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Managing Carbon Footprint at Music Festivals: A Study at Glastonbury Festival

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Abstract

The Glastonbury Festival, renowned as one of the greatest music festivals globally, has come under environmental scrutiny due to its substantial expansion. While the festival undeniably benefits the economy, it also has adverse effects by contributing to the carbon footprint. This phenomenon is a result of congregating a large number of individuals in a single location concurrently for an extended period of time. The carbon footprint generated is substantial, and when combined with the garbage generated, it can result in significant environmental harm. Recognizing this concern, the organizer has implemented a comprehensive strategy to reduce and control its carbon emissions. Hence, this study evaluated the efficacy of various approaches by employing the framework of energy consumption, trash generation, and transportation emissions (Fredline et al., 2005). The outcome demonstrates that Glastonbury Festival's endeavor to achieve environmental sustainability underscores its dedication to diminishing its carbon emissions while safeguarding its core identity. Glastonbury has implemented novel energy solutions, such as solar and wind power, biodiesel, and recycled vegetable oil waste, to reduce emissions and include sustainable energy sources. Furthermore, waste management has effectively diminished the usage of disposable plastic bottles, decreased trash through recycling efforts, and promoted the practice of participants taking their possessions with them. Lastly, the transportation emissions, which account for the largest proportion of the total emissions, still require a solution, since they remain the primary concern of the event. The Glastonbury Festival's sustainability could be improved by the implementation of additional measures, educational initiatives, and partnerships with environmental organizations.

Keywords: Glastonbury Festival, music festival, carbon footprint, sustainable event.

Introduction

Tourism is now one of the fastest-growing industries in the world as the number of international tourist arrivals increases globally. In 2015, the number of international tourists was 1.19 million people. This figure then increased to 1.24 million in 2016. Similarly, in the United Kingdom, the international tourist arrivals in 2014 were 320.61 million; meanwhile, in 2015, this number rose to 34.44 million (UNWTO, 2017). One of the tourism sectors that influences this increase is event tourism, specifically the music festival. Attendance at music festivals in the United Kingdom increased from 2.79 million to 3.9 million between 2012 and 2016 (Statista, 2016). This significant number of audiences was dominated by the Glastonbury Festival, which managed to bring in more than 130,000 at each event for the past 15 years (Victoria and Albert Museum, 2019).

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The Glastonbury Festival is the largest music festival and the most celebrated performing arts in the United Kingdom (Telegraph, 2017). Located amidst the idyllic Somerset countryside in England, the Glastonbury Festival has evolved into a cultural phenomenon since its inception in 1970, which now has been going on for 35 years, with a record ticket sale of 177,500 tickets in 2007 (Mendip District Council, 2007). Not only featuring live music by international-class singers, the festival also features dance, comedy, theatre, circus, cabaret, and other art performances (Telegraph, 2017). These performances make the Glastonbury Festival attracts millions of music enthusiast, artist, and spectators every year and makes it one of the economic developers in the United Kingdom. As stated by the Mendip District Council (2007), the local economic benefits are estimated at approximately £25 million. While it has consistently championed social and economic causes and diverse expressions, it has also faced mounting scrutiny concerning its environmental impact.

With the escalating global concerns about climate change and its implications, the management of carbon footprints has emerged as a critical priority. Therefore, as a large-scale event drawing hundreds of thousands of attendees and utilising extensive infrastructure, Glastonbury Festival faces a severe challenge as many people happen to be in one location at the same time (Gelder & Robinson, 2009). The enormous carbon footprint and the waste produced can cause severe environmental damage (Powerful Thinking, 2017). Unfortunately, this issue is rarely discussed because most of the industry-funded research on festivals has unsurprisingly focused on their economic impact (Brenan et al., 2019), as the total direct and indirect spend generated by music tourism on concerts and festivals reportedly amounted to £3.1 billion in 2014 in the UK alone (UK Music, 2015). Music festivals have not only positive impacts, such as increasing the economy, but also negative impacts, such as the enormous carbon footprint produced mentioned before and its impact on climate change (Mair & Laing, 2013). That is why several studies only discuss the negative impacts of music festivals without considering whether the organisers have managed to minimise them (Stettler, 2011). In this case, the Glastonbury Festival organiser has tried to solve this problem in various ways. Therefore, to address this gap, this paper delves into the multifaceted approach taken by the organiser of Glastonbury Festival in mitigating and managing its carbon footprint. Thus, the primary objective of this research is to assess the festival's carbon mitigation strategies and their effectiveness in reducing carbon footprint while not compromising on the essence and scale of this grand event.

According to the Oxford Dictionary, an event is a thing that happens or takes place, especially one of importance. In terms of tourism, an event is more than a mere occurrence; it represents unique, transient phenomena that offer attendees the opportunity for leisure, social interaction, and cultural immersion beyond the ordinary spectrum of choice or daily experiences (Getz, 2005). This event can manifest as purposeful rituals, captivating presentations, artistic performances, or jubilant celebrations, all consciously orchestrated to commemorate special occasions and to achieve specific social, cultural, or corporate objectives (Bodwin, 2006).

As an event, the Glastonbury Festival is an annual music performance that provides leisure opportunities and serves as a vehicle for realising distinct social and cultural goals. Glastonbury Festival is a mega event characterised by the grand scale and the capacity to generate substantial tourism, media coverage, and economic impact, both for the organiser and the local community (Getz, 2005).

However, despite its allure, this festival has faced criticism for its adverse environmental consequences and contribution to climate change (Getz, 2005). Moreover, if not effectively managed, the festival could jeopardise the very attribute that initially attracted people (Case, 2013). The most effective strategy to prevent the climate damage wrought by the event is the reduction of carbon footprint, which is notoriously substantial in the context of event organisation (IPCC, 2007).

To comprehensively assess the extent of the carbon footprint produced, it is imperative to conduct an analysis across five distinct resource utilisation categories. These encompass energy, transport, waste, consumption of food and lodging, and total surface (Anderson & Lundberg, 2013). However, due to data limitations, this paper will focus on three of these categories: energy consumption, waste management, and transportation emissions. The consumption of food and lodging data was obtained from surveying festival attendees, which took quite a long time, meanwhile the total surface data was not found online. The consequence of not employing these two variables is that the results of the analysis of carbon footprint management will not be as comprehensive as if they used all these variables. However, with these three variables, this research can give a sufficient idea of how the organiser can prevent the production of an enormous carbon footprint at the festival.

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Method

This qualitative study draws upon the Fredline et al. (2005) framework to scrutinise the carbon footprint generated during the Glastonbury Festival. Specifically, this study was conducted for one month in 2019 and investigated the carbon footprint of energy consumption, waste management, and transportation emissions in the festival. The data utilised for this research is derived from secondary data from the period 2010-2019, sourced from journal articles, reports, books, and government databases. Through these secondary sources, data is collected by identifying research variables, which are then narrowed down to find the most relevant data applicable to the research. Once the secondary data source is narrowed down, checking for duplication before assembling it into a usable format is also carried out to ensure that the data collected can be used for analysis and meet the objectives of this research. Following the data collection process, the findings are presented in a descriptive approach to show the identified issues and highlight the strategies employed by the organiser to address these challenges.

Findings and Discussion

Glastonbury Festival is an annual music and performing arts event located on a 900-acre farm in Pilton, England. The first festival was established in 1970 by a farmer, Michael Eavis, as he was inspired by a local blues festival (Discovering Britain, 2017). This festival is a legendary music festival that draws over 100,000 attendees from varied countries every year, as it presents a diverse music lineup and features a wide range of performing arts, including theatre, circus, acts, comedy, and spoken word performances (Glastonbury Festival, 2019). While the Glastonbury Festival has attained a status as a cultural phenomenon, it has also faced criticisms for its environmental impact and the challenges of managing such a massive event (Flinn & Frew, 2014). Therefore, this research addresses managing the carbon produced.

Energy

As one of the biggest music festivals in the United Kingdom, Glastonbury Festival requires a massive amount of energy to run the festival. According to Marchini, Fleming, and Maughan (2013), the energy needs to organise a festival vary, but most of it demands significant energy consumption for various purposes, including main stage lighting, video and audio systems, bars, campsites, and production offices. They further mentioned that electricity consumption at music festivals can reach astonishing levels, indicating a maximum of 26,417 kWh. That number is equivalent to the energy usage of a large-sized detached house in the United Kingdom for over six years and three months (Ovo Energy, 2014). In 2006, the Glastonbury Festival used 30,000 megawatts of energy for five days of the festival, and this number is the same as the energy consumption of the entire city of Bath (Youngs, 2017).

Acknowledging the significance of these energy used, the organisers of Glastonbury Festival were committed to making the event sustainable with minimum impact and fewer carbon footprints. Over the years, they have endeavoured to incorporate renewable energy sources into the festival's energy mix. Starting in 2010, the festival began integrating solar and wind power as part of its energy source (Gray, 2013). Furthermore, most of the energy for the festival is provided by hundreds of generators that use fuel from biodiesel and recycled vegetable oil waste. The festival significantly reduced its carbon footprint, as these renewable energy substitutes release 85% less CO2 compared to conventional fuel sources (British Gas, 2013). In 2010, Glastonbury Festival invested in a substantial solar panel installation, placing 1,500 m2 solar panels on the roof of its large cattle shed. The solar behemoth generated an impressive amount of energy but was still insufficient to power the large generator on the main stage for a small-scale festival in Brighton. Bimble Bandada, which has a capacity of 1,000 visitors, it is possible to use solar energy for the whole festival (eFestivals, 2014). However, wind power has played a pivotal role in the festival's green initiatives, with the entire Green Fields saving much carbon, including the 1,000-capacity Croissant Neuf Stage, which is entirely powered by wind and solar power (Glastonbury Festival, 2014).

The organiser adopted various innovative practices to minimise the festival's carbon footprint. This includes converting around 4,000 litres of cooking oil into biofuel annually providing energy to several areas, including Theatre & Circus and The Park, amounting to approximately 1.5 tonnes CO2e (Gray, 2013). The organisers have also embraced LED light towers, significantly reducing energy consumption compared to traditional lighting sources, with one fuel tank now powering 500 hours (eFestival, 2014). They have also actively collaborated with academic institutions, such as the University of West England, to explore green energy sources further (UWE Bristol, 2017). One of the successful collaborations was the Pee Power toilets, which harnessed attendees' urine to generate electricity for phone charging stations, lighting, and information panels, showcasing the festival's dedication to sustainability (Glastonbury Festival, 2017). Another collaboration has also been made with Aggreko PLC, a temporary power generator equipment supplier. The

collaboration produced the organisers implement power station control to efficiently manage energy usage throughout the event area efficiently, effectively reducing unnecessary generator operation (Stettler, 2011). This also supported using a hybrid generator that is more environmentally friendly than generators in general (Gray, 2013). This hybrid generator can store energy in a battery so that the stored energy can be used when the generator does not turn on at all. Simple yet impactful measures have also been implemented, such as turning off equipment when not in use. Turning off 3% to 11% of lightning can save significant energy 199kWh and reduce emissions by 200kh CO2e (Hawkes, 2010).

Glastonbury Festival has been on a continuous journey towards managing its carbon footprint by incorporating renewable energy sources, optimising energy consumption, and fostering innovation. Through their tireless effort and commitment to environmental responsibility, the organisers have demonstrated that large-scale event can maintain their grandeur while significantly reducing their carbon footprint, setting an inspiring example for the global entertainment industry. However, to maximise the use of renewable energy, one benchmark that can be used as an example is the Coachella Valley Music and Arts Festival, a music festival held annually in California, the US. They have developed various media to implement the sustainable energy framework by teaching the attendees how wind, solar, thermal, biodiesel, ethanol, kinetic energy, and other sources can be used as alternative energy without producing a carbon footprint. Furthermore, these media make the attendees not only learn but also participate actively in running environmentally friendly energy generators. Efforts like this should also be carried out at the Glastonbury Festival, as several actions have been carried out before. Therefore, as Glastonbury Festival continues to evolve and adapt its sustainable practices, it serves as a beacon of hope and progress for a greener, more conscious future in music festivals.

Waste

Waste management poses a significant challenge at the Glastonbury Festival every year of organising. More than 13,000 people gathered in one location for five days, resulting in a substantial amount of litter. In 2017, the festival accumulated 1,650 tonnes of waste, including 5,00 abandoned tents, 6,500 sleeping bags, 3,500 airbeds, 2,200 chairs, 54 tonnes of cans and plastic bottles, and various other discarded items (Bagot, 2017). The aftermath of such an event requires a massive cleanup effort, with over 1,000 volunteers and a cleaning fee of £785,000, lasting up to four weeks after the festival's conclusion (Vonow, 2017).

Addressing this waste management challenge becomes a shared responsibility between the organisers and attendees (Pringle, 2013). The organisers must establish rules to prohibit carrying non-biodegradable items, while attendees are expected to comply with these guidelines. The festival launched the "Love the Farm, Leave No Trace" campaign to encourage responsible waste disposal, urging attendees to dispose of litter accurately and take home their belongings (Glastonbury Festival, 2018). However, despite these efforts, the litter issue persists, indicating a need to raise awareness and enforce rules more strictly.

To combat the growing problem of plastic waste, the organiser implemented a ban on single-use plastic bottles during the 2019 festival. One plastic bottle can take 450 years to biodegrade in the ocean (McCarthy, 2018). This ban was implemented by limiting the supply at the festival's backstage, production, catering, and dressing room areas (Glastonbury Festival, 2019). By eliminating single-use plastic bottles, the festival significantly reduced its plastic waste (White, 2019). While this policy was a commendable step, ensuring visitor compliance remains a challenge that may require non-adherence.

During the event, the organiser has taken innovative measures to promote sustainability. They sell reusable water bottles to reduce single-use plastic consumption, collaborating with the Raw Foundation and WaterAid. The price of the bottle sold is £10, and this sale is not for profit purposes. In 2017, a total of 20,000 bottles had been sold (Raw Foundation, 2018). Attendees can fill the bottle for free at 400 drinking water taps strategically placed throughout the venue of the festival. Additionally, implementing reverse vending machines provided by Co-op can also be helpful, as it was successfully done at Download Festival, Reading Festival, and Latitude Festival in 2018 (Warrenger, 2018). These initiatives encourage responsible behaviour and contribute to waste reduction.

After the festival concludes, effective waste recycling becomes paramount. Glastonbury Festival has made significant strides in recycling, with around 50% of the total waste being reused or recycled in 2014 (Ravenhall, 2019). The most recycled waste is chipped wood, cans, plastic bottles, and waste clothing. Tents and sleeping bags were more challenging to recycle than the other waste. Further, in 2019, an impressive 99.3% of the attendees took their tents home, surpassing the 2014 rates (White, 2019). This encouraging trend demonstrated the effectiveness of the organiser's waste management efforts. Further collaboration with recycling and composting facilities can improve waste diversion rates. The festival could also explore a deposit-return system for items like cups and containers, encouraging responsible use and disposal.

Therefore, the Glastonbury Festival faces significant waste management challenges due to its large scale and the temporary nature of the event. Responsible waste management requires a collaborative approach between the organiser and the attendees. While the festivals have implemented various sustainable initiatives, the ongoing litter issue demands continuous efforts to raise awareness, enforce rules, and implement innovative solutions.

An example of good waste management at a music festival can also be seen at the Coachella Valley Music and Arts Festival, as they rarely experience a buildup of trash when the festival is over. They implemented the strategy through the TRASHed project, which is a project for painting and decorating trash bins to make them look attractive. Various local artists were invited to collaborate to decorate this trash bin, making the attendees throw their rubbish into the trash bin and not throw it away carelessly. Furthermore, they also encourage the attendees to return waste that can be recycled in exchange for prizes and merchandise. This effort further motivates the

attendees to participate in recycling activities. By learning from success and building on past experiences, Glastonbury Festival serves as a model for other events aiming to strike a balance between spectacle and environmental sustainability.

Transport

A substantial portion of music festivals' carbon footprint can be attributed to visitor travel. With such a massive congregation of people, music festivals face significant challenges in managing their carbon footprint of the air pollution produced. A study by Julie's Bicycle 2007 revealed that visitor travel alone accounted for 43% of the total carbon emissions from the entire UK music industry, with an estimated 231,000 tonnes of CO2 produced (Julie's Bicycle, 2009). This number does not include the travel of the artists, crews, volunteers, and logistics. Additionally, Powerful Thinking's research in 2017 confirmed that visitor travel created massive greenhouse gas emissions and contributed to 80% of the total emissions produced by UK music festivals. Energy and waste that are fussed have a significant negative impact on the environment, making only 13% and 7% of the total emissions. The sheer number of attendees, over 130,000, arriving at the festival location from various locations and by different transport exacerbates the carbon footprint produced.

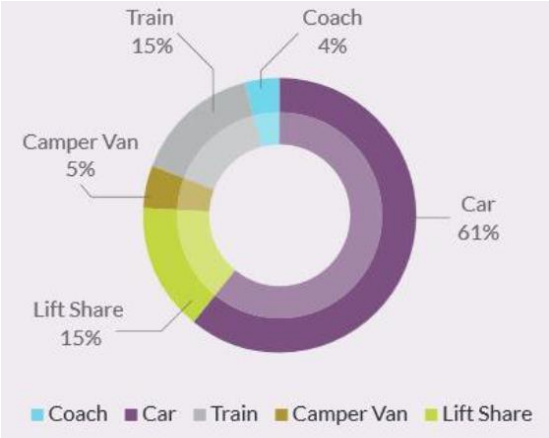

Figure 1. UK Festival Audience Travel by Type
(Source: Powerful Thinking, 2017)

Figure 1 indicates that private cars are the dominant mode of transportation to the festival, accounting for 61% of all vehicles used by attendees. While public transportation options such as coaches and trains offer more sustainable alternatives, their usage could be higher compared to private cars. This preference for driving their own car because it is more practical for the attendees, especially those from a place quite far away or bringing their family and have lots of luggage to carry. However, this results in severe congestion during festival departure, leading to significant air quality deterioration and contributing to climate change. As an example, in 2016, the traffic jams to and from music festival venues reached up to 27 hours, causing discomfort,

heat, and stuffiness. (Mullin, 2016). In Figure 1, the number of attendees who used bicycles is not included because the number is still tiny. Moreover, it needs to have how many attendees come by plane. It must be accepted that some visitors must use the plane, especially international attendees.

To find out more details about the impact of transportation, a carbon emission calculation is conducted of several modes of transport from Glasgow to Glastonbury Festival. The aim is to see an example of a clearer picture of how much carbon emission is produced. The calculation is done by multiplying the distance from Glasgow City Centre to Glastonbury Festival with the emission factor of each mode of transportation using the Conversion Factors 2018 (Department of Business, Energy & Industrial Strategy, 2018). Table 1 below is the calculation result.

Table 1. Calculation of Greenhouse Gas Emission from Glasgow to Glastonbury Festival with Different Modes of Transportation

Mode of Transportation	Distance	Emission Factor (per km)	Carbon Emission Produced (per person)
Plane	564.77 km	0.29 kg CO2e	96.9299 kg CO2e
Camper van	635.7 km	0.21 kg CO2e	133.497 kg CO2e
Car	635.7 km	0.17 kg CO2e	108.069 kg CO2e
Taxi	635.7 km	0.15 kg CO2e	95.355 kg CO2e
Coach	638.91 km	0.12 kg CO2e	76.6692 kg CO2e
Train	643.04 km	0.0044 kg CO2e	32.04616 kg CO2e
Bike	712.93 km	0	0

(Source: Adapted from Department of Business, Energy & Industrial Strategy of the UK, 2008)

As can be seen in Table 1 above, camper vans and cars produce a massive amount of carbon emissions, which are 133.497 and 108.069 kg CO2e per person. According to the data found in Figure 1, the car is a mode of transportation that is mainly used by attendees to music festivals, which is 61% of the total attendees. If this assumes that 100 people depart from Glasgow, 61 people will use the car, and the carbon emission produced will be 6,592.21 kg Coe. This number will be doubled with a return trip to Glasgow from the festival venue, which will reach 13.184.42 kg CO2e. Compared to public transportation such as coaches and trains, the attendees can save half to one-third of the emissions from camper vans and cars. Emphasising public transportation, coaches can be a practical solution to reduce transportation emissions and alleviate traffic congestion, as one coach is equivalent to 20 cars on the road (The Kings Ferry, 2015). Unfortunately, only a few attendees use public transportation to the festival. Whereas if the attendees use public transportation, coach, for example, many benefits can be obtained such as the journey being direct to and from the festival, no need to be tired of driving, and less carbon footprint.

In response to the transportation challenge, the Glastonbury Festival organiser initiated the Green Traveller program in 2011, encouraging attendees to use public transportation or bicycles (Glastonbury Festival, 2011). The program offers incentives such as discount vouchers, access to solar showers, and compost toilets. While this program has been ongoing, its success depends on the psychology and awareness of attendees regarding climate change and their willingness to adopt sustainable travel options. Further efforts may be required to make the program more appealing and effective, especially for attendees with fewer belongings or without children.

Another initiative the organisers took is to provide buses in various cities in the UK to go directly to the festival venue. This bus makes things very easy for attendees because they must come to the meeting point, usually in the city centre, and then leave together. Sales tickets for this bus often sell out faster than event tickets (Heal, 2018). This initiative is quite well known among other music festivals, and many use it as a benchmark because of its significant impact in minimising carbon emissions and reducing congestion.

Transportation emissions also arise from the travel of artists and performers to the festival. While some local acts and those from neighbouring venues contribute minimally to the overall carbon footprint, international performers who travel long distances, particularly by air, produce significantly higher emissions (Department of Business, Energy & Industrial Strategy, 2018). Furthermore, apart from transportation emissions, logistical activities like transporting food stalls, shops, and toilets to the festival site also contribute to the festival's carbon footprint. These activities require considerable energy and generate emissions during transportation. According to a study on greenhouse gas emissions of the UK music industry, the logistical activities produce a total of 7.39 tonnes of CO2e (Bottrill et al., 2010).

The Glastonbury Festival's environmental impact, particularly concerning transportation, necessitates innovative and concerted efforts to reduce carbon emissions. Encouraging attendees to use public transportation, implementing sustainable logistic practices, and incentivising eco-friendly behaviour through programs like the Green Traveller initiative can pave the way toward a greener and more sustainable future for this iconic music festival. Further, the organiser may expand this initiative by offering incentives such as priority entry or exclusive experiences. This program could entice more attendees to opt for public transportation or carpooling. Partnering with regional transportation providers to offer convenient and eco-friendly travel potions can also make sustainable transportation more accessible to the attendees. As for the performers, fostering sustainable practices should also be done. While encouraging local acts and eco-friendly travel for performers is beneficial, the organiser should actively engage international artists to adopt greener travel options. This could include offsetting flight emissions, supporting renewable energy projects, or making sustainable travel a criterion for participation. Offering information and resources to help artists make eco-friendly choices can also positively impact the festival's overall carbon footprint.

Conclusion

Glastonbury Festival, one of the UK's most significant music events, faces environmental challenges related to energy consumption, waste management, and transportation, which causes the production of a massive carbon footprint. Over the years, the organiser has implemented various sustainability initiatives to combat these issues.

The festival's electricity demands are substantial in terms of energy, resulting in significant carbon emissions. However, Glastonbury has taken strides to incorporate renewable energy sources like solar and wind power., effectively reducing its carbon footprint. The use of biodiesel and recycled vegetable oil waste in generators father contributes to emission reduction. Waste management presents a significant challenge due to the massive number of attendees. Glastonbury Festival organiser encourages responsible waste disposal and successfully bans plastic bottle sales, reducing plastic waste considerably. Additionally, approximately half of the waste generated at the festival is recycled. Initiatives like encouraging the attendees to take their belongings home have also contributed to waste reduction. Transportation emissions are a significant contributor to the festivals' carbon footprint. The Green Traveller program incentivises the use of public transportation and bicycles, aiming to reduce the impact of visitor travel. However, more efforts are needed to address the performer's journey and logistical emissions.

To sum up, Glastonbury Festival is actively striving for environmental sustainability by incorporating renewable energy, promoting responsible waste disposal, and encouraging sustainable transportation. Despite facing challenges, the festival sets a positive example for large-scale events, showcasing the importance of preserving natural resources for a greener future.

For further research on managing the carbon footprint at the Glastonbury Festival, it is encouraged to include two variables, total surface and consumption of food and lodging, into the analysis as these are limitations of this research. Adding these two variables will make the analysis results more thorough. Another recommendation for future research is to state in detail the number of carbons produced and what was successfully reduced. By including this, the effectiveness of managing the carbon footprint that has been carried out at the music festival will be seen more clearly.

Some practical suggestions to further enhance Glastonbury Festivals' environmental sustainability and minimise its carbon footprint are engaging and educating the attendees and strengthening partnerships with environmental organisations. Raising attendees' awareness about their actions' environmental impact can lead to more responsible behaviour. Implementing educational initiatives, such as interactive exhibits, workshops, or talks, can help them understand the importance of sustainable practices and motivate them to make greener choices both during the event and in their daily lives. Further, collaborating with environmental organisations and advocacy groups can bring expertise, resources, and innovative ideas to further enhance the

festival's sustainability efforts. This partnership can also help address specific environmental challenges and showcase Glastonbury Festival's commitment to positive change.

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