were engaged with ecobricking. The survey may have had more impact in terms of education if we were able to target individuals who didn't know about ecobricking.

7. Conclusion

The knowledge of what size, weight and quality of bricks the project has means that we are now able to progress and begin to establish figures what community building projects would be interested in building with them. From our quantitative data set showing how many usable and underweight bricks (that can be used for art installations) We now have the information we need to begin the organising and distributing the donated bricks to community projects.

As discussed throughout the report, our data collection mission has led to a drastic change in our organisational structure. After the first two cohorts of brick deposits we had to change the structure of our drop off points, meaning that our original objective of opening three more deposit points was not successful. We learnt that it not only was it not possible to open more deposit points with the small team we have but it isn't desirable either, as our original model for collection meant we received too many bad bricks.

With regard to the contaminated ecobricks we have received, they will likely be taken to landfill. This is a shame and although it is not what we wanted we are happy that the

single use plastic within the brick will not enter the biosphere as microplastic and now takes up significantly less space. Sequestering the scraps of plastic tightly in bottles reduces the net surface area of the plastic and reduces the harm it can do to the environment. That said, we are happy that data collection has helped us to reduce the amount of unuseable bricks being delivered to us.

The use of data collection has been very useful for us to decide how to grow and develop and identify key areas that need work. By creating our own data set we have something that can be presented to organisations who might wish to support our project and want to learn more about it. Having an open source data set would help with project promotion by raising awareness around how much plastic was being diverted from landfill and taken out of the environment through the making of ecobricks. We would love to contribute the data we have collected to other projects and studies and in the future would like to utilise the gobrik platform again when we are able to monitor onboarding fully.

Finally, throughout the duration of this project we have gained a much better understanding of the public's knowledge of ecobricks and we now have a good idea of how to develop our educational platform and volunteer database.

8.Future Development

We have isolated a number of goals to develop our organisation going forward.

- We would like to develop more designated times for drop off and if we have a deposit bin system it will need to be operated by staff.
- In order to aid building, we will only be asking for 500ml, 750ml and 1lt PET bottles now so as to create a bank of completed, identical bricks in a variety of sizes.
- From now on we will recommend only experience ecobricker's make 2litre bottles as they are very difficult to get right.
- We will develop and utilise volunteering database.
- Make information more available to the general public and provide as open source download of our data and informational booklets.
- Weigh all bricks, including bad ones, for more specific summary of plastic being contained.
- Set up fix a brick scheme for underweight bricks.
- Develop our operations so we can start utilising gobrik again.
- Finally, we are progressing onto the build section of our project and are excited to team up with architects and sustainable builders over the coming months.