Technical Note for First Step: UK Music Industry Greenhouse Gas Emissions 2007
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This technical note outlines how the industry case study data and other relevant data were used in the "First Step" study to estimate the greenhouse gas emissions (GHG) of the UK music industry 2007.

1.0 Emission Conversion Factors and Energy Benchmarks Used

Table A: Emission conversion factors used

	Fuel Price	**CO_2**	**CH_4**	**N_2O**
Global Warming Potential	-	1	23	296
Building	**pence / kWh**	**kg CO_2 / kWh**	**g CH_4 / kWh**	**g N_2O / kWh**
Electricity	7.5	0.523	0.008	0.007
Gas	2.5	0.206	0.004	0.008
Transport	**-**	**kg CO_2 / mile**	**g CH_4 / mile**	**g N_2O / mile**
Car Average sized - petrol	-	0.3372	0.003	0.056
Train, per passenger	-	0.09632	-	-
Coach/tour bus, diesel	-	1.079	0.077	0.048
Light Goods Vehicle, diesel	-	0.396	0.008	0.027
Articulated truck, diesel	-	2.65	0.077	0.048
Domestic flight – < 300 miles, per passenger	-	0.253	0.001	0.004
Short-haul flight – Average 600 miles, per passenger	-	0.209	0.001	0.004
Long-haul flight – >4,000 miles per passenger	-	0.169	0.001	0.004
Generators		**kg CO_2 / litre**		
Diesel	-	2.630		
Biodiesel	-	0		

** For CO_2 conversion factor it is assumed coaches/tour buses, articulated trucks and light goods vehicles (van) are Euro Class II travelling an average speed of 60 mph was used. For cars it is assumed the CO_2 conversion factor is that for an average petrol car as listed in Defra 2007. For CH_4 and N_2O conversion factor the Euro Class II diesel travelling an average speed of 70mph for a bus/coach was applied for coaches/tour buses and articulated trucks. For CH_4 and N_2O conversion factor the Euro Class III diesel travelling an average speed of 70mph for light goods vehicles (van). For cars it is assumed the CH_4 and N_2O conversion factor is Euro Class IV (+2008) petrol travelling an average speed of 70 mph. Sources: Barlow et al. 2001; Defra 2007; EEA 2000; IPCC-NGGIP 2003; Netcen 2003.*

Table B: Building energy consumption typical practice benchmarks used

Building Type	Electricity, kWh / m2/ year	Gas, kWh / m2 / year
Catalogue	133	-
Office		
Air conditioned, standard	226	178
Air conditioned, prestige	358	210
Naturally ventilated, cellular	54	151
Naturally ventilated, open plan	85	151

Sources: CIBSE 2004.

Many music companies contributed quantitative and qualitative data to the "First Step" study. Table C outlines by music industry activities the number of case study data inputted into the study.

Table C: Industry case study inputs

Music Industry Activities	No. Energy Data	No. Interviews
Agencies	2	2
Arenas	4	1
Artists (air travel)	5	-
CD distribution	2	1
CD manufacturing	1	2
Collection societies	2	-
Digital music delivery	1	1
Music education	5	1
Festivals	10	3
Management	5	3
Music media	-	2
Merchandising	1	-
Orchestras	2	1
Promotion	7	4
Publishing	8	3
Recording – independent	2	-
Recording – majors	4	2
Retail	2	1
Studios	5	2
Tour trucking	1	1
Touring (carbon audits)	2	-
Trade bodies	4	3
Venues	25	-
Total	**100**	**33**

2.0 Music Recording and Publishing

2.1 Recording Studios

We had the data of 5 recording studio companies that were sufficiently complete to estimate energy use and GHG emissions. For most studios energy consumption was calculated from electricity expenditure (7.5p/ kWh). None of the companies contributing to the study had information on gas consumption or expenditure. Studios can either have just a single studio room or multiple studio spaces per site. For example, one recording studio company had 5 different sites with each site having from 1 to 3 studio spaces. To calculate the total GHG emissions attributable to recording studios we used the data we had to estimate energy use per studio. Table D illustrates the range of electricity consumption and GHG emissions per studio room.

Table D: Examples recording studios' annual electricity use and GHG emissions

Examples	Electricity, kWh	CO_2, t CO_2e	CH_4, t CO_2e	N_2O, t CO_2e
Studio 1	80,000	42	0.01	0.17
Studio 2	65,000	34	0.01	0.13
Studio 3	58,885	31	0.01	0.12
Studio 4	50,000	26	0.01	0.1
Studio 5	10,881	5	0	0.02
Studio 6	6,667	3	0	0.01

The Music Week Directory (2007) listed approximately 400 studio companies. We used this figure as indication of the number of active UK recording studios. We assumed 20 t CO_2e per annum from electricity use as a reasonable average for the GHG emissions of a studio company. In total the GHG emissions from these studios was estimated to be 8,000 t CO_2e per annum. In addition, we included estimates for the handful large recording studios (assumed 4), as we had data from one of these larger studios. We estimate the large recording studios are responsible for a further 2,000 t CO_2e per annum in total from electricity use. Therefore, we have estimated recording studios collectively are responsible for approximately 10,000 t CO_2e per annum from their electricity use.

2.2 CD Manufacturing

The "First Step" study had access to data from a detailed CD emissions lifecycle assessment based on 1999/2000 industry data. To our knowledge this remains the most comprehensive analysis on the GHG emissions associated with CD production and distribution. Therefore, this data was used to calculate the GHG emissions from the number of CD albums produced, manufactured and distributed in 2007. Table E shows the amount of gas and electricity a CD manufacturing plant used to produce 161 million albums in 1999/2000. In 2007, approximately 120 million physical CD albums were sold in the UK so we apportioned 75% of the energy use of the CD manufacturing plant we had data on. Therefore, we estimate the manufacturing of 120 million CD albums will have result in the order of 10,000 t CO_2e.

Table E: Example of CD manufacturing plant's energy use and GHG emissions

Examples	**CD albums, million**	**Electricity, MWh**	**Gas, MWh**	**CO_2, t CO_2e**	**CH_4, t CO_2e**	**N_2O, t CO_2e**
Manufacturing case study	161	25	4.6	14,041	5	63
Adjusted Manufacturing	120	18.7	3.4	10,471	4	47

2.3 CD Materials & Packaging

We used the CD GHG emission lifecycle assessment data from the study previous mentioned to estimate the emissions embodied in producing CD material and packaging for the more than 120 million sold in 2007 (see table F). Based on the CD emission lifecycle figures the First Step study estimates that CD material and packaging of 120 albums generates in the order of 65,000 t CO_2e.

Table F: GHG emissions embodied in CD album's material and packaging

CD Materials & Packaging	**g CO_2e / CD album**	**~120 million CD albums, t CO_2e**
CD Materials (i.e. PC solvent)	100	12,000
Plastic jewel case & insert tray	376	45,000
Paper booklet p12 & insert card	64	8,000
Waste	6	<1,000
Total	**546**	**~ 65,000**

2.4 CD Music Distribution Centres

The study used the energy data of two major UK music distribution centres to estimate the total GHG emissions of music distribution centres (see table g). These centres are a distribution point for over 40% of the physical CD albums sales. Therefore, we assumed these centres also represent over 40% of the energy use and GHG emissions from music distribution centres. In total, the study estimates the GHG emissions of music distribution centres to be in the order of 6,000 t CO_2e per annum.

Table G: Examples of music distribution centres' annual energy use and GHG emissions

Examples	**Electricity, MWh**	**Gas, MWh**	**CO_2, t CO_2e**	**CH_4, t CO_2e**	**N_2O, t CO_2e**
Distribution Centre 1	1.3	1.6	1,000	0.39	6.5
Distribution Centre 2	2.2	1.4	1,500	0.54	8.1
Sub-total, 43%	3.5	3	2,500	1	15
Estimated, 57%	-	-	3,300	1.2	19
Total			**5,800**	**2.2**	**34**

2.5 Transportation Logistics of CD Distribution

The study used the data from the CD emissions lifecycle assessment to estimate the GHG emissions from transporting over 120 million CD albums from the CD factory to beyond the music distribution centre. Table H outlines the GHG emissions estimated per CD album and in total from the transportation of CDs.

Table H: GHG emissions from the transportation of CDs

	g CO_2e/ CD album	**t CO_2e, > 120 million CD albums**
CD factory to music distribution centre	76	9,209
Music distribution centre onwards	51	6,155
Transit packaging	7	881
Total	**134**	**16,245**

2.6 Music Retail Outlets

The study had only limited retail case study data to help inform estimates of the GHG emissions associated with selling CDs. Therefore, we decided to take the approach of assigning an average floor area for each type of music retail outlet and use the typical energy consumption benchmarks for a catalogue store from which to calculate GHG emissions. We used the benchmark of a catalogue store as this was the close building type to a music store. An all electric catalogue store with typical practice energy consumption is 133 m2/kWh/year. Table I outlines the annual energy use and GHG emissions per store and per store category. We estimate in total music retail outlets create over 16,000 t CO_2e per annum.

Table I: Music retail outlets' annual energy use and GHG emissions

Store type	**Number stores**	**Average floor area per store for music, m2**	**Electricity use / store, kWh/year**	**t CO_2e / store/ year**	**Total t CO_2e / store type/ year**
Specialist chain	662	120	15,960	8.4	5,500
Multiples	1,383	20	2,660	1.4	2,000
Independent specialist	687	70	9,310	4.9	3,400
Supermarkets	3,680	20	2,660	1.4	5,100
Other	200	5	665	0.3	70
Total	**6,612**				**16,070**

2.7 Digital Music Delivery

At this time there is not the data available to estimate fully the GHG emissions of digital music delivery. However, a major UK company storing the digital download master runs 500 servers and informed us said that the electricity need to power the servers results in 320 t CO_2e per annum.

3.0 Music Companies' Offices

3.1 Record Companies

The study used the office energy use data provided by the four large international "major" record companies (i.e. the majors) and two independent record companies. Table J outlines a sample of the building energy use of "major" record companies contributing data. The study had sufficient information on 16 office buildings used by major record companies to estimate the GHG emissions associated with the running of these buildings. The total GHG emissions of these office buildings are calculated to be approximately 6,000 t CO_2e per annum.

There are approximately 800 independent record companies/labels. We had very little data on the office energy use of independent record companies/labels. Therefore, the study assumed on average an independent record label will contribute 5 t CO_2e per annum as the result of office energy use. We estimate management companies, agencies, promotion companies and collection society/trade bodies in total contribute 4,000 t CO_2e per annum. Bring this total together with office GHG emissions of record companies' results in 10,000 t CO_2e of the UK music industry GHG emissions.

Table J: Examples of record companies' annual office energy use and GHG emissions

Examples	**Gas, kWh / year**	**Electricity, kWh / year**	**CO_2, t CO_2e**	**CH_4, t CO_2e**	**N_2O, t CO_2e**
Office building 1	445,472	1,283,580	767	0.28	4
Office building 2	279,033	1,452,068	821	0.30	4
Office building 3	322,040	489,000	430	0.16	2
Office building 4	26,757	690,326	14	0.16	2
Office building 5	-	-	6	-	-

3.2 Publishing

We used the publishing case study data to provide an indication of the GHG emissions for each size of publishing company (see table L). We categorised publishing companies as either: major, large independent or small independent (see table O). We used data from MCPS-PRS Alliance on the number of active publishers. We allocated only 1 t CO_2e to small music publishers as many of these are likely to be people working at home and/or not in full-time employment as a publisher. The total emissions from publishing are estimated to be in the order of 5,000 t CO_2e per annum.

Table L: Examples of publishing companies' annual office energy use and GHG emissions

Examples	**Floor area, m2**	**Gas, kWh / year**	**Electricity, kWh / year**	**CO_2, t CO_2e**	**CH_4, t CO_2e**	**N_2O, t CO_2e**
Publisher 1	376	403,113	176,855	176	0.07	1
Publisher 2	465	70,215	25,110	28	0.01	0.23
Publisher 3	20	3,020	1,700	2	0	0

Table O: Publishing companies' annual office energy use and GHG emissions

Publishing companies	**Number**	**Floor area, m2**	**Gas, kWh / year**	**Electricity, kWh / year**	**t CO_2e/ publisher**	**t CO_2e / category**
"Major"	3	1,000	178,000	226,000	156	467
Large independent	~25	500	75,500	27,000	30	749
Small independent	~3,000	20	3,020	1,080	1.2	3,715
Total						**4,931**

3.3 Management companies

In the study we worked from the premise there are approximately 800 active music managers (based on the number of management companies listed in the Music Week Directory, 2007). We have assumed there are 10 large management companies (with a staff of over 10 people) and 700 small management companies (with a staff of 1-2 people). Table M outlines the average office area we assumed for each management company type. We used the typical practice energy consumption benchmark of natural ventilated open-planned

office space. In total, we estimated the office energy use of management companies was upward of 1,700 t CO_2e.

Table M: Examples of management companies' annual office energy use and GHG emissions

Management	Total Number	Floor area, m2	Gas, kWh / company	Electricity, kWh / company	t CO_2e / company	t CO_2e / category
Large	10	150	23,100	12,750	12	115
Small	700	30	4,620	2,550	2	1,612
Total	**710**					**1,727**

3.4 Agencies

The study assumed there are approximately 140 agency companies based on the listings in the Music Week Directory, 2007. The vast majority of these will be small agency companies of just 1-2 people. We assumed there are 10 agency companies with staff of 12-24 people. Table N outlines the two case studies we had from two of the major agency companies – the air-conditioning standard typical practice benchmark was used for calculating office energy consumption. To estimate the office GHG emissions of agencies we assumed the larger companies have an average floor area of 300 m2 per agency. For the 130 small agencies we assumed they require a similar office area to small management companies and therefore applied the natural ventilated open-planned office benchmark. In total, we estimate agencies contribute over 500 t CO_2e per annum from office energy use.

Table N: Examples of large agencies' annual office energy use and GHG emissions

Examples	Floor area, m2	Gas, kWh / year	Electricity, kWh / year	t CO_2e
Agency 1	402	71,550	90,852	62
Agency 2	200	35,600	45,200	31

Table O: Agencies' annual office energy use and GHG emissions for agencies

Agencies	Number	Floor area, m2	Gas, kWh / year	Electricity, kWh / year	t CO_2e / agency	t CO_2e / category
Large	10	300	53,400	67,800	47	280
Small	130	30	4,530	2,550	2	223
Total	**140**					**611**

3.5 Promotion companies

We assumed there are over 100 promotion companies based on the listings in the Music Week Directory 2007. Using the case study data we received from 7 promotion companies we categorised promotion companies into large, medium and small. Table Q outlines our estimations of the GHG emissions from office energy use. For large and medium sized promotion companies we assumed the air-conditioning standard typical practice benchmark for calculating office energy consumption. For small promotion companies we assumed the typical practice benchmark naturally ventilated open-planned office type. In total, we estimate promotion companies to produce in the order of 2,600 t CO_2e per annum from office energy use.

Table Q: Promotion companies' annual office energy use and GHG emissions

Promotion	Number	Floor area, m2	Gas, kWh / year	Electricity, kWh / year	t CO_2e / promotion	t CO_2e / category
Large	2	3000	534,000	678,000	467	935
Medium	10	1000	178,000	226,000	156	1558
Small	100	30	4,530	2,550	2	179
Total	**112**					**2,672**

3.6 Collection Societies & Trade Bodies

We received data from both of the collection societies on their office energy use as well as 4 trade bodies. We summed the calculated GHG emissions of the two collection societies. For trade bodies we assumed there were 20 and each contributed 5 t CO_2e per annum from office energy use. In total, we estimated these organisations produced 2,250 t CO_2e per annum.

4.0 UK Live Performance

4.1 Music Venues

To identify the number of music venues regularly hosting live music performance we used the figures provided by MCPS-PRS Alliance on licensed venues as guidance as well as listings in the Music Week Directory 2007 and PollstarPro. The Alliance licenses approximately 2,200 venues. We had the annual energy use of 25 larger music venues and theatres (capacity of 1,000 to 4,000 people) as well as 4 arenas. We did not have good data on smaller music venues (capacity of < 1,000 people), universities or miscellaneous venues (i.e. town halls and leisure centres), therefore we made an assumption on their energy used informed by the venue data we did have. We assumed the energy use small music venues resulted in 110 t CO_2e per venue per annum (~ 25% of the emissions associated with large music venues). For university and miscellaneous venues we assumed the resulted in 140 t CO_2e from energy use.

Table P outlines some examples of venue energy data we had inputted into the study. For large music venues we used the average energy use of 19 music venues (average capacity of 2,000 people) in order to derive the GHG emissions per large music venue and theatre used in our calculations. Therefore, we assumed on average large music venues and theatres results in 430 t CO_2e annually per venue.

Table P: Examples of large music venues and theatres annual energy use and GHG emissions

Large Music Venues & theatres	Gas, kWh / year	Electricity, kWh / year	CO_2, t CO_2e	CH_4, t CO_2e	N_2O, t CO_2e
Venue 1	38,485	284,053	156	0.06	0.68
Venue 2	483,690	790,706	514	0.19	2.78
Venue 3	354,238	380,520	272	0.10	1.63
Venue 4	78,339	505,253	280	0.10	1.23
Average used	631,067	565,965	430	0.16	2.67

Table R outlines the number of venues by category; average energy use per venue; percentage of energy use allocated to the music industry; the average emissions per venue allocated to the music industry; and total emissions per venue category allocated to the music industry.

The GHG emissions of arenas were calculated using 4 case studies contributed to the study. The 17 UK arena's that are members of the National Arena Association (NAA) range from from a capacity of 5,500 (Royal Albert Hall) to 23,000 (O2 Arena). Therefore we used arena capacity to help determine energy use for the arenas we did not have data. We estimate the GHG emissions of arenas will range in the order of 1,100 t CO_2e to 2,200 t CO_2e per annum, with 1,800 t CO_2e as the average. The NAA 2007 Annual Report indicated that 56% of events hosted at arenas were music events therefore we assigned 56% of emissions to the Music Industry. Individually arenas may have more or less of there events be music events however it was not possible to go into this level of granularity.

Table R: Annual energy use and GHG emission per music venue type

Venue type	**Gas, kWh / year**	**Electricity, kWh / year**	**t CO_2e / venue**	**% allocated to music**	**t CO_2e to music**
Arenas	1,470,874	2,868,069	1,800	56%	1,000
Large music venues	631,067	565,965	430	75%	323
Small music venues	145,631	388,350	110	75%	83
Theatres	631,067	565,965	430	10%	43
Universities	194,175	191,205	140	10%	14
Miscellaneous	194,175	191,205	140	10%	14
Total	**-**	**-**	**-**	**-**	

Table S outlines the total GHG emissions our study has allocated to the music industry by each venue type as well as the estimated total emissions of these venues.

Table S: Total GHG emissions per venue category and proportion allocate to the music industry

Venue type	**Number venues**	**Total per category, t CO_2e**	**Total allocated to music, t CO_2e**
Arenas	17	34,000	19,000
Large music venues	150	64,500	48,375
Small music venues	100	11,000	8,250
Theatres	750	322,250	32,250
Universities	550	77,000	7,700
Miscellaneous	700	98,000	9,800
Total	**2,267**	**607,000**	**125,375**

4.2 Audience Numbers to Live Music Events

There is limited information on total audience numbers attending live music events each year. Therefore, to derive an estimate for audience numbers attending live music events we took the following approach:

Audience per venue category =
number of venues X average number of events per venue X average audience size

Table T outlines the numbers used for each venue category to estimate annual total audience figures. As more data becomes available there are likely to be significant revisions to the figures we have used.

Table T: Annual audience numbers per venue type and per venue category

Venue type	**No. venues**	Average no. events / venue	Average audience / venue	Total audience / venue category	Rounded figures used to estimate audience travel
Arenas*	17	-	6,300	5,900,000	5,900,000
Large music venues	150	130	2,000	39,000,000	40,000,000
Small music venues	100	200	300	6,000,000	6,000,000
Theatres**	750	12	500	4,500,000	5,000,000
Universities	550	15	300	2,475,000	2,000,000
Miscellaneous	700	50	300	10,500,000	10,000,000
Total	**2,267**	-	-	68,375,000	68,900,000

**Used NAA 2007 report figures. Although many theatres can have a larger audience capacity that 500 (and the case study data was for theatres with capacities of 2,000) we decided to use this figure as many of the 750 theatres will have small capacities and we limited data we did not want to overestimate audience figures*.

4.3 Audience Travel to Venue-based Live Music Events

We estimated per annum audience travel to venue-based live music events to total more than 175,000 t CO_2e. We used the emissions conversion factor for trains (on a per passenger basis) to estimate the emissions impact of audience using public transport. However, many people travel to music venues using local bus services, which will have a slightly different factor and future analysis might want to split public transport into different travel modes. Table U and V outline our calculations for audience travel by car and public transport.

Table U – Part 1: Audience car travel scenario used for UK live music events

Venue type	% total audience travelling by car	Number of people travelling by car	Number of cars (assuming 2 people / car)	Distance travelled, miles
Arenas	60%	3,540,000	1,770,000	100 (25% cars) 50 (75% cars)
Large music venues	30%	12,000,000	6,000,000	40 (25% cars) 20 (75% cars)
Small music venues	20%	1,200,000	600,000	10
Theatres & universities	20%	1,400,000	700,000	10
Miscellaneous	30%	3,000,000	1,500,000	10
Total		**21,140,000**	**10,570,000**	

Table U – Part 2: GHG emissions associated with audience car travel

Venue type	CO_2, t CO_2e	CH_4, t CO_2e	N_2O, t CO_2e
Arenas	37,303	1,834	8
Large music venues	50,580	2,486	10
Small music venues	2,023	25	0
Theatres & universities	2,360	29	0
Miscellaneous	5,058	62	0
Total	**97,324**	**4,436**	**18**

Table V: GHG emissions from audience to live music venues using public transport

Venue type	% total audience using public transport	No of people using public transport	Rtn distance travelled, miles	Total emissions / venue category, t CO_2e
Arenas	40%	2,360,000	40	6,819
Large music Venues	70%	28,000,000	20	53,939
Small music Venues	80%	4,800,000	10	4,623
Theatres & universities	80%	5,600,000	10	5,394
Miscellaneous	70%	7,000,000	10	6,742
Total		**47,760,000**		**77,518**

4.4 Tour Trucking and Bus Logistics

To estimate the GHG emissions from tour trucking and bus logistics we had to make assumptions about the number of UK artist tours annually; the number of trucks and buses required for an average tour by venue type; and distance travelled on an average tour (see table X). To determine a reasonable figure for the number of tours by venue we studied the 2007 line-ups of a variety of venues listed in PollstarPro as well as examining artists touring using SeeTickets and TicketMaster. We used a recent artist's arena tour as an indication of the average distance travelled for arena and large music venue tours. We assumed small music venue tours would be more regionally based so assigned an average distance of 1,000 miles. In total we estimate tour trucking and bus logistics to result in approximately 10,000 t CO_2e per annum (see table Y, part 1 and 2).

Table X: Number of trucks and tour buses used to support UK touring

	No. tours / year	**No. shows / tour**	**Distance travelled / tour**	**Average No. articulated trucks / tour**	**Average No. buses / tour**
Arenas	70	10	2,000	2	2
Large music venues	1,000	17	2,000	1	1
Small music venues*	2,000	12	1,000	1	0

**Assumed artists touring small venues are travelling in a light good vehicle.*

Table Y – Part 1: GHG emissions from trucks used for UK touring

	Trucks, t CO_2e / tour	**CO_2, t CO_2e**	**CH_4, t CO_2e**	**N_2O, t CO_2e**
Arenas	11	742	4	0
Large music venues	5	5,300	28	4
Small music venues	0.4	792	16	0
Total		**6,834**	**48**	**4**

Table Y – Part 2: GHG emissions from tour buses used for UK touring

	Buses, t CO_2e / tour	**CO_2, t CO_2e**	**CH_4, t CO_2e**	**N_2O, t CO_2e**
Arenas	2	302	0	4
Large music venues	1	2,158	2	28
Small music venues	0	0	0	0
Total		**2,460**	**2**	**32**

4.5 Festivals

We developed a series of assumptions in order to estimate the GHG emissions of festivals. The aim was to develop an indication of the GHG emissions for different sized festivals and to festivals in total. Our assumptions were informed by information gathered from the 10 festival case studies, the Music Week Festival Map 2007 and MCPS-PRS Alliance.

There were approximate 500 licensed festivals in 2007, therefore we aimed to develop an indication of the GHG emissions of 500 festivals

Festivals were categorised as large, medium or small:
Large, audience numbers of greater than 40,000 people
Medium, audience numbers of between 10,000 and 40,000 people
Small, audience numbers of less than 10,000 people

We defined a festival as a multi-day outdoor event. We did not include in the analysis music festivals that are venue-based (e.g. The Great Escape) or outdoor concert series (e.g. Hampton Court Palace summer concert programme).

4.6 Calculating Average GHG Emissions per Festival

To do this we examined 79 festivals for which we knew estimated audience size and geographic location. For the most part these were the festivals listed on the Music Week Festival Map 2007.

The 79 festivals were categorised as follows:

- 10 large
- 40 medium
- 29 small

We estimate the total audience for these 79 festivals is approximately 2 million people. Effort was made to account for day ticket holders as well as those attending the full festival.

4.7 Audience Travel Scenarios

No information was found on the distances people typically travel to festivals. Therefore, we developed travel scenarios in order to get an indication of the GHG emissions associated with audience travel (see table Z). We assume the audience of festivals are UK based.

For each of the 79 festivals we had some information on audience capacity and geographic location. We used this to determine the appropriate travel scenario to each festival in order to calculate GHG emissions.

We assumed two people per car and 40 people per coach.

Table Z – Part 1: Transport Mode Split

Festival Location	Car	Train	Coach
London Festivals	20%	70%	10%
Urban Festivals	40%	50%	10%
Greenfield Festivals	70%	15%	15%

Table Z – Part 2: Return Distance Travelled

Festival Location	Car & Train, % split 50:50, miles		Coach, miles
London/Urban	100	50	100
Large Greenfield	300	150	300
Medium Greenfield	200	100	200
Small Greenfield	100	50	100

For example, for a London based festival it is assumed 20% of people will travel by car and of those 50% will travel 100 miles round trip and 50% will travel 50 miles round trip.

4.8 Trucking, Tour Buses and Generators for Festivals

We applied the following assumptions for trucking, tour buses and generators:

- Tour buses used 40 litres (at large and medium festivals) and 20 litres (at small festivals) of diesel on site.
- A few of the case study festivals use some biodiesel in generators – however we treated biodiesel as 0 emissions. This is because although these fuels do result in GHG emissions in the production and distribution so do regular diesel and this is not included in the emission conversion factor for regular diesel so it would be an unequal comparison to do the same for biodiesel.

Table AA – Part 1: Trucking assumptions and GHG emissions for festivals

Festivals	Trucking/festival				
	No. trucks	Miles	CO_2, t CO_2e	CH_4, t CO_2e	N_2O, t CO_2e
Large	100	300	80	0.05	0.43
Medium	80	200	43	0.03	0.23
Small	25	100	7	0.00	0.04

Table AA – Part 2: Tour bus assumptions and GHG emissions for festivals

Festivals	Tour buses/festival				
	No. buses	Miles	CO_2, t CO_2e	CH_4, t CO_2e	N_2O, t CO_2e
Large	100	300	43	0.05	0.43
Medium	40	200	11	0.01	0.11
Small	10	100	2	0.00	0.01

Table AA – Part 3: Diesel power generators assumptions and GHG emissions for festivals

Festivals	Diesel generators /festival	
	Litres	t CO_2e
Large	80,000	210
Medium	50,000	132
Small	7,000	18

4.9 Average GHG Emissions by Festival Category

The average GHG emissions by festival category were derived from the 79 festivals assessed.

Table AB –Average GHG emissions by festival category

	Large, t CO_2e	**Medium, t CO_2e**	**Small, t CO_2e**
Audience size	> 40,000	10,000 to 40,000	< 10,000
Car travel	1,080	287	51
Train travel	382	75	6
Coach travel	40	15	2
Generators	210	132	18
Trucks	80	43	7
Tour buses	43	11	2
Total	**1,7731**	**563**	**86**

4.10 Total GHG Emissions of Festivals

According to MCPS-PRS Alliance there were approximately 500 festivals licensed in 2007. However, we had no information about these 421 festivals (subtracting from the 500 the 79 festivals we had indicatively been able to calculate the GHG emissions). Therefore to develop an indication of the total GHG emission of festivals we made the assumption that these 421 festivals were small or medium sized. Based on this assumption we estimate these 500 festivals will have had a total audience of approximately 5.3 million people. To estimate an emissions impact for the 421 festivals we applied the small festival averages for each festival activity and multiplied it by 421.

Table AC: Total GHG emissions of festivals

Festivals	**Estimated 79 festivals*, t CO_2e**	**Estimated 421 festivals, t CO_2e**	**Total, t CO_2e**
Audience size	~1,900,000 people	~3,368,000 people	~ 5,268,000 people
Car	24,338	21,471	45,809
Train	7,428	2,526	9,954
Coach	1,123	421	1,544
Trucks	2,807	3,368	6,175
Tour buses	965	842	1,807
Generators	8,650	7,999	16,649
Total	44,891	36,627	81,518

* Mixture of large, medium and small festivals.

5.0 Music Industry Air Travel

5.1 Record Companies

The 2007 staff air travel information was provided by each of the "major" record companies. The companies provided the information either as:

a) The number of return domestic, short-haul or long-haul flights, or
b) The kilometres travelled domestically, short-haul or long-haul.

Air travel data for the most part was for record company staff (i.e. not artist travel).

The "major" record companies account for approximately 80% of the music market. We assumed the independent record companies account for 10% of summed air travel done by the "major" record companies.

- Total "major" record companies' staff air travel estimated to be 11,663 t CO_2e
- Total independent record companies' staff air travel estimated to be 1,166 t CO_2e
- Total staff travel for all record companies = 12,829 t CO_2e

5.2 Artist Managers

We had 2007 air travel data for 5 artist managers. We used this to develop an indication for the total GHG emission of managers' air travel.

Based on the case study data we segmented and apportioned managers into one of three categories:

1) Frequent traveller = 17 t CO_2e per annum
2) Moderate traveller = 3 t CO_2e per annum
3) No travel = 0 t CO_2e per annum

Table AD: Total annual air travel of artist managers

	Number managers	t CO_2e / manager	Total, t CO_2e
Managers travelling frequently	100	17	1,700
Managers travelling moderately	150	3	450
Managers not travelling internationally	650	0	0
Total	**750**	**-**	**2,150**

5.3 Artists

We had 2007 air travel information for 5 artist/bands – we used this as illustration of the GHG emissions associated with artist air travel when touring or promoting a new album.

5.4 Agents

Table AE outlines the assumptions made to estimate the GHG emissions of agents' air travel:

Table AE: Total annual air travel of artist agents

	Number of Agents	t CO_2e / agent	Total, t CO_2e
Agents travelling frequently	**20**	**10**	**200**
Agents travelling moderately	**14**	**5**	**70**
Agents travelling a little	**130**	**2**	**260**
Total	**160**		**530**

6.0 International Pop and Rock Music Touring

AF: Number and audience size of international touring by UK artists in the USA and Europe

	No. Tours	No. shows / tour	Audience / show	Total audience / tour	Total audience
USA Amphitheatre	10	10	20,000	200,000	2,000,000
USA arena	10	10	10,000	100,000	1,000,000
USA theatre	100	20	3,500	70,000	7,000,000
European arena	20	10	10,000	100,000	2,000,000
European theatre	100	20	2,000	40,000	4,000,000
Total	**240**	**-**	**-**	**-**	**16,000,000**

6.1 USA Tours

We applied 38 kg CO_2 and 33 kg CO2 per ticket to calculate the total GHG emissions of USA amphitheatre/arenas and theatres respectively. These per ticket estimates are from Bestfoot Forward's Carbon Audit of the Radiohead USA tours.

6.2 European Tours

We used the following assumptions to estimate a per ticket GHG emissions for a European arena and theatre tour (see table AF to AK). We assumed an arena ticket to be 22 kg CO_2e and a theatre ticket to be 7 kg CO_2e.

Table AG-Part 1: Audience travel assumptions & GHG emissions for arena European tours

Arena	% travel by car	Average rtn distance, miles	CO_2, t CO_2e	N_2O, t CO_2e	CH_4, t CO_2e
Car	60%	75% = 60 miles 25% = 200 miles	961	27	2
Public Transport	40%	30 miles	116	-	-
Total			**1,077**	**27**	**2**

Table AG – Part 2: *Audience travel assumptions & GHG emissions for theatre European tours*

Theatre	**% travel by public transport**	**Average rtn. distance, miles**	**CO_2, t CO_2e**	**N_2O, t CO_2e**	**CH_4, t CO_2e**
Car	40%	75% = 30 miles 25% = 60 miles	101	5	3
Public transport	60%	30 miles	69	-	-
Total			**170**		

Table AH: Trucking assumptions and GHG emissions

Trucking	**Number trucks**	**Total distance travelled, miles**	**CO_2, t CO_2e**	**N_2O, t CO_2e**	**CH_4, t CO_2e**
European arena	2	12,000 miles	64	<1	<1
European theatre	1	12,000 miles	32	<1	<1

Table AI: Tour bus assumptions and GHG emissions

Tour buses	**Number tour buses**	**Total distance travelled, miles**	**CO_2, t CO_2e**	**N_2O, t CO_2e**	**CH_4, t CO_2e**
European arena	2	12,000	26	<1	<1
European theatre	1	12,000	13	<1	<1

Table AJ: Venue GHG emissions

Venue	**Per show, t CO_2e**	**Total/tour, t CO_2e**
European arena	15	150
European theatre	3	60

Table AK: Artist and crew flight assumptions and GHG emissions

Flights	**No. Return Flights/tour**	**Total CO_2e**
European arena	100	24
European theatre	10	2

Table AL: Average GHG emissions per European touring by venue type

	Arena, t CO_2e	**Theatre, t CO_2e**
Audience size	100,000	40,000
Audience transport	1,103	176
Trucking	64	32
Tour buses	26	13
Venue	150	60
Crew/artist flights	24	2
Total	**1,367**	**283**
Emissions per ticket	**14 kg CO_2e**	**7 kg CO_2e**

7.0 References

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