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Sustainable Events

Event Waste Audit & Carbon Footprint Evaluation

EARTHFEST 2019

Case study by xhebit

2019 | JULY

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Thank you Michael Broadhead for all his support in carrying out this waste audit, and to the ever helpful and fun waste volunteer team at EARTHFEST 2019 - Francesca Pera, Sumita Thiagarajan, Sandra Zhang, Ram, Justine, and Cherie. Thank you to Zarin for following up on the waste oil data. Thank you to Jonathan Tostevin of Revolv and Ugly Foods for sharing providing information.

We would also like to thank Gaia Environment for sharing data on event carbon footprint. Gaia Environment specialises in helping organisations offset carbon footprint and lower greenhouse gas emissions through carbon credits and RECs.

Thank you to Laura Heerema of GiantLeaps for her valuable input.

Title: EARTHFEST 2019 Event Waste Audit & Carbon Footprint Evaluation

ISBN:978-981-14-1825-9

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Date of Publication: July 2019

xhebit

Working towards a circular events ecosystem.

xhebit, Singapore's one-stop platform for Sustainable Event Planning, was launched in 2017 with the objective of helping the events industry transition to a circular events ecosystem. We provide an event planning guide, case studies & consulting services to help event organisers make informed decisions. Our services include sustainable event consulting, waste audits and research studies that help further sustainable event planning. xhebit is an initiative developed by EARTHYS Sustainability.

EARTHYS Sustainability

EARTHYS Sustainability specialises in formulating solutions that support a circular economy. Because behaviour shapes the success of environmental initiatives, we place importance on understanding the interplay between behaviour & sustainability, and how this can be utilised to solve challenges.

Our diverse group of academics and industry specialists bring a wealth of knowledge and deep expertise in areas such as psychology, technology, social impact and data science, amongst others. We believe, the importance of natural resources, however small, need not be compromised or side-lined in the pursuit of growth.

EARTHFEST 2019

"EarthFest is a sustainable, fun, and inspirational festival for all ages! Featuring a planet-friendly food fair, live music, games, screenings, and talks."- EARTHFEST

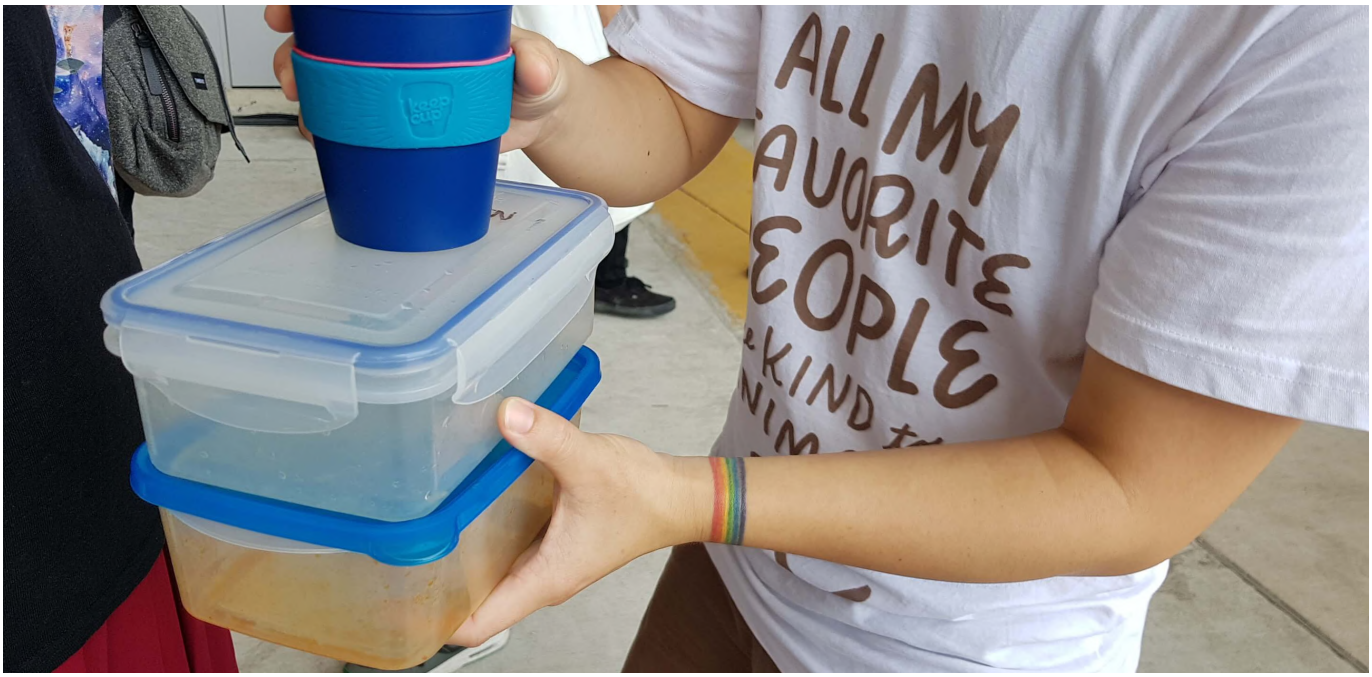
EARTHFEST is an eco-festival which takes place annually and is one of the greenest festivals in Singapore. The 5th edition of EARTHFEST was held on January 2019 and sold out 8000 tickets. This one-day minimalist festival takes an all-rounded approach to reducing upstream resource use, and diverting downstream waste.

WASTE AUDIT & SUSTAINABLE EVENT PLANNING

This year, xhebit carried out a waste audit on the festival. This audit report will serve as a baseline for future editions of EARTHFEST and for other festivals of similar size and type to use as a guide. The report also captures the sustainable event planning elements of EARTHFEST 2019 and how the organising committee engages vendors and festival attendees in going green.

CARBON FOOTPRINT ANALYSIS

There is a huge gap when it comes to evaluating the carbon footprint of events in Singapore. Event carbon footprint helps us understand the true impact of the resources used and waste generated. In this report, xhebit evaluates and compares the carbon footprint of EARTHFEST against a festival of equal size, but without sustainable planning in place, to assess the difference in environment impact.



1.0 Sustainable Event Planning

EARTHFEST had a total of 140 vendors ranging from F&B to farmers market, small businesses, schools and NGOs. The organisers adopted a three-pronged approach to working with vendors to reduce waste:

1. EARTHFEST is collaborative in nature and meant to highlight individual stalls rather highlight the EARTHFEST brand. Therefore, individual stalls are not made to conform to EARTHFEST specifics in terms of design or style. Instead, vendors are free to create what they need in terms of marketing and advertising. They are then able to reuse this at other events, thus minimising event-specific waste.

"80% of responsibility [to go green] is on the event planner." - Michael Broadhead, Founder of EARTHFEST

2. Vendors are pre-surveyed in detail when they register. This allows the organisers to create a list of all that will be produced in terms of waste. After assessing what can be prevented, organisers reach out to vendors and find alternative options.

3. Vendors are required to commit up front to the festivals' standards & requirements. This approach is used to filter out vendors who are not committed to going green.

KEY AREAS

VENUE

Marina Barrage outdoor area was the selected venue for EARTHFEST 2019. As an outdoor venue, minimal air-conditioning is utilised – air-conditioning is typically an area of significant energy consumption for events. Marina Barrage is a BCA Green Mark Platinum certified building.

In addition, organisers limited tickets to 8000 to limit environmental impact from large numbers of people.

F&B

EARTHFEST provided all F&B vendors with pre-approved bio-degradable and compostable cutlery. All food sold was either vegetarian or vegan – this included the ice-creams, laksa, burgers, cookies and cakes. Plant-based foods have a lower carbon footprint than meat-based meals. To reduce plastic use from the sale of drinks, Revolv reuseable cups were available on site. Festival-goers could buy drinks once or multiple times without creating plastic waste from disposable cups

WASTE INCLUDING FOOD WASTE

A waste collection point was setup and manned by volunteers to ensure all waste was segregated according to paper, plastic, cans, glass, and food waste. The collection point was equipped with scissors which festival-goers used to cut up food waste and cutlery. Breaking it down into smaller sizes ensures faster composting by designated composter, Quan Fa Organic Farm. Other types of recyclables were segregated and placed in Marina Barrages' recycling bins.

In addition to the above measures, festival attendees were encouraged to bring their own reusable cutlery, and sinks were available on site to washup.

"If it doesn't need to be created, we just don't create it" - Michael Broadhead, Founder of EARTHFEST

Door Gifts

EARTHFEST 2019 did not give out door gifts. Most events order large numbers of goodie bags to cater for the majority, if not all, of the event-attendees. However, this approach often leads to waste as not all event-attendees want what's given.

VENDOR FREEBIES

One of the festival vendors bio-home, providers of a range of environmentally friendly cleaning solutions, wanted to offer a free giveaway starter kit. In order to do this with minimal waste EARTHFEST worked with them to do it digitally. Festival-goers were offered the option to redeem a 100 sets of bio-home starter kits prior to the event. On the day of event, these were handed out to those with the redemption coupon. This approach largely ensures only attendees interested in the gift will respond, therefore waste from giving away unwanted gift sets is minimised. xhebit spoke with Lam Soon, the suppliers of bio-home, to get their feedback on this approach. They shared that they were happy with the outcome as it helped them to target (out of 8000) the specific group of customers that were interested in their product. This is an approach that benefitted sponsor, attendee and organiser.

CARBON OFFSETTING

The carbon footprint of EARTHFEST, estimated at 110 tons of CO2, was offset by ESPower.

OTHER WAYS OF REDUCING RESOURCE USE

EARTHFEST actively reduces resource use in a number of other ways:

1. No commercially printed PVC banners or backdrops. Instead, displays were printed on regular scrap paper and pasted on the wooden pallets. All of which will go for recycling after the event.
2. Wooden pallets were used for display and these were borrowed from a local company and will be returned after the event.
3. Volunteer Badges to identify volunteers were reused from previous years' festival.
4. No plastic bags were given out by vendors selling products.
5. No bottled water was sold, water dispensers were available on site.

2.0 Waste Audit

xhebit collaborated with EARTHFEST 2019 to carry out a waste audit. Majority of the waste generated by the festival is food related waste including biodegradable cutlery. All food waste and biodegradable cutlery was collected and sent for composting at Quan Fa Organic Farm. Most of the paper collected were in the form of cardboard boxes from vendors. Plastic waste primarily took the form of PVC wrapping, also by vendors. Glass was made up of beer bottles, wine bottles and juice bottles. A total of 133 250ml juice glass bottles weighing 39.9 kg were returned back to one vendor for recycling. Used cooking oil from vendors was sent to Alpha Biofuels for reuse.

Table 1. Breakdown of waste from EARTHFEST 2019

Food Waste	
Food Waste	85.3 (kg)
Recyclables	
Cans	1 can
Plastic	2.5 (kg)
Paper	13.9 (kg)
Cooking Oil	8 (L)
Glass	50.3 (kg)

3.0 Carbon Footprint

To get a clearer understanding on which resources have a greater environmental impact, xhebit decided to compare the carbon footprint of EARTHFEST 2019 against a hypothetical festival, Festival XYZ, which has no sustainable event planning in place.

ASSUMPTIONS

These are the following assumptions of Festival XYZ:

- Like EARTHFEST, Festival XYZ had 8000 registered festival-goers.
- EARTHFEST was primarily held outdoors with two small indoor, air-conditioned rooms used. We assume Festival XYZ occupies the same area as EARTHFEST but entirely indoors with air-conditioning, which is typical of most events in Singapore.
- Festival XYZ has no recycling programme in place, which is typical of most events in Singapore.
- For simplicity, we assume all 8000 have meals in both festivals – EARTHFEST (plant-based) and Festival XYZ (meat-based).
- We assume Festival XYZ gave out 4000 cotton goodie bags and 4000 bottled water for festival-goers.

METHODOLOGY

For the carbon footprint we have chosen to evaluate Energy, General Waste, Recyclables, Print, Door Gifts and Food & Beverage. We reviewed Life Cycle Assessment (LCA) reports, boundaries of the LCA (see Figure 1), published literature and industry averages to gather relevant data (see Appendix 1). In the following section, we describe what was measured and provide the reference from which we gathered the data. It must be noted that very little Singapore specific data exists and so much has been adopted from international data. Carbon footprint values may change with more specific data.

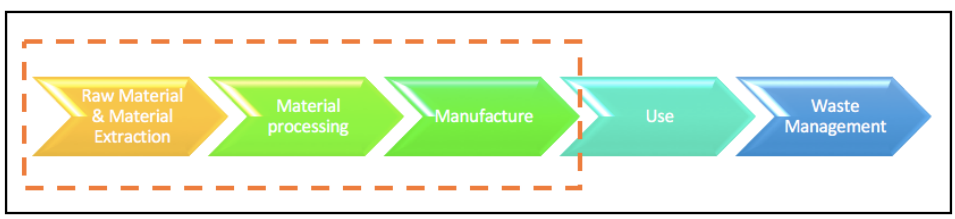


Figure 1. Life Cycle Assessment boundaries - Cradle to Gate (dotted line) and Cradle to Grave (solid line).

FESTIVAL XYZ

Carbon footprint for Festival XYZ

Gaia Environment specialises in carbon offsetting and have provided the carbon footprint for Festival XYZ for:

a) meat-based meal for 8000
b) indoor energy consumption for 3646 square meters
c) non-recyclable waste for a festival of 8000
d) printed material (banners, posters etc) for a festival of 8000

Door Gift

Cotton totes were selected as the door gift of choice for 4000 attendees at Festival XYZ. The carbon footprint is for cradle to grave without any re-use. This assumption is based on another study by xhebit on goodie bags, where over 60% of respondents had up to 10 goodie bags at home. Given the prevalence of re-useable bags in Singapore homes, it would not be likely cotton totes would be re-used sufficiently (173 times) to reduce overall carbon footprint.

Reference – Edwards & Fry (2011). Life cycle assessment of supermarket carrier bags: a review of the bags available in 2006 (The Environment Agency, Bristol, 2011).

Single-Use Plastics

Bottled Water - As is typical with most events, bottled water is given out free or sold on site. We factored in a single 0.5L PET bottled water for 4000 attendees at Festival XYZ which were not recycled (incineration).

Reference – Chen et. al. (2016). Comparative life cycle assessment of fossil and bio-based polyethylene terephthalate (PET) bottles.

Drinks were sold at EARTHFEST 2019 using Revolv re-useable cups. For Festival XYZ we have substituted the 473ml Revolv cups with 0.5L PET single-use plastic cups. A total of 856 drinks using Revolv cups were sold. We assume the same number for Festival XYZ which were not recycled (incineration).

Reference – Pladerer et. al. (2008). Comparative Life Cycle Assessment of various Cup Systems for the Selling of Drinks at Events Focussing on major events such as the European Football.

Recyclables

Since Festival XYZ has no recycling programme in place, we use the same amount of recyclables collected from EARTHFEST as baseline for the additional carbon footprint incurred from not recycling. For details on recyclable carbon footprint analysis, refer to Appendix 1.

EARTHFEST 2019

Energy

Total indoor area was 334 square meters. Energy use for Marina Barrage (categorised as mixed development) was pegged at 274kWh/m2.yr.

Reference – BCA Building Energy Benchmarking Report (Statistics and Figures) 2018 & Electricity Grid Emission Factor and Upstream Fugitive Methane Emission Factor, 2005 - 2017.

Printed Matter

EARTHFEST used a total of 200 A4 + 50 A3 sheets of paper (as reported by EARTHFEST).

Reference – Environmental Paper Network Paper Calculator Version 4.0.

F&B

Carbon footprint for 8000 meatless meals was retrieved from Dettling et. al. (2016). A comparative Life Cycle Assessment of plant-based foods and meat foods.

Recyclables

The Life Cycle Assessment (LCA) data for plastics, paper, glass, aluminium, and oil was collated from published LCA analysis on each item. For details on recyclable carbon footprint analysis, refer to Appendix 1.

RESULTS

Table 2. Carbon footprint comparison of EARTHFEST 2019 against a similar hypothetical festival without sustainable event planning. All values are in kg CO2.

	EARTHFEST 2019	Festival XYZ
Energy Consumption	105	1840*
Door Gifts		
4000 Cotton totes	0	23600
Printed matter		
Backdrop; Banner; Posters	4.08	1200*
Waste		
Non-recyclable	7557*	7557*
Recyclables		
Cans	0.01	0.33
Plastic	1.18	8.43
Paper	7.51	17.24
Glass	9.55	90.03
Cooking Oil	-9.44	58.85
SUB-TOTAL	8.80	174.87
F&B		
8000 Meals	6720	20160*
4000 0.5L PET Bottled Water	0	501
856 0.5L PET cups	0	65
TOTAL	**14395**	**55098**

*Carbon footprint values provided by Gaia Environment.
Waste refers to non-reuseable general waste which would be generated at both events.

From the results it can be surmised that a regular festival without environmental sustainability planning in place produces **3.8 times** more carbon emissions (CO2) than a similar festival with sustainability planning. The bulk of the carbon emissions originates from door gifts (cotton tote bag), meat-based meals, and non-recyclable waste.

Plant or Meat

Food is a favourite in Singapore and most, if not all, festivals offer food. Much of the food offered is typically meat-based with a smattering of plant-based options. Aside from festivals, a range of other events (conferences, seminars, workshops, conventions) cater food for their delegates/attendees, much of which are also meat-based. Meats are a favourite with people, while we do not have to do away with them, event carbon emissions can be significantly reduced by reducing the amount and selection of meat-based options. Providing more plant-based foods is a simple and effective way to reduce our impact on the environment.

Waste

Waste is unavoidable. Events are no exception. However, by taking sustainability into consideration at the **planning stages** and thinking through how to reduce resource use ***or*** use eco-friendly options where possible, the amount of waste generated can be substantially reduced. EARTHFEST has an effective system in place which actively reduces waste generated (see Section 1.0). Their sustainable event planning system gets vendors involved from the beginning and encourages festival attendees to do their part. This opens up more avenues for addressing resource use and waste reduction. Often, event organisers wait till later stages to incorporate sustainability, but by then there is very little room to manoeuvre and make changes as vendors/suppliers are fixed, planning complete and logistics arranged. To reduce waste, organisers need to start at the planning stages, and only then will they end with lesser waste.

Door Gift

The charm of a door gift appears to be more for organisers and sponsors, rather than attendees. In an earlier study done by xhebit, Re-Thinking the Goodie Bag Culture, 53% of respondents thought goodie bags were wasteful and more than 80% had a preference for vouchers (xhebit 2018).

Having a successful event and drawing attendees/delegates is more often tied to quality. EARTHFEST and Responsible Business Forum are testament to this – they are examples of events that have by no means fallen short because they choose to be sustainable.

As a hub for events, local and international, Singapore has a strong foothold in MICE. However, the economic advantages of a thriving MICE industry should not be a reason to overlook the environmental impacts of it. Much of the waste generated from events ends up incinerated and in Semakau. This means that the MICE industry too, like all other industries, needs to do its part to reduce our ever shrinking landfill. EARTHFEST by its very nature is lean. However, other types of events, like tradeshows and conventions, often generate huge amounts of solid waste in the form of backdrops and displays - much of these are not recycled. There is much room for reducing solid waste, however a waste audit at the industry level is a necessary step to understand waste trends.

Given the very limited LCA data available for Singapore, we have done our best to empirically compare the carbon footprint of two festivals. We hope this study paves the way for a complete carbon analysis of differing types of events with Singapore specific data. Such information can be used to inform the industry and stakeholders of areas which need to be addressed.

APPENDIX 1

Source & Scope	Carbon Footprint
Kissinger et. al (2013)	
Cradle to Gate	
Plastic (PVC)	1.92 kg CO^2 eq/kg
Plastic (PET)	2.24 kg CO^2 eq/kg
Paper (Cardboard)	0.89 kg CO^2 eq/kg
Aluminium	10.84 kg CO^2 eq/kg
Glass	0.99 kg CO^2 eq/kg
Tyskeng & Finnveden (2010)	
CO^2 savings from recycling	
Plastic	1.45 kg CO^2 eq/kg
Paper (Cardboard)	0.35 kg CO^2 eq/kg
Aluminium	10.5 kg CO^2 eq/kg
Glass	0.8 kg CO^2 eq/kg
Schmidt (2015)	
Cradle to Gate	
Palm Oil	2.024 kg CO^2 eq/kg (w/ biogenic sequestration); 4.847 kg CO^2 eq/kg (w/o biogenic sequestration)
Veolia	
CO^2 savings from recycling	
Cooking Oil	3 kg CO^2/litre
Edwards & Fry (2011)	
Cradle to Grave	
Cotton Tote	5.9kg CO^2/tote
Pladerer et. al (2008)	
Cradle to Grave (heat recovery from Incineration)	
0.5L cup PET (11.5g)	0.6kg CO^2/cup
Dettling et. al. (2016)	
Farm to fork	
Meatless Lunch	0.884 kg CO^2/meal
Chen et. al. (2016)	
cradle-to-gate	
0.5L PET Bottle	0.055kg CO^2/bottle

Table 3. The values presented in this table are the carbon emission values used to derive the overall carbon footprint of EARTHFEST and Festival XYZ. The table also indicates the scope e.g cradle to gate or cradle to grave. The assumptions for the chosen scope have been explained in Section 3 above. It must be noted that very little Singapore specific data exists and so much has been adopted from international data and values may change with more specific data.

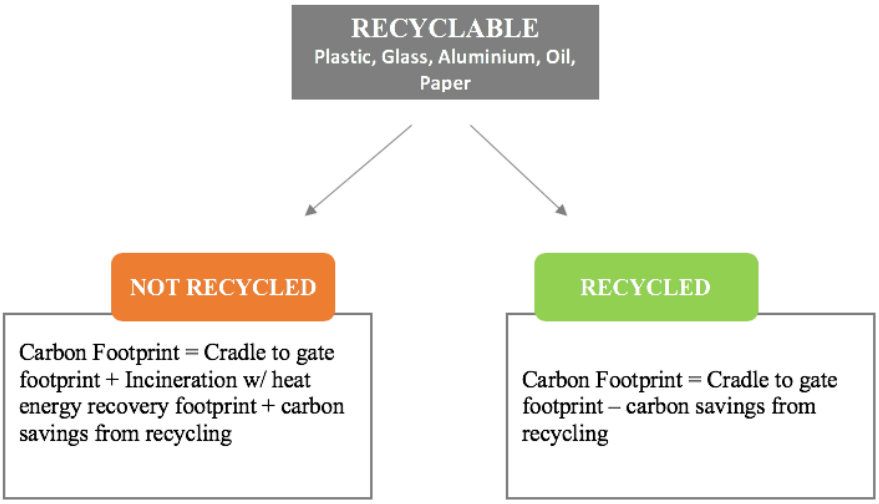


Figure 2. This diagram explains how carbon footprint for the recyclables are to be calculated.

Table 4. This tables provides the breakdown of the carbon footprint using the method described in the above figure. Incineration with heat recovery was not included as it was unavailable.

Recyclables	Quantity (kg)	Carbon Footprint (cradle to gate) kg CO^2	With Recycling kg CO^2 eq	Without Recycling kg CO^2 eq
Cans	0.015	0.17	0.01	0.33
Plastic (PVC)	2.5	4.80	1.18	8.43
Paper (Cardboard)	13.9	12.37	7.51	17.24
Glass	50.3	49.79	9.55	90.03
Cooking Oil	7.19	-	-9.44	58.85
		TOTAL	**8.80**	**174.87**

Carbon footprint of recyclables:

1. Cradle to Gate CO2 values for various recyclables.
2. If recycling is practised the CO2 savings from recycling is deducted from cradle to gate footprint.
3. If recycling is not practiced, savings from recycling is added to cradle to gate footprint. Ideally, incineration with heat recovery should be used for non-recycled products. However, we were not able to source that data. Given the small quantity of recyclables we do not think this would have a major impact on the value.
4. For cooking oil, we have used CO2 value including biogenic uptake for the oil that is **recycled**. We have excluded biogenic uptake for oil **not recycled** and added the savings from recycling.

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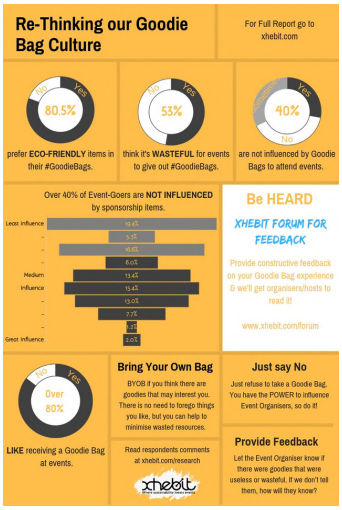

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