OCTOBER 20~~21 - OCTOBER 2022 F-10 ARTIST TRAVEL EMISSIO~~NS REVIEW

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Figure 1: F-1O Artistes Logo (F-10.co.uk, 2022)

What is the Impact of Carbon Emissions Caused by Artist Travel within F-10 Artistes LTD and How can Emissions be Reduced?

1.0 Contents:

1.1 Table of Figures

2.0 Abstract

This portfolio contains an investigation into carbon emissions of artist travel within the agency 'F-10 Artistes', an analysis into reducing the carbon emissions, and research into actions that the business could take.

For the portfolio, a critical analysis into artist travel for the last year of events has been completed. The viability of emission reduction methods has been reviewed, creating an 'action plan' to achieve low carbon operations.

3.0 Introduction and Background Explanation

F-10 are an international DJ agency representing predominantly UK based acts (F-10 Artistes, 2022). Managing Director, Jon Beckley, wants to push the agency towards being environmentally responsible. To achieve this, it must assess the carbon and GHG emissions released from actions it is responsible for (Berklee College of Music, 2022). According to the GHG protocol (2004), assessed emissions need to be within F-10's operational control.

3.1 Background Explanation

In 2021, annual worldwide carbon emissions were 36.4 billion metric tons (Statista, 2022). The Climate Change Committee (2020) state that damaging climate impacts are being felt at current emission levels, and unchecked emission growth would lead to widespread severe climate change by 2100 or earlier. Stabilising this would mean reaching net zero global emissions by 2050, a target set within the Paris Agreement (Petersen, 2021). As Jones (2021) states, all aspects of the live music industry have roles to play to reduce carbon emissions of the sector. Berklee College of Music (2022) estimates that carbon emissions of the sale of music products and live music performances to UK customers is at least 540,000 tons of CO2e per annum, with ¾ of this from the live music performance sector. Surface travel and flights by both artists and audiences contribute significantly to emissions of the live music sector (Jones, 2021). According to Ritchie (2020), some methods of transport, especially domestic flights, have significantly higher emissions per passenger. Considering this, there is room for improvement in the operations of F-10 to reduce carbon emissions, such as programming tours to maximise low carbon travel methods, attempting to reduce equipment transportation and using public transport over flights (Jones, 2021).

Although audiences are larger in number than artists teams, audience travel is outside operational control of the company (GHG Protocol, 2004). However, due to the relationship between audiences and artists (Reiter, 2014), there is the potential of influencing audience travel methods if communicated effectively. Coldplay have already announced direct action to reduce carbon emissions from touring, as well as successfully encouraging fans to commit to low-carbon travel (Beaumont-Thomas, 2021). Bands such as Massive Attack have commissioned research into this field (Jones, 2021), and others such as Harry Styles and Tame Impala have pledged to global projects that offset carbon emissions (Beaumont-Thomas, 2021), although carbon offsetting has been heavily criticised for not tackling the problem at its core (Ghussain, 2020) (Beaumont-Thomas, 2021).

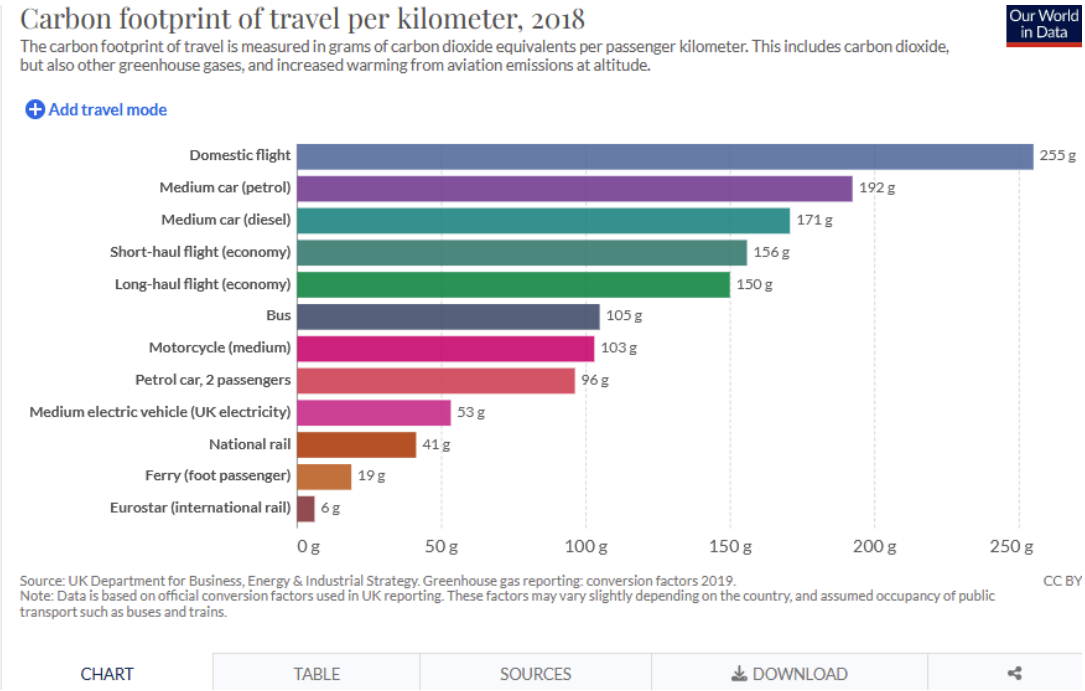

Figure 3: Carbon footprint of travel per kilometre, 2018 (Ritchie, 2020)

Changes to the operations of F-10 will need to ensure minimal impact to running of the company and need to be analysed in terms of task duration, employee integrity, commitment and effort required for them to be viable, as according to Sirkin (2005), changes would otherwise likely be side-tracked due to a lack of time alongside existing responsibilities. F-10 have already taken steps to reduce waste and carbon emissions such as paperwork digitisation, saving thousands of sheets of paper yearly (Ogletree, 2021). It is important that operational changes are viable for their implementation in the long term, as short-term changes will not lead to any long-term positive impact (Forster, 2020). Changes will also need to be within the company's operational control and accurate with any assumptions disclosed (GHG Protocol, 2004).

3.2 Aims and Objectives of the Project

The aim of this portfolio is to provide F-10 with information on the impact of artist travel via analysis, and to provide viable recommendations to offset or reduce the impact of artist travel.

Objectives:

- Collect data of the last year of artist travel within F-10.
- Calculate the carbon footprint of this data using appropriate methods.
- Critical Analysis –researching the impact of emissions.
- Research into methods to reduce or offset carbon emissions.
- Provide F-10 with recommendations so that they can take an informed next step into reducing carbon emissions.

4.0 Methodology

The methodology to create the portfolio will be based on the collection, critical analysis, and research of carbon emission data from artist travel, alongside the research of methods to offset or reduce carbon emissions. The travel records will be from events between October 1st, 2021, and October 1st, 2022. The summer of 2021 was affected by Covid restrictions within the industry. By October 2021, restrictions had been removed from venues (Dee, 2021). The altered logistics of summer 2021 (Robertson, 2021) also means that carbon footprints of businesses in this period would likely be outliers, as emissions during government restrictions were nominally lower than usual (Forster, 2020) (Statista, 2022).

4.1 Detailed Methodology

The methodology of this portfolio can be broken down into three phases. It is essential to break down project work during planning to make large projects easier to track and complete (Roseke, 2016).

4.1.1 Data Collection and Processing

Artist travel data within the set timeframe will be collected from the booking system, Overture, which contains all information relating to bookings of F-10's artists. This data will be stored in a spreadsheet in an appropriate manner for storage, analysis, and visualisation (Broman, 2017).

There are incomplete records for some bookings requiring further investigation, for example, where a train cancelled, and an artist had to drive to an event; details of the route and vehicle may not be stored. In all cases, there will be no way to have 100% accuracy on carbon emissions, as the planned journey is being analysed, not the real- time, physical carbon emissions. According to the GHG protocol (2004), uncertainties need to be reduced as far as practical and any relevant assumptions need to be disclosed. Traffic, holding patterns, etc., provide uncertainties, which is not within F-10's operational control. Where data is missing, this can be obtained retrospectively or estimated to an appropriate degree. Precise details of transport method, journey time and distance will be stored to calculate carbon emissions.

Artist names upon completion of this will be stored under a pseudonym. A key to reverse this will be held by F-10, so that the agency can analyse this data privately if desired.

4.1.2 Critical Analysis of Data

The carbon emissions of the planned journeys will be calculated. Due to the data size (400+ bookings), there is likely no industry standard tool that can retrospectively handle that much data. Calculators for logistics, such as Carbon Care, are specifically designed for Freight and Cargo handling (CarbonCare, 2022). Companies such as Ecolibrium have applications (Riach, 2021) that could be used for this purpose, however, are not designed for mass data and would be better suited as a tool to measure carbon emissions whilst planning tours. To process the data collected, a tool will be built in Excel, alongside figures on carbon emissions from the travel methods used. Problematic areas highlighted to focus on could include domestic flights, releasing significantly more CO2 than rail or petrol cars (Ritchie, 2020).

This will be compared against other logistics operations, ideally within the Music Industry, to assess F-10's carbon footprint. The level environmental impact will be researched to quantify emission levels to an impact level. This will affect the viability of all recommendations made to F-10.

4.1.3 Analysis and Research into Viable Methods to Reduce the Carbon Emissions Produced

The final phase will conclude with research into viable methods to reduce carbon emissions. Research will be conducted to analyse whether changes such as programming tours to focus on low carbon travel, reducing any equipment transportation and using public transport over flights (Jones, 2021), could reduce carbon emissions.

Methods of carbon offsetting via 3rd parties will be researched and analysed in terms of their efficiency and viability when implemented into business operations, in terms of reducing emissions, being easy for staff to manage, and cost efficiency. Criticisms of carbon offsetting will be researched due to the ongoing discussion as to its own viability in the long term (Ghussain, 2020), due to it not tackling the issue at its core.

This will be presented to Jon Beckley to discuss the recommendations.

4.2 Resources and Timescale

Resources to enable the completion of this project will include:

- Overture – booking system used by F-10 containing key information on event logistics.
- Technical information on various methods of transport and their carbon emissions (DBEIS, 2019, 2020).
- Excel tool to analyse carbon emissions created by travel.

Weeks	1	2	3	4	5	6	7	8	9	10	11	12	13
Date W/C	Sept 26	Oct 3	Oct 10	Oct 17	Oct 24	Oct 31	Nov 7	Nov 14	Nov 21	Nov 28	Dec 5	Dec 12	Dec 19
Activity													
	Internal Planning												
		Project Proposal											
				Data Collection and Processing									
						Critical Analysis of Data							
							Carbon Emission Research						
						Create Report Draft							
									Research into Recommendations				
											Recommend-ation Viability		
											Refine and Edit Report		
													Subm it

Figure 2: Gantt chart showing a timescale for the completion of the project.

5.0 Data Collection

Travel data was collected using the report function within Overture, generating a spreadsheet with all booking information. Irrelevant data was deleted from the spreadsheet. Overall, data for 402 bookings was stored for analysis.

5.1 Travel Method Data Collection and Outliers

Bookings where F-10 acted as a 3rd party agent were removed from the data, as it was not the role of F-10 to organise those artist's travel. 2 other artists were removed under the same rationale (GHG Protocol, 2004).

The following travel methods were recorded; Bus, Diesel Car, Diesel Taxi, Domestic Flight, Electric Car, Electric Taxi, Eurostar, Ferry, Hybrid Car, Hybrid Taxi, International Flight, Petrol Car, Petrol Taxi, Tour Bus, Train, London Underground, and Van.

For car journeys with available vehicle information, information has been stored in order to more accurately determine vehicle emissions per kilometre. Where unavailable, the artist's personal car has been recorded, as this is likely the case. For taxis, the registrations have been stored in the same manner, and in other cases, vehicle type has been estimated by analysing the fleet of the company.

5.2 Journey Uncertainty

The precise journey taken was unavailable in some cases, where artists took detours etc. Where recorded, it has been used to determine distance and time travelled. Where unavailable, the planned journey has been used to determine distance and time travelled. This has been completed by taking an average of the journey distance and time from mapping software, set at the approximate date and time that the journey was taken, providing a reasonable estimate as to the journey distance and time. Real world changes in planned journeys are not within the scope of F-10 (GHG Protocol, 2004), so an analysis of the planned journey here is acceptable.

5.3 Carbon Emissions of Journeys

The estimated carbon emissions of all journeys have been calculated via recommended methods from the UK Government. The Department for Business, Energy and Industrial Strategy (DBEIS) propose appropriate methodology for accurately attributing carbon emissions to travel. (DBEIS, 2021).

5.3.1 Flights

Domestic Flights start and end in the UK (DBEIS, 2021). According to Ritchie (2020), UK Domestic Flights, Long Haul, and Short Haul International flights are in the top 5 travel methods that release the most CO_2e per km. International Flights emissions have been individually calculated. Flights release most emissions at high altitude, amplifying their impact (Planetair, 2022; DBEIS, 2021). The Intergovernmental Panel on Climate Change and DBEIS recommend applying a radiative forcing factor to emissions of 1.891 to account for their full effect. However, this is an active area of research and contains a lot of uncertainty (DBEIS, 2021).

To calculate carbon emissions of flight journeys, the Planetair (2022) calculator was used and compared against the figures of Ritchie (2020), and DBEIS (2021) aircraft CO_2e emissions per km. To appropriately account for flights releasing emissions at high altitude, the radiative forcing factor has been applied to flight emissions (Planetair, 2022, DBEIS 2020, 2019).

Flight emissions have been calculated depending on class. The class of the flight taken affects calculations based on the area of each plane that a passenger takes up (DBEIS, 2019, 2020), as first, business and premium economy classes have fewer seats.

5.3.2 Cars, Vans and Tour Busses

For passenger vehicle categories, DBEIS (2019, 2020) CO_2e figures per km were used. The CO_2e emissions per km were multiplied by the journey distance in km to calculate estimated carbon emissions. For Tour Busses, it is assumed that 10 people were on the Tour Bus. Electric cars are recorded as 0 CO_2e emissions as direct emissions are being estimated (GHG Protocol, 2004), however it is worth noting that emissions are dependent on the ultimate source of the electricity used to power the car (DBEIS, 2019).

For car sharing, according to Ritchie (2020), car sharing splits the carbon emissions between passengers. Carbon emissions were divided between respective artists.

5.3.3 Trains and Other Public Transport

As in 6.3.2, DBEIS (2019,2020) CO2e emission figures per km were used per travel method to determine journey emissions. National Rail, London Underground, and Bus figures were calculated in the same manner as 6.3.2.

6.0 Data Analysis

6.1 Analysis of Collected Data

Total estimated CO2e emissions related to artist travel is 40.076 tonnes CO2e for the period analysed, 27.983 tonnes CO2e without the radiative forcing factor. Average total emissions of all artists is 0.6792 Tonnes CO2e. Standard Deviation of total emissions of all artists is 1.2477 Tonnes CO2e.

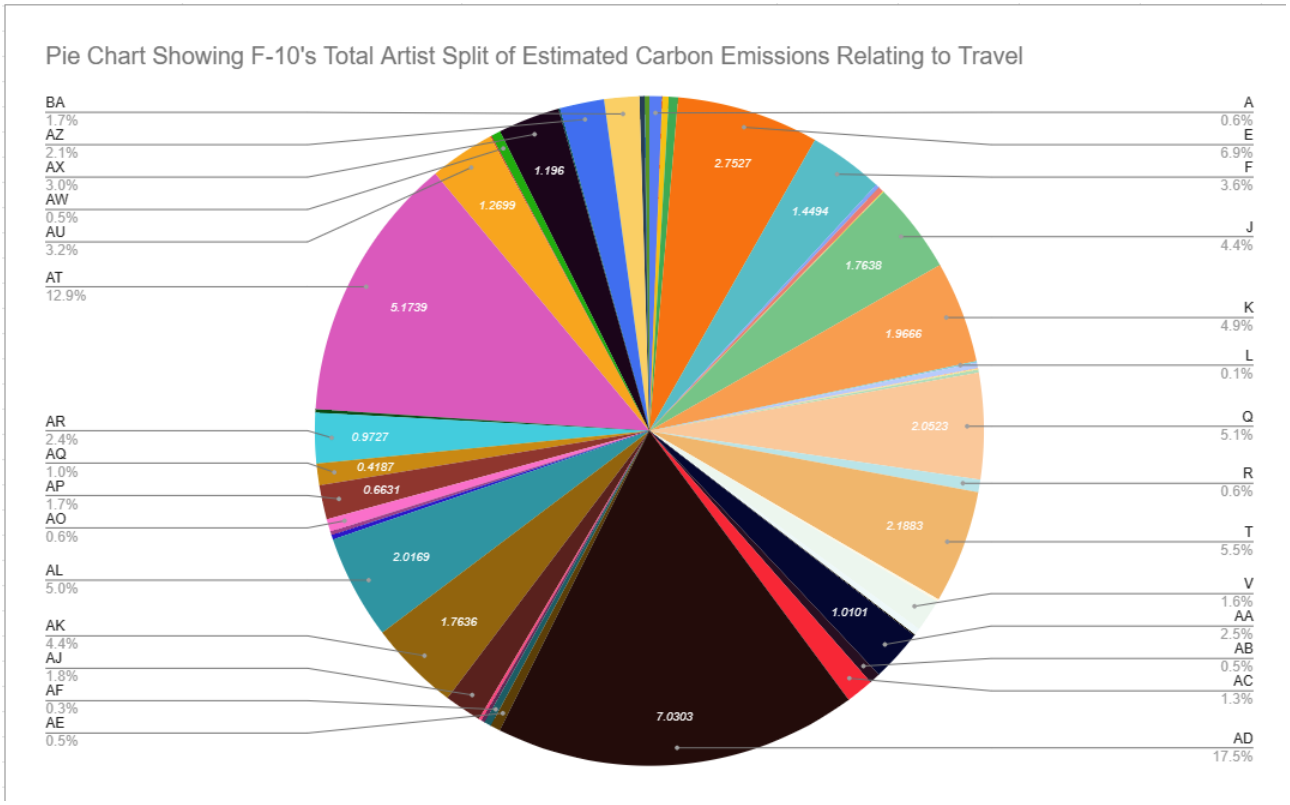

Figure 4: Pie chart showing F-10's Total Artist Split of Estimated Carbon Emissions Relating to Travel.

As shown in Fig.4, emissions vary per artist. Some artists have significantly higher emissions than others due to varying factors; higher number of events in total, higher proportion of an artist's bookings being international, and last-minute travel plan changes.

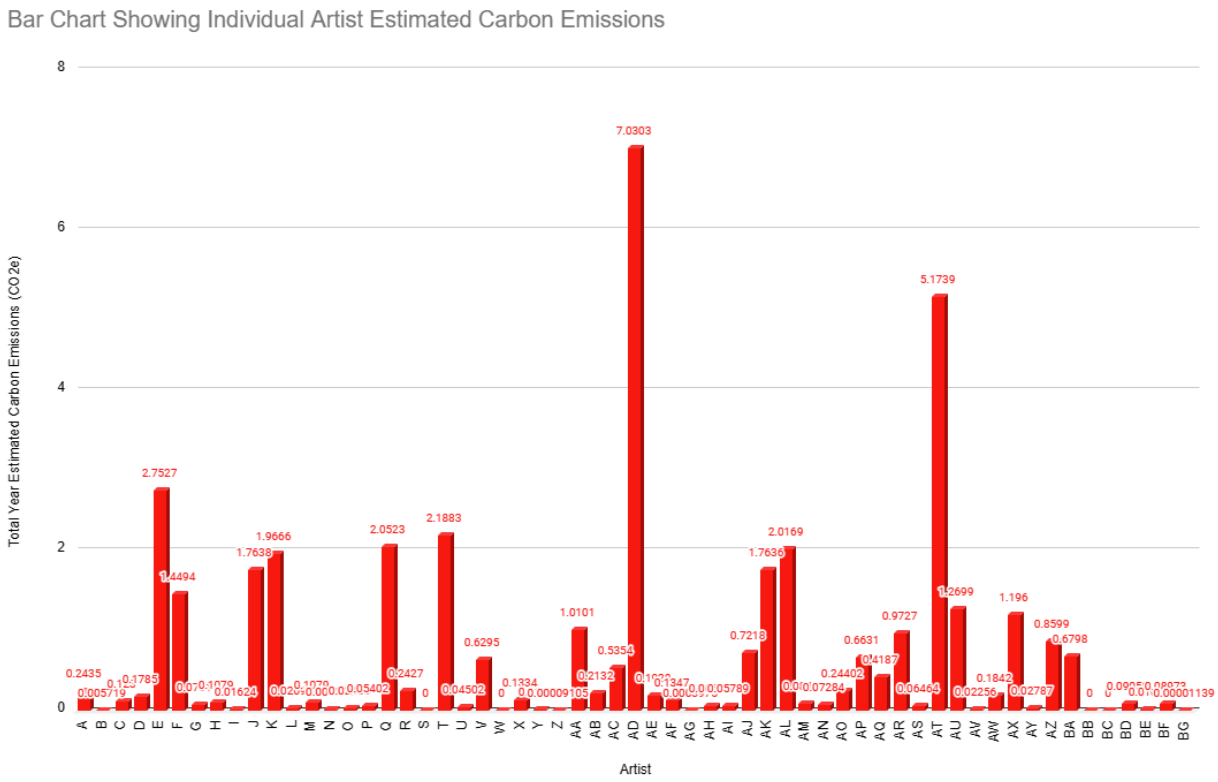

Figure 5: Bar chart showing individual artist estimated carbon emissions.

Fig.5 shows this data in a bar chart. Artists AD and AT have significantly higher emissions. All other artists fall within a range of 0 Tonnes CO2e to 2.8 Tonnes CO2e. Artist AT has a total emissions figure of 5.1739 Tonnes CO2e. This artist had 19 events booked via F-10; 14 domestic, 5 international. Artist AT didn't take any domestic flights, which would likely be an area of improvement (Ritchie, 2020; Jones, 2021). Discounting this, artist AT being a group of 2-7 people, and not a singular artist. With 4 international bookings, the emissions of artist AT are explainable and justifiable against the rest of the artists analysed, and any other artists that are groups.

Artist AD has the highest emissions of any artist, 7.0303 Tonnes CO2e, which accounts for 17.5% of the total. Artist AD is a solo artist with 44 bookings, with only 1 of these being international, containing higher emission Business Class flights (DBEIS, 2019, 2020). Additionally, artist AD typically drives a high emission car to events, rather than public transport. Artist AD also took 5 domestic flights in the year analysed.

To compare, artist T had 61 bookings: 58 domestic, 3 international. Artist T had an estimated total of 2.1883 Tonnes CO2e, significantly less than artist AD. Artist T typically uses trains, London Underground, and taxis for domestic event travel, realistically maximising their use of lower emission travel options (Jones, 2021) given event routings. Despite more international bookings, emissions are still lower than

artist AD. For artist AD, a better choice of travel method would decrease carbon emissions (Jones, 2021). In Fig.6, artists AD and AT are seen above the line of best fit. Artist AT's emissions are justifiable, however, artist AD should consider options to reduce their emissions to fit more within the expected range.

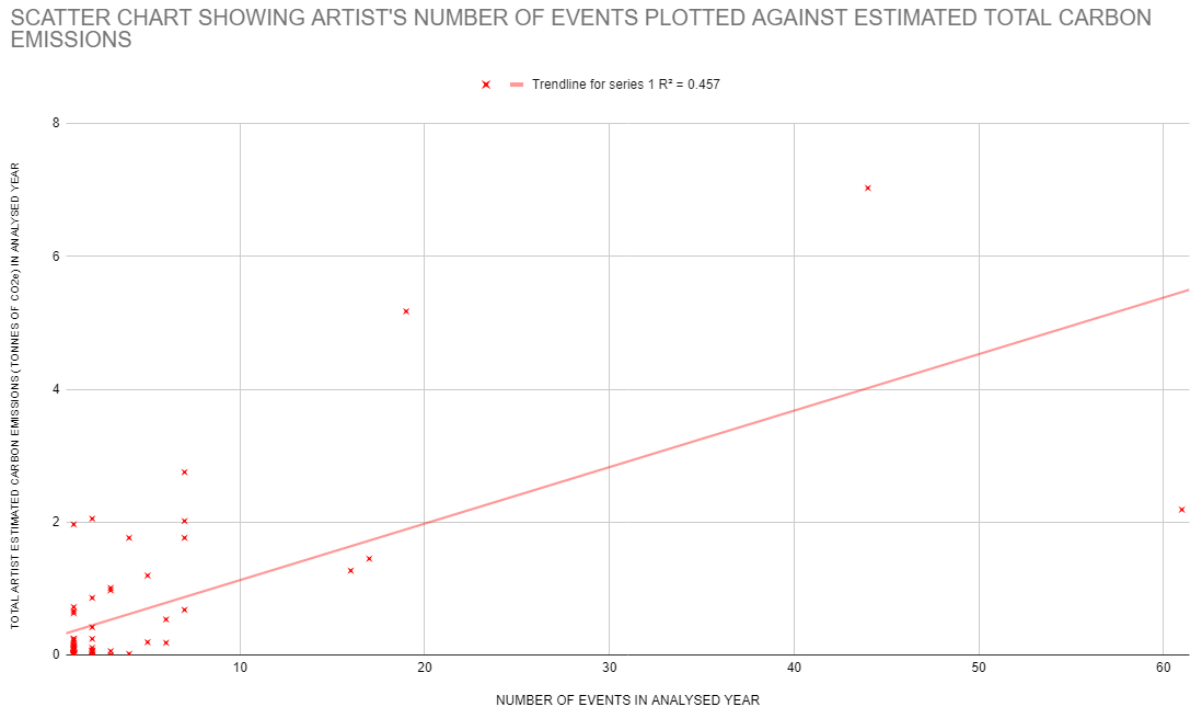

Figure 6: Scatter Chart of Artist's Number of Events Plotted Against Estimated Total Carbon Emissions. Artists above this line of best fit should consider options they could take to lower their carbon emissions.

Fig.6 shows a Scatter Chart of number of events plotted against artist estimated carbon emissions. Most artists had <20 bookings, creating a lack data for artists emissions of artists with more than 20 bookings (see Fig.9 and 10). Only artists AD and T had >20 bookings. The coefficient of determination (COD) of Fig.6 is 0.457. It is expected that an increase in the number of bookings would increase the total emissions. The importance of the COD value is the trendline shown in Fig.6. The COD value of 0.457 indicates 45.7% of the variance in total emissions can be explained by the number of artist bookings, and 54.3% of the variance can be explained by the travel methods used. (Statology, 2022).

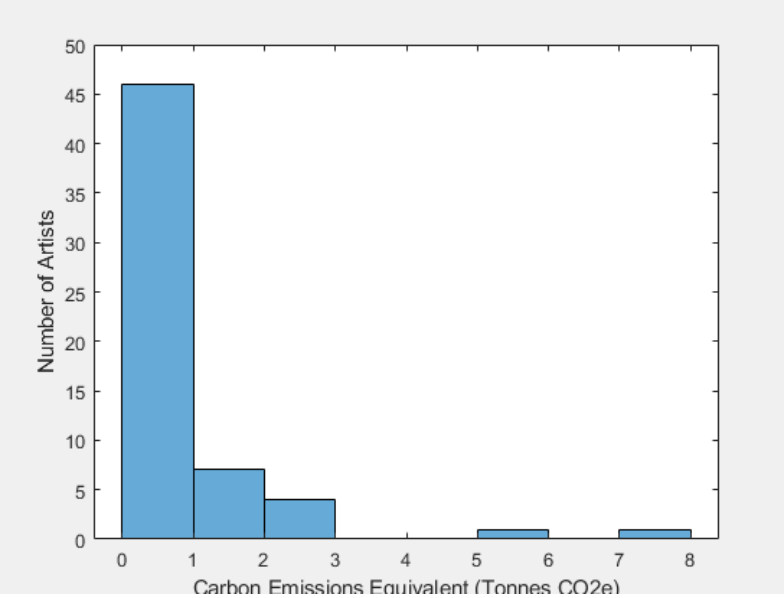

Figure 10. Histogram showing spread of artist total carbon emissions in Tonnes CO2e, with a lack of data for artists with over 3 Tonnes of CO2e.

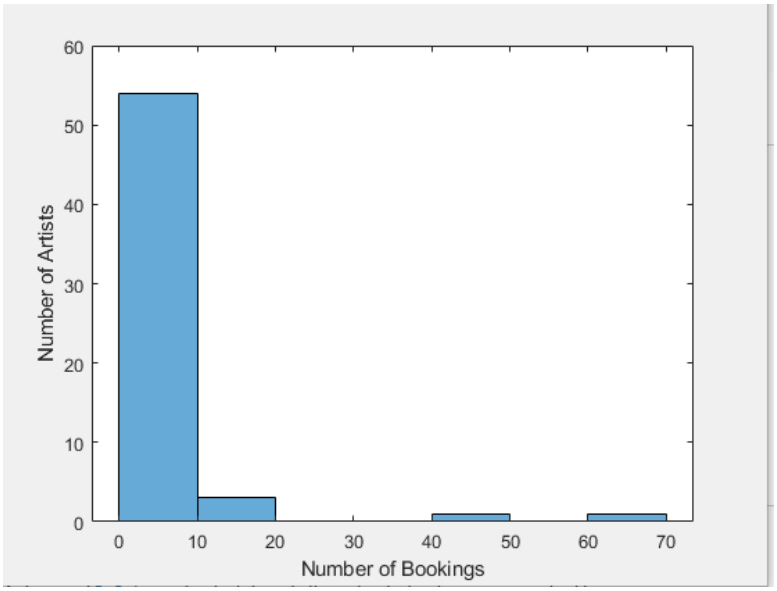

Figure 11. Histogram showing number of artists and number of bookings. The artist showing between 60-70 bookings is artist T, and in Figure 9 is under 3 Tonnes of CO2e emissions. Additionally, artist AD is the data point of 40-50 bookings, and in Figure 9 is the artist with the highest emissions.

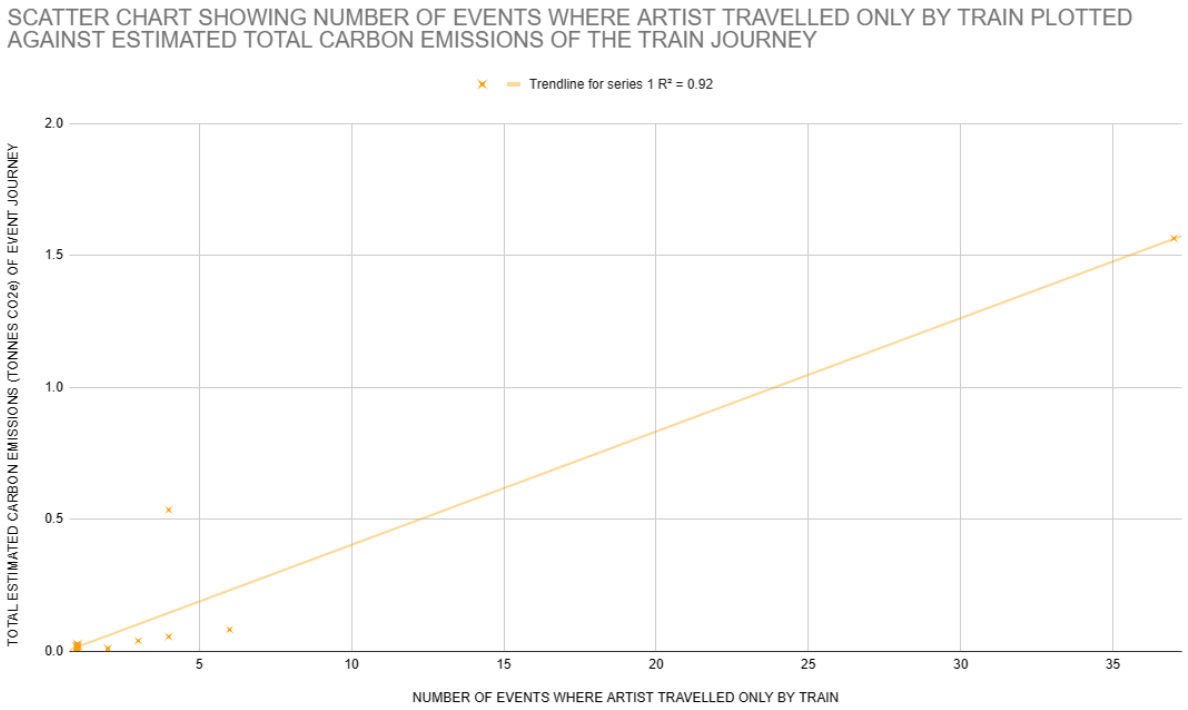

Figure 7: Scatter Chart of number of events where artist travelled only by train plotted against estimated total carbon emissions of train journeys for that event.

As train journeys are similar in terms of emissions figures released by DBEIS (2019,2020), Fig.7 shows artist's number of events where they travelled only by train, plotted against the total emissions of that events travel. The COD value is 0.92, which indicates 92% of the variance in train-based travel emissions can be explained by the number of events where the artist travelled by train, and 8% variance caused by the type of train. This shows that in Fig.6, the number of bookings in total, and the travel methods used both directly impact total emissions.

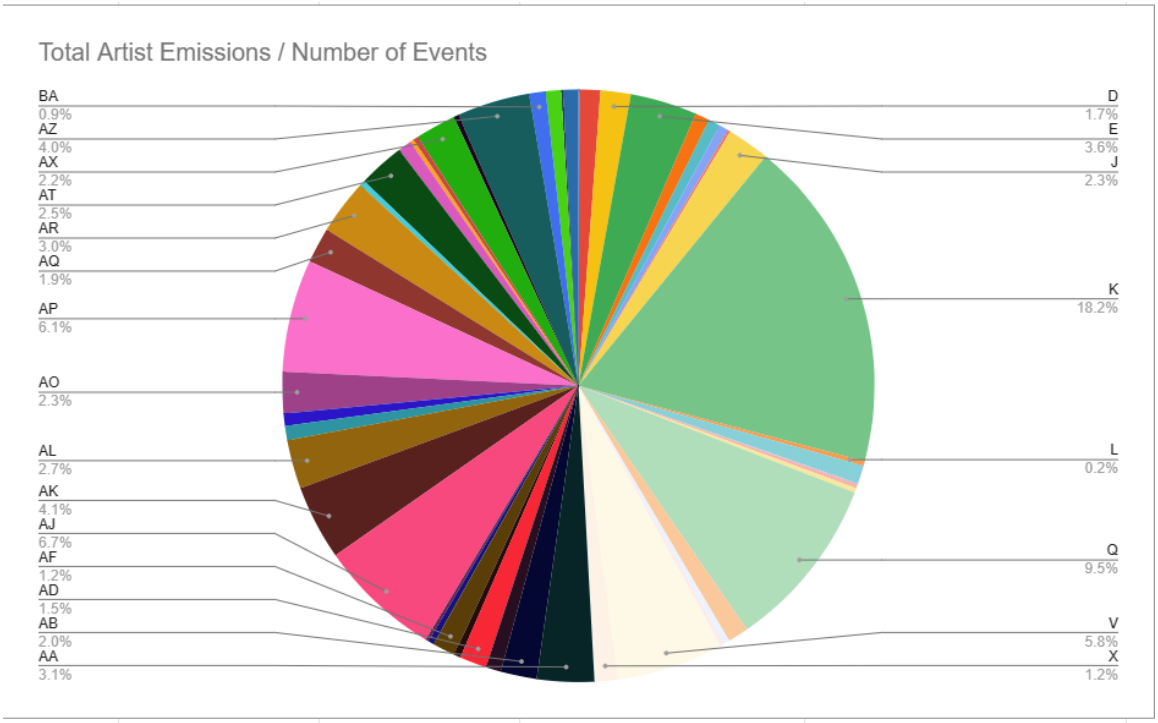

Figure 8: Pie Chart showing total artist emissions / number of events per artist. Abnormally high percentage here means that artists may have had extremely large emissions for one or more bookings. It is worth noting here that artist T's figure here 5%.

Fig.8 shows a pie chart plotting the values of artist's total emissions / the number of events. Artists K and Q are shown as having a higher value than other artists, with artist K at 18.2% of all artists. Artist K is a group of 4 with 1 international booking, meaning that there are 8 international flights associated with this one booking, giving the higher figure. Artist Q is a group of 2 people with 2 international bookings, meaning again there are 8 international flights associated with 2 bookings. Whether this can be improved depends on other travel option availability to the locations of the events.

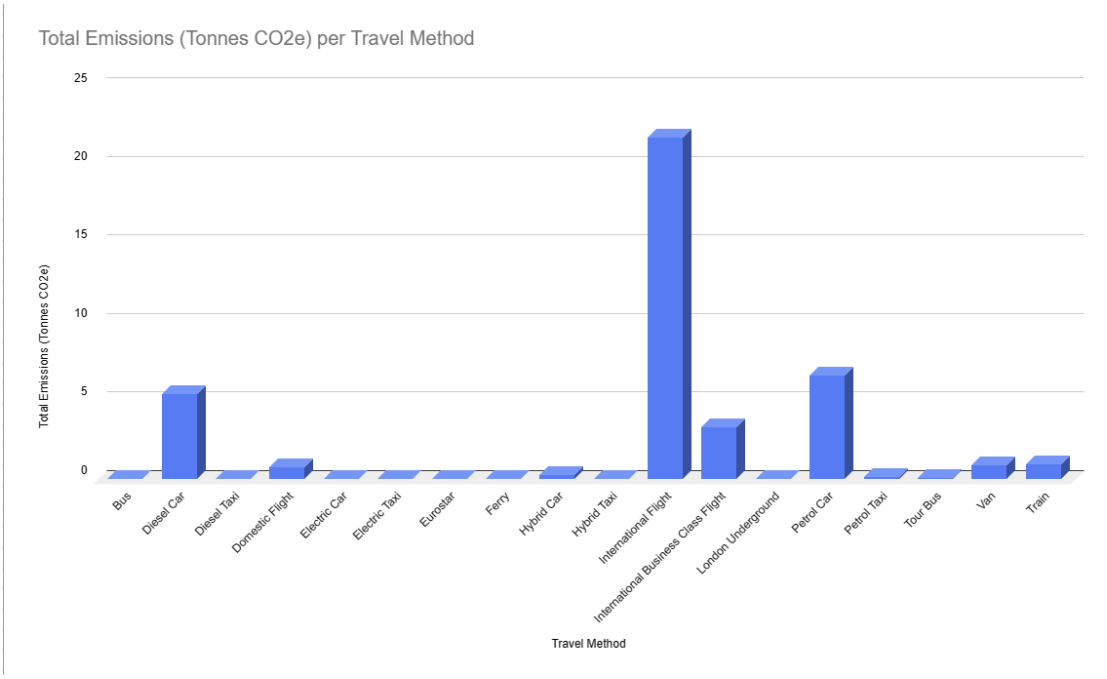

Figure 13: Bar chart showing total CO2e emissions per travel method of F-10's artists. International flights are the largest in emissions.

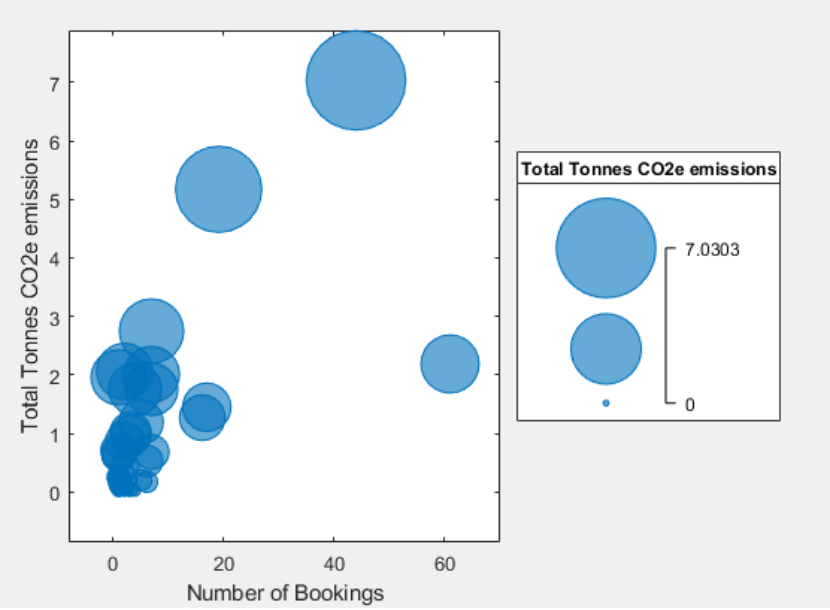

Figure 12: Bubblechart visually representing Number of artist bookings plotted against artist total tonnes of CO2e emissions by event travel. Size of bubbles is related to the size of artist emissions. Each artist is an individual bubble.

6.2 Emissions Impact

40 Tonnes of CO2 has the approximate volume of 27500000 meters squared (Chameides, 2007). In approximately 2 years, half of the CO2e released will be absorbed, however, the remaining amount tends to stay in the atmosphere for an extended period. One hundred years from now, around 1 Tonne of the 40 Tonnes of CO2e released will remain in the atmosphere (Chameides, 2007). 40 Tonnes of CO2e is equivalent to around 4.8 million smartphone charges, or 100,000 miles driven by an average petrol vehicle. Worldwide, F-10's artists travel only accounts for 1.08E-9% of global emissions (Edenseven, 2022). 40.076 tonnes CO2e is difficult to attribute directly to a level of impact (AASHE, 2009). Comparisons can only realistically be made with other activities with known emissions levels.

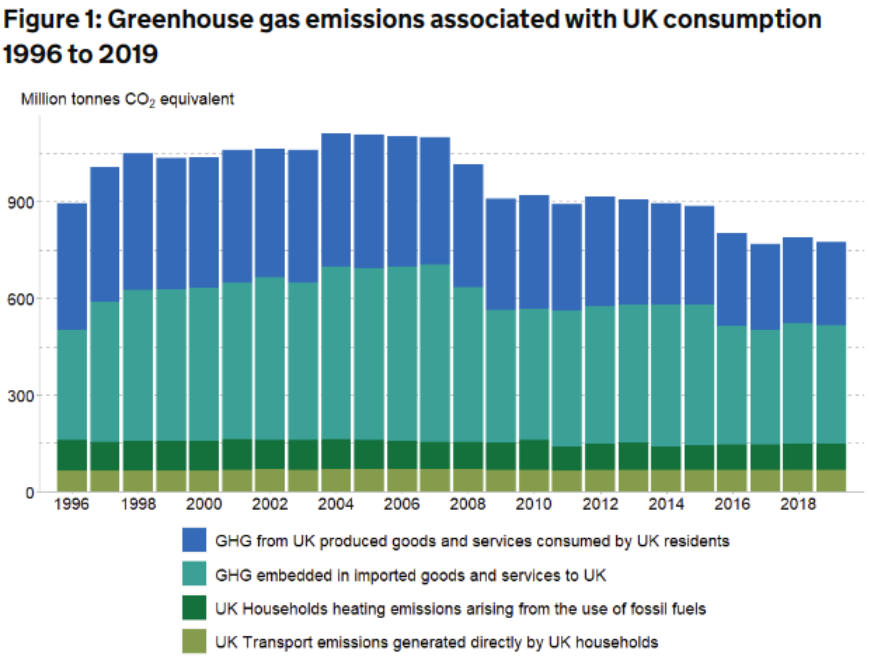

Figure 9: Greenhouse gas emissions associated with UK consumption 1996 to 2019 (GOV.UK, 2022).

The UK Government release UK and England's 2020 carbon footprint figures in May. The most recent figures available are for 2019. Fig.9 shows CO2e emissions of the UK between 1996 and 2019. Onwards of 2019, a decrease in emissions would be expected (Jones , 2021) from global pressure to reduce carbon emissions. In 2019, total estimated artist event travel emissions would have accounted for approximately 5.14E-8% of total UK emissions. Using provisional data for 2021, it would account for 9.4E-8% (GOV.UK, 2022). In terms of the live music sector, F-10 Artist travel would account for 0.00007% of sector emissions (Jones, 2021),

Encore Musicians represent 25,000 musicians and 10,000 music groups (Encore Musicians, 2022), compared to F-10's 59 artists with bookings in the year analysed. If 15,000 of Encore Musician's artists

had 1 booking each, using the same emission average as F-10's arists, this would total approximately 10,188 Tonnes CO2e for artist travel. Although F-10 is a much smaller agency in comparison, as Jones (2021) states, every aspect of the live music industry needs to make positive action to reduce sector emissions. Encore Musicians have already taken action to become a carbon negative agency to mark the COP26 event (Independent Society of Musicians, 2022).

7.0 Recommendation Research

7.1 Creating a Carbon Neutral or Negative Agency

F-10 are already actively impacting the operations of the agency to reduce emissions. The agency is paperless, which according to Ogletree (2021), saves thousands of sheets of paper every year. F-10's office is also located in the city centre of Derby, with staff either walking or cycling to work. Other staff work remotely. Additionally, the office is in a shared office building, meaning any emissions or use of energy for heating etc. is shared between a total of 12 office rooms. This reduces F-10's own carbon footprint significantly (Independent Society of Musicians, 2022), and is an excellent start to becoming carbon neutral (Ogletree, 2021).

Encore have taken all these steps (Independent Society of Musicians, 2022). The strategy to reduce carbon emissions of event travel by their artists consists of 3 steps; asking musicians to specify their mode of transport when they accept a booking, automatically calculating the expected CO2 emissions, and paying for carbon offsetting through their partner, Ecologi (Independent Society of Musicians, 2022). Encore pay double the calculated carbon offsetting value for each booking to become carbon negative. Additionally, they plant a tree for every booking, planting 3000 trees by 2022. Staff are also enrolled onto the Climate Positive Workforce scheme at Ecologi to offset the entire carbon footprint of every employee.

These are all feasible implementations for F-10, within the scope of the business (GHG Protocol, 2004), and a model like this would reduce carbon emissions. From the data collected, there is quite a spread between artists emission levels, and there is certainly a problem with certain artists having unreasonably high carbon emissions. Stopping artists taking domestic flights and reducing the number of international flights would significantly reduce overall CO2e emissions (Fig.13) (Ritchie, 2021). Additionally, encouraging artists to use lower emission travel methods would be another area that would significantly lower carbon emissions (Jones, 2021).

7.2 Reduced Carbon Emissions from Better Tour Planning

Encore don't discuss organising events to maximise low carbon travel opportunities. As discussed in 8.3, carbon offsetting has its own drawbacks, so to effectively reduce carbon emissions, it's important to look at core operations of F-10 to analyse operational changes to reduce emissions (Jones, 2021; Parker-Smith, 2022).

There are a significant number of instances with excessive travel, despite some artists still taking low carbon travel methods. For example, where an artist that resides in the south of the country has multiple bookings over the course of a weekend in the north travelling home between events. Where

feasible, having artists stay over rather than travelling home would reduce the number of journeys taken.

Additionally, artists had runs of shows that, in some cases, spanned the length of the country in one weekend. Where feasible, it would be better practice to organise runs of shows or tours in chunks based on geographic location to minimise journeys and travel distance. Analysing artist AD, if bookings were grouped by geographic location with roughly 2 -3 bookings per weekend, a potential 2.5 Tonnes of CO2e could have been saved. If artist AD also took low carbon travel methods, like artist T, then a further estimated 2 Tonnes of CO2e could be saved (Jones, 2021; DBEIS, 2019, 2020). However, this ultimately down to venue and artist availability, and budgets. Venue unavailability places limitation on the routing of shows.

Exclusion clauses are a common feature in booking contracts, where an artist cannot play another event in a certain radius and timeframe. Whilst this may aid ticket sales for an event in a local area, an unintended side effect is that it forces the artist to travel a further minimum distance to another show.

Organising tours in this manner would consume more staff time and may disrupt the overall operation of the business, meaning the change would need to be properly managed (Sirkin, 2005). However, it is important to consider how far artists are travelling and reduce this where possible (Jones, 2021).

7.3 Carbon Offsetting

Many carbon offsetting solutions exist in 2022, Encore use Ecologi (Independent Society of Musicians, 2022). Planetair, Ecologi, and Ecolibrium are all carbon offsetting businesses that are well established. Fundamentally, carbon offsetting works by calculating how much carbon to offset and purchasing Certified Emission Reduction (CER) credits that comply with regulations set out in the Kyoto Protocol, of equivalent value (Parker-Smith, 2022).

Carbon offsetting has flaws. Reforestation projects are limited in offsetting capability, as they can take upwards of 20 years to fully offset as desired. Meanwhile, carbon emissions released remain in the atmosphere (Parker-Smith, 2022). Reforestation projects are also at jeopardy, as carbon emissions can be offset against an area's reforestation, but logging companies could decide to fell an area anyway, meaning carbon emissions will never be offset. According to Ghussain (2020), carbon offsetting is also liable to greenwashing, with large companies such as Heathrow and BP offering carbon offsetting services, without the focus of reducing their emissions prior. With discourse around carbon offsetting, it is important to reduce carbon emissions as much as possible before carbon offsetting is used (Parker-Smith, 2022).

Using the Ecologi (2022) Impact Shop, carbon emissions can be offset by buying into projects with CER's. Projects are accredited before making it onto their site. According to Ecologi (2022), a monthly subscription of £4.70 per month offsets 3 Tonnes of CO2e every year, and funds the planting of 8 trees. Whilst planting trees is not an effective form of carbon offsetting (Ghussain, 2020; Parker-Smith, 2022), it can contribute to increased biodiversity and health of forested areas (Ghussain, 2020). This would equal 0.25 Tonnes of CO2e offset per month. At the cost of £4.70 per booking made with F-10's artists,

over 100 Tonnes of CO2e could theoretically be offset using the Ecologi service, which would likely put F-10 in the carbon negative range. A progressive recommendation would be that per booking, around £5 is charged to the promoter of the event. Of this £5, a small amount can be used to fund the planting of trees, and the rest can be used to offset carbon emissions. To push this further, artists could match this payment per booking to double the impact.

As explained in 6.3.1, flights have considerably more effect due to releasing emissions at higher altitude. The recommendation can be made that the radiative forcing factor of flights be applied to the carbon offsetting fee charged to promoters or artists where flights are used. This would ensure that in terms of carbon offsetting, F-10 are actively carbon negative, and may help discourage the use of flights where avoidable.

Additionally, when CER's are used, a certificate is issued (Ecologi, 2022; Parker-Smith, 2022). If issued to artists, they could generate climate positive social media assets to promote themselves as carbon negative, encouraging fans to act in a similar way (Reiter, 2014). As audience travel is such a large part of industry emissions, this could drive audiences to make better travel decisions, such as encouraged previously by the likes of Coldplay (Beaumont-Thomas, 2021).

7.4 Recommendations and Viability of Potential Plans for F-10

The recommendations made to F-10 from research and data analysis of artist travel over the analysed year period are below:

- Limit the use of domestic flights, aiming to phase them out completely by 2025.
- Consider enrolling staff onto a Climate Positive Workforce scheme such as the one provided by Ecologi (2022).
- Aim for runs of shows to group geographically and be accessible via low carbon emission travel methods.
- Encourage artists to stay overnight where applicable to reduce excess travel.
- Encourage artists to limit their use of high emission vehicles.
- Discourage the use of exclusion clauses to maximise the possibility of better tour routing.
- Charge a carbon offsetting levy of £5 per domestic booking / £10 per international booking to both artists and promoters, using this to offset carbon emissions around events, and a small portion to fund the planting of trees.
- Continually review carbon offsetting provider to ensure projects are correctly accredited and diversify the type of projects funded.
- Provide artists certificates to promote themselves are carbon negative within F-10 to push audiences to adopt the same methodology.
- Conduct another yearly review to analyse the impact of implemented recommendations versus carbon emissions released to ensure operations fall within the carbon negative range and analyse any further improvements in lowering carbon emissions before carbon offsetting is used.

These recommendations are feasible within the operations of F-10 and will not require excess extra time from staff to manage. There is extra work for staff with these recommendations, in terms of keeping track of payments, carbon offsetting, better tour management etc., but recommendations should have significant effect, turning them into a carbon negative agency.

8.0 Discussion with F-10 and Conclusions

Upon recommendations to F-10, the carbon offsetting plan was in place in operations within a matter of weeks. In 2023, As bookings for the 2023 year are made, F-10 look to implement further recommendations and will continually review operations with the view of reducing carbon emissions further.

To conclude, Carbon emissions within the live music sector denote action (Berklee College of Music, 2022) by all aspects of the industry to make positive changes (Jones, 2021). Within F-10, there is no scope to alter the operations of events or audience travel (GHG Protocol, 2004), but the logistics of artist travel can be analysed to lower emissions. F-10 are well within reach of not just becoming carbon neutral, but quite possibly carbon negative. Plans have already been implemented to push them towards this, and as an agency are very active in their review of any further opportunities to reduce emissions. Whilst they are currently relying on carbon offsetting to reduce emissions from travel around events, they are actively working on reducing their carbon emissions before carbon offsetting is considered.

9.0 References

AASHE. (2009). *What Does One Ton of CO2 Really Mean?* [Online] Available at: Find Out What One Ton of CO2 Really Means Today! (aashe.org) [Accessed 07 Jan 2023]

Beaumont-Thomas, B. (2021) *Coldplay pledge 50% lower CO2 emissions on 2022 world tour*. [Online] Available at: https://www.theguardian.com/music/2021/oct/14/coldplay-pledge-50-lower-co2-emissions-on-2022-world-tour [Accessed 30 Oct 2022]

Berklee College of Music. (2022) *CO2 Emissions in the Music Industry.* [Online] Available at: http://www.thembj.org/2010/11/co2-emissions-in-the-music-industry/ [Accessed 24 Oct 2022]

Broman, K. et al. (2017). *Data Organization in Spreadsheets.* [Online] Available at: https://www.tandfonline.com/doi/full/10.1080/00031305.2017.1375989 [Accessed 24 Oct 2022]

CarbonCare (2022). *CO2 Emissions Calculator.* [Online] Available at: https://www.carboncare.org/en/co2-emissions-calculator.html [Accessed 24 Oct 2022]

Chameides, B. (2007). *Picturing a Ton of CO2.* [Online] Available at: Picturing a ton of CO2 (edf.org) [Accessed 07 Jan 2023]

Climate Change Committee (2020). *Sixth Climate Budget.* [Online]. Available: https://www.theccc.org.uk/publication/sixth-carbon-budget/. [Accessed 31 Oct 2022]

Dee, A (2021). *Impact of the COVID – 19 Pandemic on Music Venus and Clubs in Europe.* [Online] Available at: https://www.live-dma.eu/wp-content/uploads/2021/10/Impact-of-COVID19-on-music-venues-and-clubs-in-Europe-Live-DMA-Oct-2021.pdf [Accessed 22 Oct 2022]

Department for Business, Energy and Industrial Strategy. (2021). *2021 Government Greenhouse Gas Conversion Factors for Company Reporting.* [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1049346/2021-ghg-conversion-factors-methodology.pdf [Accessed 05 Jan 2023]

Department for Business, Energy and Industrial Strategy. (2022). *2021 UK Provisional Greenhouse Gas Emissions.* [Online] Available at: 2021 UK Provisional Greenhouse Gas Emissions (publishing.service.gov.uk) [Accessed 05 Jan 2023]

Department for Business, Energy and Industrial Strategy. (2019). *Greenhouse gas reporting: conversion factors 2019.* [Online] Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019 [Accessed 05 Jan 2023]

Ecologi. (2022) *Climate Action at your fingertips.* [Online] Available at: Become Climate Positive with Ecologi | Ecologi [Accessed 08 Jan 2023]

Edenseven. (2022). *What does a tonne of CO2 look like?* [Online] Available at: What does a tonne of CO2 look like? (edenseven.co.uk) [Accessed 07 Jan 2023]

Encore Musicians. (2022) *About Us*. [Online] Available at: About - Encore Musicians [Accessed 07 Jan 2023]

F-10 Artistes. (2022). *Home.* [Online] Available at: https://f-10.co.uk [Accessed 16 Oct 2022]

Forster, P. et al. (2020). *Current and future global climate impacts resulting from COVID-19.* [Online] Available at: https://www.nature.com/articles/s41558-020-0883-0 [Accessed 24 Oct 2022]

Ghussain, A. (2020). *The biggest problem with carbon offsetting is that it doesn't really work.* [Online] Available at: https://www.greenpeace.org.uk/news/the-biggest-problem-with-carbon-offsetting-is-that-it-doesnt-really-work/ [Accessed 30 Oct 2022]

GHG Protocol (2004). *A Corporate Accounting and Reporting Standard. Revised Edition.* [Online] Available at: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf [Accessed 01 Nov 2022]

GOV.UK. (2022). *UK and England's carbon footprint to 2019.* [Online] Available at: UK and England's carbon footprint to 2019 - GOV.UK (www.gov.uk) [Accessed 07 Jan 2023]

Independent Society of Musicians. (2022). *Creating the world's first carbon negative music agency.* [Online] Available at: Creating the world's first carbon negative music agency (ism.org) [Accessed 07 Jan 2023]

Jones, C. et al. (2021). *Super-Low Carbon Live Music: a roadmap for the UK live music sector to play its part in tackling the climate crisis.* [Online] Available at: https://documents.manchester.ac.uk/display.aspx?DocID=56701 [Accessed 20 Oct 2022]

Ogletree, C. (2021). *10 Benefits of going paperless.* [Online] Available at: https://www.gobyinc.com/going-paperless-benefits-of-cutting-out-paper/ [Accessed 22 Oct 2022]

Parker-Smith, A. (2022). *How Does Carbon Offsetting Work? A Simple Guide.* [Online] Available at: How Does Carbon Offsetting Work? A Simple Guide (selectra.co.uk) [Accessed 08 Jan 2023]

Petersen, K. et al. (2021). *Destination net zero: setting and delivering ambitious, credible targets. COP26 Universities Network Briefing.* [Online]. Available at: https://www.gla.ac.uk/media/Media_781321_smxx.pdf [Accessed 31 Oct 2022]

Planetair. (2022). *Air Travel Calculator.* [Online]. Available at: https://app.planetair.ca/calculator/avion?lang=english&gclid=CjwKCAiAh9qdBhAOEiwAvxIok7FljE2AOQKSxuKfAaCWzEFwa6oKm9yDHjdnuhA3NyMVuUcfX272oxoCvzgQAvD_BwE [Accessed 05 Jan 2023]

Reiter, B. (2014) *The relationship that exists between the artist and the fan on social networks.* [Online] Available at: https://www.linkedin.com/pulse/20140520000824-101858170-the-relationship-that-exists-between-the-artist-and-the-fan-on-social-networks [Accessed 30 Oct 2022]

Riach, B. (2021). *Ecolibrium launches Travel Carbon Calculator app for live music industry.* [Online] Available at: https://ecolibrium.earth/ecolibrium-launch-travel-carbon-app/ [Accessed 24 Oct 2022]

Robertson, A. (2021). *UK Music Festival Logistics in 2021 Post Lockdown.* [Online] Available at: https://festivalpro.com/festival-management/1313/news/2021/3/31/UK-Music-Festival-Logistics-in-2021-Post-Lockdown.html [Accessed 24 Oct 2022]

Roseke, B. (2016). *Dividing a Project into Tasks.* [Online] Available at: https://www.projectengineer.net/dividing-a-project-into-tasks/ [Accessed 24 Oct 2022]

Ritchie, H. (2020). *Which form of transport has the smallest carbon footprint?* [Online] Available at: https://ourworldindata.org/travel-carbon-footprint [Accessed 25 Oct 2022]

Sirkin, H., et al. (2005). *The Hard Side of Change Management*. [Online] Available at: https://hbr.org/2005/10/the-hard-side-of-change-management [Accessed 22 Oct 2022]

Statista. (2022). *Annual CO2 emissions worldwide from 1940 to 2020.* [Online] Available at: https://www.statista.com/statistics/276629/global-co2-emissions/ [Accessed 31 Oct 2022]

Statology. (2022) *What is a Good R-Squared Value?* [Online] Available at: What is a Good R-squared Value? - Statology [Accessed 07 Jan 2023]