JULIE'S BICYCLE

Moving arts

REPORT

Managing the carbon impacts of our touring

Volume I:
BANDS

June 2010

Foreword

Tony Wadsworth

Chairman Julie's Bicycle

Since our founding three years ago Julie's Bicycle has published four major research contributions to environmental sustainability for the performing arts; we have developed new industry-specific tools to measure our greenhouse gas impacts; and we have produced resources and guides to help music businesses to cut their emissions.

This latest work on international touring is our most ambitious to date. Touring is a fragmented, complex and elusive sector unused to collecting and accounting for emissions data. We want this research to trigger a major global shift in the touring industry which puts environmental concerns at the heart of the business. Nothing less. Legislation, carbon pricing and markets are inexorably shifting the ground anyway.

Now is the time for a shared international ambition with the vision and processes that can embed sustainability deeply into our work. We are at a pivotal junction in which the decisions taken today will determine the future of generations to come.

Great leadership is always driven by integrity and by being an example of what you intend to inspire. But instead of relying on one individual we can all do it: and therein lies the heart of our vision.

Special thanks to Bryan Grant, Rob Hallett, Nick Levitt, Steve Levitt, Jo Little, Simon Moran, Steve Strange and Jazz Summers for their work on the steering group, our funders AEG and SJM, and to Catherine Bottrill, Christina Tsiarta and the superb team at Julie's Bicycle for this pioneering and extremely challenging contribution to our industry. I hope we will meet it.

Moving arts – Managing the carbon impacts of our touring
Volume 1: BANDS

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When we committed to do this almost a year ago it felt like a necessary and compelling piece of work. We didn't anticipate how hard it would be to get commitment, how anxious many colleagues would be, and how outside our business this is. There have been moments when the study looked perilous simply because people in our industry couldn't understand what was being asked of them. We pulled it off, and are amazed at the commitment and passion we have encountered. But now we face the real challenge: making our touring as low carbon as we can. This is not going to be easy. It means doing things differently, working with new people and adding new skills into our touring teams. And the margins for all of us at every stage are tighter than they were even a year ago.

But the reason to do this is that we must – we owe it to our audiences and our artists, present and future. We want our tours to be the best in the world and we hope we can hand over the touring industry in a decent shape, and that means business as usual is not an option.

Jazz Summers and Rob Hallett jointly chaired the Julie's Bicycle Touring group which also included Bryan Grant, Nick Levitt, Steve Levitt, Jo Little, Simon Moran and Steve Strange.

Preface
Alison Tickell

When we began researching the environmental impacts of British based touring bands, theatres and orchestras last September we had no idea that the scientific and political framework within which we were working would change so dramatically. The month between mid- November and mid-December seeded sudden doubt in the integrity of science and witnessed political disarray in Copenhagen. Now we have become hesitant and it is clear that for the vast majority the resumption of economic growth ranks far higher than action on human- induced climate change.

However, trajectories for greenhouse gas emissions combined with our knowledge of related environmental concerns such as species extinction and ocean acidification remain the stuff of high tragedy. After hopes were so dramatically dashed in the last moments of 2009 we are now experiencing the onset of uncertainty which makes it harder to gauge appropriate responses and, crucially, take decisive action. Already I see this in the cultural sector – it shimmies between stances that could easily tip over to schisms: either to deal with carbon dioxide, or to promote overall sustainability. This is a false opposition; it polarises identity and paralyses action; above all it unveils how deeply uncomfortable we are with uncertainty. If ever the arts could intervene and bridge the 'eithers' and the 'ors' it is now.

Before embarking on the report it is worth anticipating and heading off likely apprehensions. We do not suggest that we stop touring or that international touring is worse than domestic, that large-scale touring is excessive, or that bands are worse than orchestras. There are no goodies and baddies; in reality comparisons of this kind are rarely useful and tend instead to splinter arts communities and reinforce stereotypes. What is much more interesting is that this broad collection of people have come together and given freely of their time and painstakingly gathered data because everyone has committed to understanding their part in this crisis.

Every day we use – and waste – huge quantities of energy. The degradation of the planet – including human-induced climate change – boils down to inequitable over-consumption largely perpetrated in developed countries. Sadly it is not within our direct capacity to prevent wholesale species from extinction but it is possible to reduce our energy consumption by planning routing, or flying less. Reducing consumption and decarbonising our touring will return a direct positive net profit to the environment, including species preservation – not to mention ethical, reputational and financial benefits.

The research has highlighted environmental costs and existing fiscal mechanisms intended to account for them. To date our market system has not begun to reflect the true costs of environmental impacts; so if we are anxious about financial stability we must surely factor in cost considerations that give us the long view. A resilient international performing arts industry that flourishes for generations will be one that anticipates its financing to operate

within ecological limits. This is simple good sense.

We set out to probe the business of touring, harvesting the abundant creative raw materials from which to craft a touring industry that puts environmental concerns at its heart. Our goal? To thrust the issue of environmental impacts, starting with decarbonisation, into the heart of the touring industry so that it becomes important enough to provoke an industrial shift.

We have produced a three-volume research study, each volume with a voice of its own but there is much common content. Each sector – bands, theatres and orchestras – considers itself unique, quite distinct from all others. Whether this is the case or not, what matters is accounting for this common perception. What is certainly true is that the cultures and behaviours of the people in these industries, the professional relationships and dynamic interplays, are very different. Within the industries decisions are prescribed by subtle dynamics which operate alongside the obvious financial and logistic transactions. If we are to stimulate change it is important to understand how we can best deploy the human element: it uniquely informs each touring realm and our ambition to alter a complex supply chain means pulling the right levers of influence; to maximise power relationships we need to be aware of where they are. For example, in commercial band touring successful artists are the definitive force, in theatre it is shared between the work itself and the creative interpreters; with orchestras it is the forces of repertoire and management.

Our research legacy will be contingent on whether we manage to draw out common ambitions, issues, and activities, while maintaining the capacity for each industry to tailor and champion environmental priorities internally.

Failure to understand how these ultimately powerful dynamics flow is perhaps why responses from government, science and media are often ineffective and enervating. The assumption that if we focus hard enough on celebrity, regulation or science we will effect a behavioural revolution has proved distinctly shaky. By understanding the science and deploying our creativity in the manner in which we consider best we are much more likely to shape regulation as it will affect us.

A word on expectations: this piece is only a start. It looks at core touring activities: the movement of people and product and how that translates into the generation of greenhouse gases. Touring doesn't have the advantage of fixed or stable data gathering points, such as gas or electricity meters, repetitive work patterns, a predictable or permanent work force, or easy access to information about audience travel. There were things we had to remove from our initial scope: notably show power demand and some festival tours and all three industries share a common deficit: available data. Too much of our time was spent doing basic detective work.

We want to track environmental performance and use it in policy, planning and industry intelligence, so where there is relevant data that is in our mutual best interests it makes sense to share it.

We have avoided comparisons across sectors because the scale of activity and audience generally corresponds to the emissions profiles: international touring generates the most emissions because distances are vast and people tend to fly. Similarly, the emissions produced by bands far exceed orchestras and theatres, but so do their audiences.

While there are some pioneering examples of leadership we are, as a community, short on vision and long on doubt. We need to take a few priorities and commit to them. Only large-scale will do, action at the margins is simply not enough. We are suggesting that we begin with the actions that can command the broadest assent and achieve the quickest results. So we propose beginning with four core, principled, priorities:

1. Get to know the issue, engage with energy and environmental issues.

2. Measure your impacts: understanding what the carbon profile of touring is the first step towards managing it.

3. Identify what you can do to reduce your impacts, support 'green' products and activities to help shift markets.

4. Talk about it, disclose your impacts, invigorate the issue, talk to your artists and audiences, be accountable. We all want to avoid suspicions of greenwash.

Finally we would be missing a trick if we failed to bring into the narrative the art itself: the song, the play, the piece. Whatever other factors are at work – including taste – the art is what brings us together and what shapes the industries. We cannot ask artists to 'do' climate change but we can help those artists who choose to make climate change and the environment a part of their work.

Good outcomes ultimately require trust, transparency, accountability and cooperation on a grand scale – in other words, good governance. We have to stop being parochial as it relates to the comfort of art forms and national boundaries, and scale up our ambition.

This research is a heartfelt appeal to the touring industries to be sure-footed and assertive in your environmental responses. With good will and determination our recommendations will become standard practice and the research itself can be archived. Until then I hope that it is, above all, useful, and helps free that palpable but paralysed energy that has characterised our research encounters over the last nine months. Over 300 people have contributed to this research: we all need to look back and know that it has been worth it.

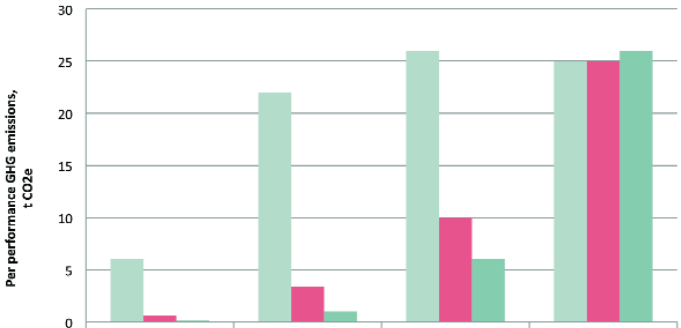
Alison Tickell
Director, Julie's Bicycle

Overall Summary Findings for Bands, Orchestras and Theatre

Touring greenhouse gas (GHG) emissions:

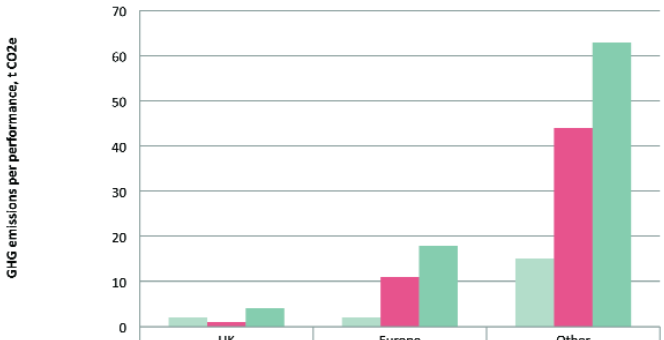
- Bands = c 85,000 t CO_2e
- Orchestras = c 8,600 t CO_2e
- Theatre = c 13,400 t CO_2e

*Figure 1 Initial values of the GHG emissions **per band performance** by each size by region, in tonnes CO2e*



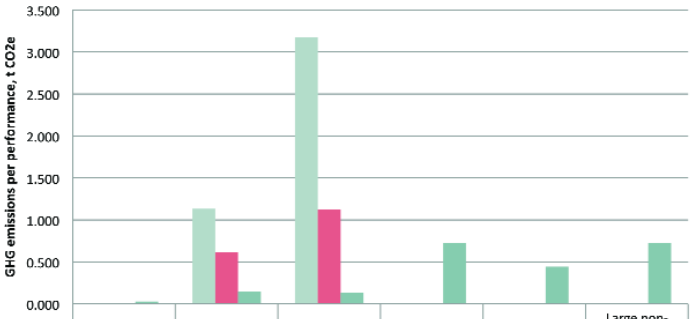
	Club	Theatre	Arena	Stadium
Other	6	22	26	25
Europe	0.565	3	10	25
UK	0	1	6	26

*Figure 2 Initial values of the GHG emissions **per orchestra performance** by each size by region, in tonnes CO2e*



	UK	Europe	Other
Small orchestras	2	2	15
Medium orchestras	1	11	44
Large orchestras	4	18	63

*Figure 3 Initial values of the GHG emissions produced **per theatre performance** by production scale by region, in tonnes CO2e*



	Education (subs)	Small (subs)	Middle (subs)	Large (subs)	Large musical (comm)	Large non-musical (comm)
Other	0	1.131	3.177	0	0	0
Europe	0	0.619	1.129	0	0	0
UK	0.028	0.144	0.129	0.729	0.442	0.729

Concluding observations

This study has found that touring bands, orchestras and theatres have not systematically embedded environmental considerations into touring practices. They are at the start of the process of engaging, measuring, reducing and communicating their efforts to improve the environmental performance of touring. We found professionals across the sector are willing and committed to take action, but need guidance on the priorities and support in taking actions.

General recommendations

Touring productions

- Embed environmental sustainability into tour planning.
- Create demand for goods with strong environmental credentials.
- Scope the GHG emissions when planning a tour.
- Measure the GHG emissions post the tour.
- Report the GHG emissions produced from touring.
- Calculate the environmental damage of a tour by pricing these impacts.

The business supply chain

- Venues embed environmental sustainability into operations and investment plans.
- Suppliers invest in and offer customers goods with strong environmental credentials.
- Funders require as condition of funding measurement of GHG emissions.
- Membership organisations disseminate information on environmental action to members and communicate the concerns of members to relevant stakeholders.

Collective action

- Collection and analysis of environmental statistics on live performance sector.
- Provision of environmental training to develop knowledge, expertise and skills.
- Commit to small number of joint priority actions across the sector.
- Fast-track environmental innovation for the performing arts sector.

1.0 Introduction

Sustainability is the art of living well, within the ecological limits of a finite planet. Art is more than an instrument in this process. It's the nature of it.

Professor Tim Jackson, 2010[1]

If any experience captures the art of living well it must be the experience of live music. Live music connects us to one another, creating a vital bond between the performers and the audience. When it's good, the imprint stays with us forever.

But Professor Jackson is mainly referring to sustainability in terms of how we in the developed world manage – or mismanage – the environmental consequences of our current lifestyles.

And while the experience of music is sustaining is this also true of the business? This research was undertaken to address that question as it relates to touring, and to identify how to reduce the environmental impacts, specifically greenhouse gas emissions. The results provide fascinating insights, but more crucially, the evidence for the practical actions we propose to reduce those impacts.

Therefore the work is addressed to touring musicians and their management as well as to agents, promoters, venues, production and logistic suppliers.

This study is the first systematic attempt to link the evidence of environmental impacts with practical solutions for cutting carbon emissions. It presents an in-depth understanding of greenhouse gas emissions generated across all scales of touring activity. We have focused on the movement of people and of the production - in other words the primary business of touring - because these decisions have ramifications for all associated greenhouse gas emissions. The findings are the result of extensive data gathered from a wide variety of tours undertaken in 2009 and from conversations with a broad cross-section of touring professionals.

With this information we have been able to:

1) Quantify the total annual and per performance greenhouse gas emissions from all scales of touring activity undertaken in the UK and by UK artists touring overseas.

2) Identify practical actions through the business supply chains, which if taken now, pave the way for a touring sector with a minimal environmental impact.

Early actions have been led by a few brave pioneers – artists and bands that have blazed a trail by asking for environmentally responsible products and tours and by so doing they have often exposed themselves to an exacting and relentless media spotlight.

Artists connect with vast audiences and have a history of speaking on issues of social concern. But the power of the artistic community to change the way the business works cannot be under estimated. An artist who seizes the issue can ask for green tours, green venues, green festivals, green recordings, and green merchandise. This will stimulate significant market shifts and the power of good example increases their appeal to audiences. But the desire for change by the artists needs to be supported by practical solutions in the industrial infrastructure. When artists put themselves on the line by committing to action it is critical that the industry supports them and is ready for their requests.

The urgency of climate change is not the only motivation for the touring sector. The increasing volatility of the price of oil will, in the coming years, inevitably affect a sector dependent on transport. Actions taken to reduce GHG emissions now will have the benefit of buffering the sector from any oil price spikes in the future as well as having a net impact on our stifled biosphere.

These issues are driving both mandatory government regulation and voluntary action. In the UK, the Climate Change Act which requires an 80% reduction in greenhouse gas emissions by 2050, is directly affecting larger venues, logistics companies and lighting manufacturers and suppliers. And while direct regulation of a tour itself is not likely in the short term, regulation will be experienced via increases in the cost of oil, and carbon costs passed on by venues, transport or equipment suppliers.

The market aided by environmental regulation is already beginning to put a true price on the environmental impacts of business and consumer choices. This price will become clearer in coming years as regulation develops and oil begins to run out.

Whether we like it or not, paying the real cost of goods and services, including the environmental costs, will profoundly influence businesses, organisations and consumer choices. The live performance sector can only benefit from pre-empting and championing a shift towards practices that minimise environmental impacts, and adapting to changing circumstances.

This is the first time most of the participants have been asked to provide data for the purposes of calculating the GHG emissions and many found this challenging. We need more bands to measure GHG emissions in their planning. Passing on this information to Julie's Bicycle will support the development of robust environmental performance benchmarks and overall tracking of the touring industry's progress. We have developed a free online Industry Green "IG" tool to facilitate this process.

To support further development of thinking and practice, this study includes a number of specialist pieces focused on "hot topic" issues (i.e. aviation, biofuels, carbon offsets and leisure travel) that are of immediate relevance to the sector as it moves forward with reducing the environmental impacts of live performance

[1] Julie's Bicycle and British Council (2010). *Long Horizons: An exploration of art and climate change*. British Council, London

experiences. We have also identified an emerging community of organisations and practitioners at hand to help the music industry navigate safely through these issues.

Environmental leadership will take commitment, time and resources but here is a clear opportunity for musicians and music professionals to embrace this issue with confidence. Wisely done, the cultural influence of music can inspire wider systemic shifts towards a society that embeds environmental sustainability as a guiding principle.

So it is timely to be taking stock of touring practices. Dealing with these issues now will give the music industry a greater ability to respond to future challenges posed by environmental issues, and help to determine its future.

This study of band touring is part of series conducted by Julie's Bicycle into the GHG emissions produced by a number of performance forms. The other two areas under analysis are orchestra and theatre touring, with the scope for additional performing arts forms to also be undertaken with the same methodology.

2.0 Conclusions

- Although there is concern about the environment this is not yet reflected in touring practices (with a small number of exceptions). This is largely because financial decisions and constraints alongside artistic considerations are the main drivers dictating touring practices and therefore will override environmental considerations.

- There is a perception environmental actions will cost more, and therefore may reduce profit. However, few people in the industry to date have systematically approached their touring from an environmental perspective and furthermore not all actions will be more costly than conventional practices.

- The artist, especially at the large theatre and arena circuit level, will have the greatest influence on their supply chain.

- At the club circuit level the promoter will have the greatest influence on the supply chain of the tour. Club artists have very limited control over their touring schedule, but conversely they have limited production (as they will often use in-house venue production) and will usually travel together in a single vehicle so are relatively energy efficient overall.

- Maximising opportunities for reducing GHG emissions requires consideration of the environment at the very early planning stages when the artist, manager, agent and promoter are booking the tour as the decisions taken at this stage will have ramifications for the overall environmental impact of the tour.

- Consolidation in music club and theatre ownership by multinational corporations (such as in the UK) may mean that venues are increasingly being refurbished to a level that removes the need for much of the production gear currently being brought in.

- Movement of production for arena shows is likely to continue; these are highly bespoke shows performed in multi-purpose venues and it will not make financial sense to re-fit expensive production equipment. GHG emissions reductions of arena shows should focus on show power demand and design to minimise the movement of equipment between arenas.

- Touring is highly fragmented and decisions are all premised on ticket sales so far-sighted planning is difficult and requires considerable co-ordination between different participants. As the capacity of the sector to consider the environment increases there is substantial scope for shifts in practice and developing new tour models where the environment is placed centrally, alongside artistic and financial considerations.

- The industry currently lacks the capacity, resources and tools for an informed response to reducing GHG emissions, but the will to take action is increasingly evident.

3.0 Recommendations

Environmental action is an ongoing process requiring a commitment to four principles: company or personal engagement with the issues; measurement of impacts; development of a strategy to reduce damages; and communication of what you are doing.[2] To fulfil these principles Julie's Bicycle recommends that the steering group and the music industry adopt the following actions.

The recommendations are addressed to those responsible for organising the tour and suppliers of products and services. The list below identifies 11 priorities for action. In addition, we have prepared detailed tables of immediate actions for each participant in the touring business supply change with practical guidance of 'how to do it' found in Section 3.4. Section 3.4 also outlines the scale of ambition for environmental improvement.

3.1 Headline recommendations

Planning:

1. **Embed environmental sustainability into tour planning alongside artistic and financial considerations**. The main areas for artists, managers, production managers and tour managers (and their employees) to consider during the planning stages are; the routing; the venue selection; the travel logistics; the goods and service procurement; show power demand and set design.

2. **Scope the GHG emissions when planning a tour**. This is vital for being able to assess early on in the planning process opportunities for reducing GHG emissions. Use the free Industry Green tour tool to predict GHG emissions from the tour.

Measurement:

3. **Measure the GHG emissions after the tour**. Use the free Industry Green tour to calculate the actual GHG emissions from the tour.

Action:

4. **Share the GHG emissions produced from touring and any steps taken to reduce environmental impacts**. Sharing this information with staff, suppliers and Julie's Bicycle would enable the development of robust sector environmental performance benchmarks and disseminate emerging and best practice on improving environmental performance.

5. **Venues embed environmental sustainability into day-to-day operational practices and in future building investments**. Venues should seek a standard accreditation for their environmental performance and communicate this to all incoming productions. Artists should request information about environmental performance using a green rider.

6. **Suppliers invest in, offer and signpost customers to the products and services with strong environmental credentials**. This is relevant for a whole number of suppliers such as trucking and tour bus companies, lighting companies, merchandise companies, hotels and consumables.

7. **Membership organisations should increase member awareness of the importance of embedding environmental sustainability in operational practice, and communicate the concerns of members to relevant stakeholders**. Membership organisations should work with Julie's Bicycle to collect, collate and report sector intelligence on touring that is relevant for monitoring environmental impacts.

8. **Environmental training is provided to develop expertise and skills for taking actions**. Training should be incorporated as part of the curriculum in sector relevant degree courses and certification programmes and also professional development training offered by employers and membership organisations.

9. **Fast-track environmental innovation that is grounded in the business realities of the music industry**. Identify the most appropriate vehicle and sources for investment to support innovation pilots. The purpose would be to identify low carbon future technologies, formats and business models specific to the music industry, and to take the best innovations to scale.

10. **Collect statistics on live performance industry**. Important statistical information about the sector is fragmented, opaque, un-collated or simply not collected at all. This creates a significant barrier to taking environmental action forward. There are well placed organisations for collecting data for monitoring the industry's environmental performance. The sector would benefit from this information being shared regularly (e.g. annual intelligence reports) to inform strategic thinking and action to reduce its environmental impact.

Finance:

11. **Calculate the environmental damage of a tour by pricing these impacts**. This is done by measuring environmental damage (i.e. GHG emissions of the tour) and then multiplying this by a price per unit of environmental damage. Furthermore, if wanting to invest in sector specific climate mitigation and adaptation the calculated environmental damage cost can determine the amount to invest.

[2] These principles form the foundations of the Industry Green framework developed by Julie's Bicycle specifically to support the creative industries in reducing its environmental impact.

3.2 Tools and resources needed

A series of web-based information and tools is needed to support the touring sector. Some of these tools are already in prototype development and others need to be created. The benefits of these tools will grow as organisations and companies contribute information and the sector uses them:

- Industry Green (IG) tool for touring emission measurement and tracking (prototype)
- A database of venues with environmental accreditation(s) (prototype)
- A database of suppliers offering goods and services with environmental credentials
- A database of venue equipment in-house and local suppliers
- A database of set materials for rental, sale and recycling
- Sharing of emerging practice to improve environmental performance
- Standard template green rider for venues
- Standard template for venues to report environmental performance

3.3 Further research needed

The live performance sector will benefit from further environmental research in the follow areas to be able to strategically address its environmental impacts:

- A study of audience travel and services to venue-based performances
- Assessment of the GHG emissions from the venue-residency performance models
- Assessment of the emissions of festival touring

3.4 Detailed recommendation for each key participant

For: Artists, Managers, Agents, Production Managers and Tour Managers

Your actions	Where we want to be	How you do it
Tour Planning		
Ensure environmental issues are taken into account when planning a tour.	Environmental considerations are embedded into all tour planning decision-making.	Include responsibility for environmental actions in the job requirements of all those planning a tour.
Emissions Measurement		
Commit to pre- and post GHG emissions measurement of each tour.	All tours are measured for GHG emissions at the planning stage and upon completion stage of each leg.	Use the free web-based Industry Green (IG) touring tool to measure and track the emissions of tours by leg.
Tour Routing		
Assess the environmental impacts of your routing options.	All tours use a routing schedule that will minimise the GHG emissions produced from travel.	Calculate travel distances between performance dates and use the free web-based IG touring tool to work out the GHG emissions of route options.
Venue Engagement		
Use a green rider to ask venues for information about their environmental performance.	Venues with strong environmental credentials become market leaders.	Use Julie's Bicycle venue environmental reporting template (or equivalent) in your green rider.
Travel Logistics		
Use low emission transport options where commercially competitive and convenient.	All tours make travel choices specifically to minimise the GHG emissions from moving production equipment and personnel on tour.	Use rail rather than flying where possible. Use logistics companies with fuel efficient vehicles and drivers with eco-driving training. If using biofuels use sustainably sourced. For overseas touring sea freight when possible rather than air freight.
Emission Reporting		
Report tour GHG emission results to staff, suppliers and audiences as well as for industry tracking.	All tours report their GHG emissions to assist with benchmarking and tracking of the live performance sector.	Use the free web-based IG touring tool to report emissions for confidential and anonymised sector analysis.
Costing the Environment		
Make the environment a budgetary consideration.	All tours make the environment a budgetary consideration.	Allocate time and resources for staff and contractors to assess environmental options.
Apply a price of carbon to tour emission results to help inform decision-making.	A total price of carbon is applied to all tour emission results. This amount is invested into schemes supporting climate mitigation and adaptation.	Use the free web-based IG touring tool to calculate the carbon costs. Costs could be compensated for by contributing funds to reduce environmental impacts and support adaptation of the music industry or by funding carbon offset projects.

For: Artists, Artistic Directors, Lighting Directors, Managers, Production Managers and Tour Managers

Your actions	Where we want to be	How you do it
Show Power Demand		
Learn about the environmental pros and cons of different lighting design and set materials.	Sector specific information about environmentally responsible lighting and set materials widely available.	Talk to your suppliers about what environmentally responsible products and services they offer and are available on the market. Read the *White Light Green Lighting Guide*.
Minimise the show power demand.	All tours have minimised the show power demand.	When designing the show calculate the total show power demand and identify design and technologies that will reduce the power demand.
Communicate to suppliers and technicians that you want show power demand to be minimised and equipment used efficiently in set-up and rehearsals.	There is strong communication and cooperation between tour production and suppliers about opportunities for minimising environmental impacts cost effectively.	Talk to your suppliers about what environmentally responsible products and services they offer and are available on the market.
Production		
Freight only essential production.	Sector-wide freighting of lighting and set materials is minimised.	Contact venues upfront to know what production is in house or locally available.
Adopt an environmental sustainability procurement policy to use environmentally responsible suppliers where possible.	All tours use sustainably sourced materials, equipment is sourced locally (where possible) and lighting has a low energy demand.	Learn about the environmental impacts of goods and services - gather intelligence on best suppliers. Ask suppliers to provide you information about their environmental credentials. Use suppliers with recognised environmental accreditation(s).
Re-use and recycle production equipment and staging where possible.	National and regional stage storage hubs with searchable web-based database are created for the sharing of set materials.	Use agencies such as Scenery Salvage to rent and recycle set materials.
Merchandise, Accommodation and Consumable Suppliers		
Adopt an environmental sustainability procurement policy to use environmentally responsible suppliers where possible.	The mainstream use of goods and services with strong environmental credentials.	Learn about the environmental impacts of goods and services - gather intelligence on best suppliers. Ask suppliers to provide you with information about their environmental credentials. Use suppliers with recognised environmental accreditation(s).

For: Promoters (managing venues), Venues Managers, Programmers

Your actions	Where we want to be	How you do it
Artist Engagement		
Communicate what steps you are taking to incoming productions.	There is strong communication between venues and incoming productions on environmental considerations.	Use Julie's Bicycle environmental reporting template for venues (or equivalent). The same template should be used to respond to the green rider requirements of artists.
Provide incoming productions with information about equipment available on-site or locally available.	The amount of equipment needing to be moved venue to venue is reduced.	Make available information about in-house production and local suppliers on venue website.
Ask incoming productions what steps they are taking to reduce their environmental impact.	There is strong communication between venues and incoming productions on environmental considerations.	Ask for this information via the promoter rep or ask the production team directly.
Emissions Measurement		
Measure the GHG emissions of your venue(s).	All venues measure their GHG emissions.	Use venue auditing and management tools such as Industry Green (IG) venue tool, SMEasure, and Best Foot Forward Footprinter.
Emissions Reporting		
Report venue GHG emission results to staff, suppliers and audiences as well as for industry tracking.	All venues report their GHG emissions to assist with benchmarking and tracking of the live performance sector.	Use the free web-based IG venues tool to report emissions for confidential and anonymised sector analysis.
Seek a standard environmental performance accreditation for venues.	All venues have standard environmental performance accreditation(s).	Apply for Industry Green status for Venues, Carbon Trust Standard, British Standard 8901 and/or ISO 14001. Submit information on venue accreditation(s) to Julie's Bicycle database of venues with environmental credentials.
Costing the Environment		
Invest in building staff capacity to address environmental issues, energy efficiency and renewable energy.	All venues are investing in reducing building energy use and support renewable energy development.	Ring-fence money from energy saving efforts to further improve your venue's environmental performance.
Apply a price of carbon to venue emission results to help inform decision-making.	A total price of carbon is applied to all tour emission results. This amount is invested into schemes supporting climate mitigation and adaptation.	Use the free web-based IG touring tool to calculate the carbon costs. Costs could be compensated for by contributing funds to reduce environmental impacts and support adaptation of the music industry or by funding carbon offset projects.

For: Product and Service Suppliers, e.g. Lighting, Sound Systems, Set, Travel Logistics, Hotels, Consumables and Merchandise Companies etc.

Immediate	Where we want to be	How you do it
Learn about the environmental sustainability of the goods and services you provide to bands.	Suppliers understand and communicate the environmental performance of what they sell to clients.	Contact manufacturers for information about the environmental credentials of their products and services.
Promote the products and services you provide with strong environmental credentials.	Environmentally responsible products and services supplied to the sector are widely available and cost competitive.	Signpost your customers to the products and services you offer with strong environmental credentials, e.g. on your company website.
Where applicable and appropriate get a carbon label for your productions or services.	All key products and services are carbon labelled.	If appropriate, use a standard carbon label certification, such as, PAS2050 developed by the Carbon Trust. For example, Continental Clothing, a T-shirt wholesaler, carbon labelled their Earth Positive T-shirt range.

For: Membership Organisations

Immediate actions

- Make environmental sustainability a standing agenda item.
- Keep abreast of legislation, financial/economic implications and audience concern.
- Signpost tours to resources for how to reduce the environmental impacts of touring.
- Develop a charter for members, which set out environmental principles, and includes a commitment to monitor and reduce emissions.
- Recognise and award members that are environmental leaders
- Collect, collate and report statistics on live performance activities relevant for monitoring environmental impacts of sector.

These barriers have been identified to help each participant understand where they could focus to make their actions more effective.

4.0 Barriers to environmental action

Participant	Creative	Financial	Operational
Artists	• Primacy of artistic vision will supersede environmental considerations. • Desire to consistently replicate high production standards across the tour. • Desire to meet audience expectations for unique, visually spectacular show. • Desire to extend reach to new audiences.	• Desire to maximise income from touring.	• Limited awareness and lack of accessible information on measures to reduce the environmental impact of touring. • Time constraints because of other commitments. • Timing and type of tour depend on career stage.

Participant	Creative	Financial	Operational
Managers	• Ensuring tour schedule is sensitive to well-being of artists to maintain performance quality. • The shape of a tour - its order, length and stop-off points is influenced by desire to build profile in target audience markets. • When assembling the tour team creative concerns will supersede environmental considerations.	• Priority to maximise artists' income. Increased audience demand can extend the tour and create inefficiencies in the tour routing. • Typically will only choose the environmental solution if it costs the same or less than the conventional option. • Cost and convenience supersede environmental considerations when deciding travel arrangements. • Tour schedule influenced by avoiding touring at similar time to competitors. • Can present artist with information and recommendations on how to reduce environmental impacts, but ultimately decision lies with the artist.	• Limited interest and lack of accessible information on measures to reduce the environmental impact of touring. • Availability of venues in key markets. • Complex supply chain can result in lack of accountability for environmental issues. • Artist profile will affect degree of influence on supply chain. • Limited availability of personnel trained with the skills for addressing environmental considerations in producing tours. • Need to balance schedule as often managing more than one artist at any one time.

Participant	Creative	Financial	Operational
Agents	• The shape of a tour - its order, length and stop-off points is influenced by desire to build profile in target audience markets.	• Priority to maximise artists' income.	• Tour date bookings influenced by venue availability and key markets. • Limited interest and lack of accessible information on the relatively few venues with good environmental credentials. • Handling multiple artists so limited time to explore measures to reduce the environmental impact of touring.

Participant	Creative	Financial	Operational
Promoters	• Not applicable.	• Competition for tour contracts reduces capacity to require more challenging environmental measures. • Slim profit margins on touring mean promoter will not take environmental actions that have a higher cost. • Limited ability to alter venue as usually only leasing or renting space.	• Limited control over production if the tour is artist led.

Participant	Creative	Financial	Operational
Artistic Directors / Lighting Directors	• Dependent on brief from artist and management: unlikely to push an environmental brief is not asked for by artist. • Concerned with impact of show based on artists' character and music. • Show design artistically led so will use lighting, sound and material able to best create the desired affect. • Low levels of awareness about the environmental impacts of design choices on tour emissions. • Wary of new environmental technologies. • Energy waste can be highest during rehearsals when equipment is running and/or being tested all day.	• Budget constraints will determine show design much more than environmental considerations. • Not likely to choose environmental solutions if notably more expensive.	• Restricted by the dimensions of the buildings and ability to move and/or to source equipment.

Participant	Creative	Financial	Operational
Production / Tour Managers	• Have limited or no input on show design so have to respond to the equipment and logistical requirements set by the show design.	• May not be brought on board until the tour is booked and key elements of the show have already been decided and are in place. • Have to follow the briefing given to them by the artist and their management. • Production decisions will be based on budgetary constraints. • Freelance so limited capacity to influence - have to go where and when the work is available. • Low levels of awareness and interest about what actions could be taken to reduce environmental impacts of tours.	• Responsible for realising the artistic vision of the production, and may have limited or no input on show design. • Very time constrained when on tour to follow through on actions to minimise and track environmental impacts. • Likely to have a tour project immediately before and after. • Transport modes dictated by tour itinerary as might be limited time between show dates. • Large scale tours with bespoke staging are too complex to be sourced reliably on the road and will need to travel complete. • Restricted by the dimensions of the buildings and ability to move and/or to source equipment. • Limited interest and lack of accessible information on measures to reduce the environmental impact of touring • Suspicion that environmentally sustainable materials will be less durable and therefore not hold up to the rigours of touring. • Not typically easy to store or recycle staging materials and sets, so go to landfill.

Participant	Creative	Financial	Operational
Venue Managers / Programmers	• Priority is to deliver on creative requirements of incoming productions before those of environmental sustainability. • Impossible for venue to have equipment to answer every incoming production's creative and environmental needs.	• Cannot undertake major changes in building operations for single artist tours. • Often old buildings requiring major refurbishment, with onus of responsibility dependent on landlord-tenant terms. • Investment in energy saving improvements depends on incentives and regulations. • Venues often are locked into energy contracts and can only ask for a renewable energy tariff at the re-negotiation stage. Unlikely to purchase a renewable energy tariff unless it is cost competitive. • Concessions in venues typically have long-term contracts so the venue can only negotiate for environmental sustainability procurement when these are up for renewal. • Budget constraints preclude additional costs of 'green rider' or 'green' audience concessions.	• Need artist production to load in and out efficiently to be able to schedule other events. • Venues, especially arenas, are multipurpose spaces so need to be able to easily adapt the space for other events. • Venue staff may be too busy or unwilling to adopt environmental measures that increase their workload. • Venues may not have the capacity or inclination to oversee local sourcing or building of set and properties. • Venues may not have information on local suppliers of environmentally sustainable equipment.

Participant	Creative	Financial	Operational
Technical Suppliers	• Equipment manufacturers and suppliers are primarily concerned with the effects that can be created with their equipment, rather than environmental considerations.	• Can only offer equipment that is available in market place and in-stock. • Directors and designers are not yet creating the demand for environmentally sustainable technology and equipment.	• Not applicable.

Participant	Creative	Financial	Operational
Logistic Suppliers	• Not applicable.	• The purchase of efficient vehicles for freight company fleet constrained by purchase price and running costs. • Artists are not yet creating sufficient demand for environmentally sustainable vehicles.	• Number of vehicles depends on size of production and driver regulations (i.e. Health and Safety). • Freight companies rarely us public transport because of unreliability or inaccessibility of services. • Environmentally sustainable fuels are not readily available on the road, making use of vehicles running on these fuels difficult.

Participant	Creative	Financial	Operational
Trade and Membership Organisations	• Priority for trade organisations to demonstrate their value to their members means they are protective of their position in relation to a given issue.	• Priority to deliver financial benefits to membership supersedes considerations of environmental sustainability.	• Representing the best interests of the membership is not always compatible with the best interests of the environment. • Membership organisations can be slower and less flexible in responding to emerging issues. • Membership organisations are always interpreting what is best for their membership, which can act as a brake on issues of emerging concern.

5.0 Research findings

This section presents our findings of the scale of greenhouse gas (GHG) emissions resulting per annum from artists' tours within the UK and UK based artists touring globally.

5.1 Summary findings

- The total GHG emissions impact from bands touring in the UK and UK acts touring overseas in 2009, based on available data, is estimated to be approximately 85,000 t CO_2e (see Figure 6).

- The majority of touring GHG emissions is from overseas touring. It is estimated two-thirds of audiences are in the UK, but only a quarter of all touring GHG emissions are generated in the UK. Live performances by UK based artists to overseas audiences produce an estimated three-quarters of UK based artists' touring emissions.

- Theatre level touring overseas accounts for the majority of non-UK touring emissions (at 80%).

- In the UK, theatre circuit tours account for approximately half of UK tour GHG emissions and arena circuit tours account for a third of UK GHG emissions.

- UK club circuits account for a fifth of audiences and only 4% of global touring emissions.

- 'Per performance' GHG emissions of arena or theatre tours in Europe are likely to be double as compared to the UK, or triple as compared to 'other' global regions.

- Unsurprisingly, personnel and freight air travel will account for the lion's share of emissions for overseas touring. Personnel air travel will typically contribute at least half of emissions with air freight being another fifth to a half (freight is a lot more variable because it depends on production requirements).

5.2 Sector trends

Key informants interviewed identified a number of sector trends. These will have a bearing on the GHG emission profile of the sector in the future.

- Tours are increasing due to the demand for live performance as artist income and industry revenues are diminishing with physical recorded music sales declining as we shift to digital music delivery.

- Tours are expanding to new international music markets, particularly Asia, the Middle East and South America as these countries grow in wealth and UK artists get exposure through the internet and media channels.

- Few bands are able to do stadium tours because only a limited number of acts can attract sufficient audience numbers.

- The number of arena and large theatre tours are increasing (because a small number of multinational companies have acquired the majority of venues at this level).

- More theatres are installing high-quality sound systems and lighting which will lessen the need for artists to travel with their own production equipment. It is not inconceivable that production upgrades in venues will negate the need for the movement of extensive production at the theatre level, especially in some territories.

- More arena level artists are interested in doing residency tours (tours based in a single venue for consecutive dates) at premium venues.

- There is a marginal decrease in clubs hosting live music because profit margins are very tight at this level.

- The number of music festivals is increasing. Festival tours provide a cost effective opportunity for smaller bands to reach new audiences without incurring the high costs and financial risks of touring solo. This is because they do not need to transport production or ensure ticket sales: these are the responsibility of the festival promoter.

- With the increasing number of festivals, more bands are doing festival-only tour circuits.

5.3 Band status

A band's success and therefore its touring ambition is measured in terms of its audience size, the number of performances, the type of tour and the tour's location.

5.3.1 Total number of performances

Based on best available data and reasonable assumptions it is estimated there are approximately 50,000 performances each year by bands within the UK (including overseas bands) and UK based bands performing overseas (see Figure 4).

Of these performances:

- by tour circuit type: about three-quarters (70%) are at the club level; about a quarter (28%) are at the theatre level; and 3% are at the arena and stadium level;

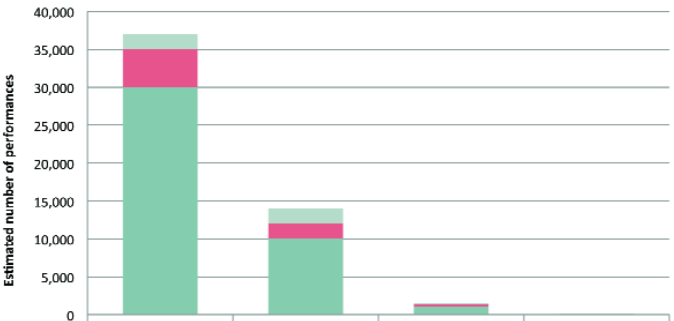
- by geographic region: the majority are in the UK (78%); 14% are in Europe; and 8% are in 'other' geographic regions.

Furthermore it is estimated that 800 live music performances take

place each week in the UK with almost three-quarters (73%) taking place in club venues.

Figure 4 Estimated number of performances per geographic region by venue type. Total = 53,000 performances were estimated for 2009

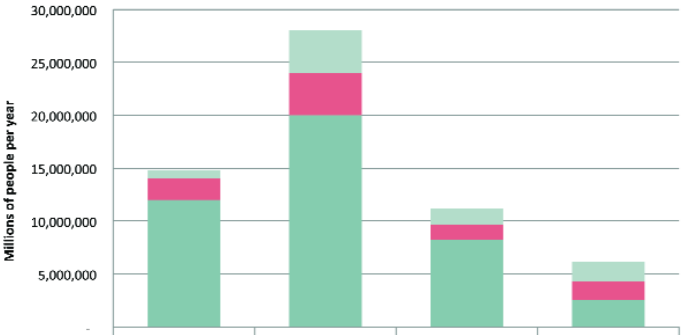
5.3.2 Total audience size



	Club (<1000 people)	Theatre (1000 to 4,999 people)	Arena (7,400 people)	Stadium (60,000 people)
Other	2,000	2,000	200	30
Europe	5,000	2,000	200	30
UK	30,000	10,000	1,123	42

Based on limited available data and best available assumptions the total audience numbers for venue-based live music performances by UK bands globally is estimated to be **at least 60 million** of which 43 million are UK audiences (71%). In the UK half of the audience (47%, 20 million) is for theatre level performances; a fifth (19%, 8.2 million) is for arena level performances; and a third (28%, 12 million) is for club performances. It is estimated that approximately 2.5 million attend stadium performances in the UK and a further 3.6 million attend stadium performances of a UK artist globally (see Figure 5).

Figure 5 Total estimated audience numbers in 2009 by venue type for each geographic region, total = 60 million people



	Club	Theatre	Arena	Stadium
Other	800,000	4,000,000	1,480,000	1,800,000
Europe	2,000,000	4,000,000	1,480,000	1,800,000
UK	12,000,000	20,000,000	8,200,000	2,520,000

5.4 Total GHG emissions from touring bands

The total GHG emissions impact from bands touring in the UK and UK acts touring overseas in 2009, based on available data, is estimated to be approximately 85,000 t CO_2e (see Figure 6).

Of these emissions:

- almost three-quarters (72%, 61,065 t CO_2e) are attributable to bands touring at the theatre level;
- a sixth (16%, 13,470 t CO_2e) are attributable to bands touring at the arena level;
- a tenth (9%, 7,578 t CO_2e) are attributable to bands touring at the club level;
- and only a small percent (3%, 2,597 t CO_2e) are attributable to bands touring at the stadium level.

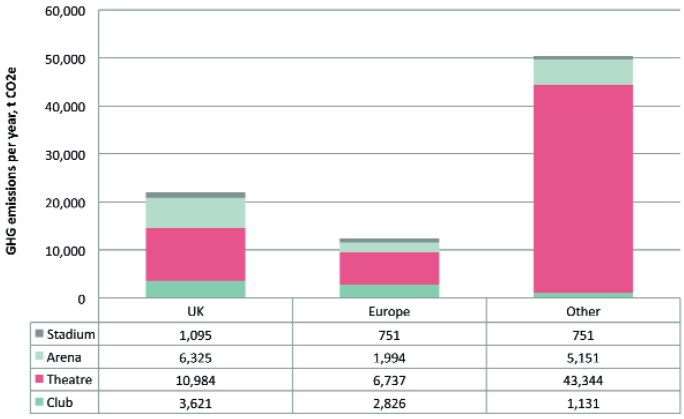
Apportioning emissions by geographic region:

- a quarter (26%, 22,025 t CO_2e) are from touring activities within the UK;
- a sixth (15%, 12,309 t CO_2e) are from European touring;
- the majority (59%, 50,376 t CO_2e) are due to UK based artists touring to 'other' geographic regions, such as the United States, Australia and Japan (see Figure 6).

In the UK, theatre touring accounts for approximately half of emissions (50%) and arena touring accounts for almost a third (29%).

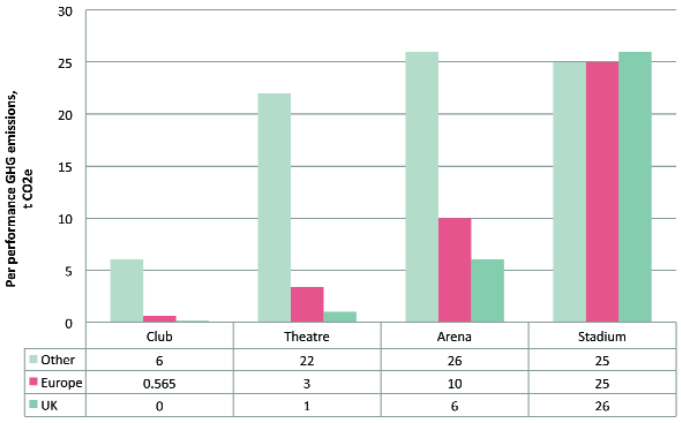
Bands touring at theatre level in 'other' geographic regions produce 86% of touring related GHG emissions; however this level of touring represents only a very small proportion of performances (an estimated 2000 of ~50,000 performances globally, or 4%). Theatre touring represents the highest proportion of emissions because it is the most prevalent touring scale. Very few UK based artists are able to fill arenas overseas and at the club level it is difficult for a tour to be profitable given the overheads of the tour production. UK based artists at the club level circuit may be more likely to do overseas festivals as they will not have the production costs but will be able to gain profile with international audiences. Therefore tours at the theatre level are the most consistently profitable.

Figure 6 GHG emissions of the band touring sector for 2009 by geographic region (in tonnes CO_2e)



	UK	Europe	Other
Stadium	1,095	751	751
Arena	6,325	1,994	5,151
Theatre	10,984	6,737	43,344
Club	3,621	2,826	1,131

Figure 7 Initial values of the GHG emissions per band performance by each size by region (in tonnes CO_2e)



	Club	Theatre	Arena	Stadium
Other	6	22	26	25
Europe	0.565	3	10	25
UK	0	1	6	26

5.4.1 Initial values and ranges per band performance

Identifying what constitutes a typical tour in each range and region will, over time, become straightforward. This study is the first attempt to systematically analyse and classify touring according to the circuit (i.e. venue type) and leg (i.e. territory). Based on our 32 tour leg samples from 16 touring bands we have calculated initial values of the GHG emissions produced per band performance by tour circuit for each leg (see Figure 7). The initial values are the average per performance results for each tour circuit and leg. The data we collected constitutes a rich set of tour samples, but it is still too small to determine robust average GHG emissions per performance. However, these initial values serve as a useful starting point from which we can build up an idea of what the average GHG emissions for each category are. Table 1 provides the per performance ranges (i.e. minimum and maximum) in the tour data we received.

As more bands measure and report the GHG emissions produced from their touring activities these initial values will become increasingly robust. When the sample size is sufficiently large it will then be possible to benchmark tours (freighting, air travel, accommodation etc) so that production and tour managers can usefully interrogate and compare their touring activities with other similar tours. This will enable them to manage their tours 'down' in terms of GHG emissions, as well as prepare the industry for compliancy and support artists and audiences in their 'green' ambitions.

Per performance an arena tour generates four times more emissions in 'other' geographic regions when compared with a UK arena tour. This is on account of the greater distance travelled by people and production from the UK.

A theatre tour in Europe generates three times more emissions and twenty-two times more in 'other' geographic regions when compared with a UK theatre tour. Again, this is because of the greater distances travelled from the UK.

We were not able to collect stadium tour sample data for every region; we had stadium results for the UK and US (i.e. 'other' geographic region), but not Europe. Therefore, we took the average per performance of the tour legs for which we had data and used this figure for the European stadium per performance. In addition, for each stadium tour we collected on-site generator energy use so the results for stadium tours include the power used for the show. Ideally this information would have been available for all tour samples because show power demand and therefore the show's total power use are determined by the band.

The per performance GHG emission results of the tour samples varied in each tour circuit category for each region because of the following varying factors: from the size of tour party; number of performances; tour routing; and modes of travel used. Table 1 indicates the minimum and maximum per performance GHG emission results we had in our tour samples for each tour circuit in each region. These ranges are an illustration of the varying GHG emissions per band performance a tour can produce.

5.5 Examples of tour GHG emissions

The study focused on collecting information about the movement of people and production to put on the show. The examples below illustrate GHG emission results for different tour circuits (club, theatre, arena and stadium and a global theatre tour) by legs. For each tour example we present the proportion of emissions by activity source and also the per performance result compared to the initial value we have calculated for a tour circuit to that geographic region.

Table 1 *Ranges of GHG emissions per performance (in tonnes CO_2e)*

	UK		Europe		Other	
	Min	Max	Min	Max	Min	Max
Club	0.07*	0.22	1**		3	8
Theatre	1	1	1	7	2	43
Arena	4	8	8	12	9	43
Stadium	26		NA		11	38

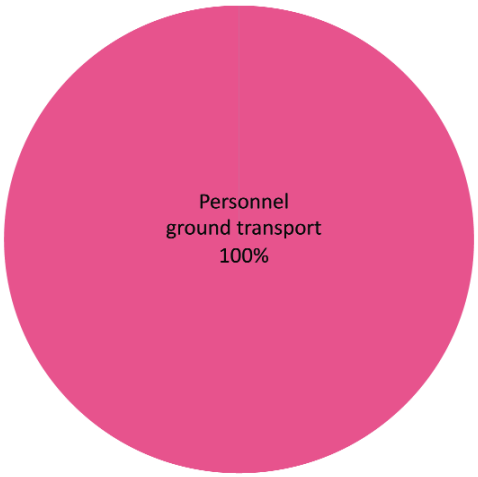
* 0.07 tonnes = 70 Kg

** No range is available as only 1 tour leg sample was submitted.

5.5.1 A UK club tour

This 7 performance date tour with a touring party of 4 people resulted in 460 Kg CO_2e (or 0.46 t CO_2e). On a per performance basis of 66 Kg CO_2e this tour is almost half our initial value result of 120 Kg CO_2e (or 0.12 t CO_2e). All the emissions produced from the tour are from ground transportation of the band and their gear in a single vehicle. The band did not require accommodation or separate freighting of their instruments and production (see Figure 8).

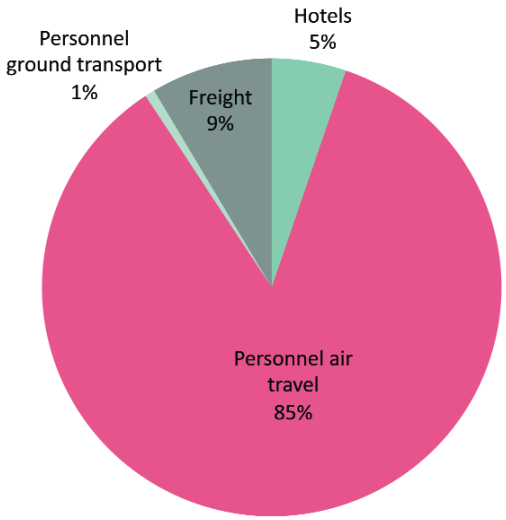
Figure 8 *Percentage of GHG emissions by source for a UK club tour*



5.5.2 An Australian club tour

This 8 performance date tour with a touring party of 9 people resulted in 67 t CO_2e (8 t CO_2e / performance is slightly higher than our initial value result of 6 t CO_2e). The majority of emissions were generated from air travel (85%) (see Figure 9).

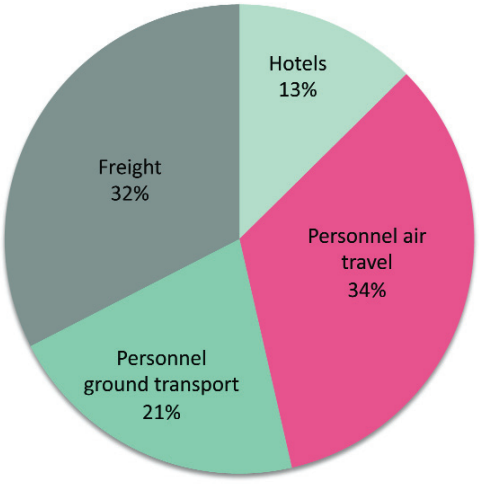
Figure 9 *Percentage of GHG emissions by source for Australian club tour*



5.5.3 A North American theatre tour

This 18 performance date tour with a touring party of 11 people resulted in 36 t CO_2e (2 t CO_2e / performance, significantly lower than our initial value result of 22 t CO_2e due to the number of performances in the tour) (see Figure 10).

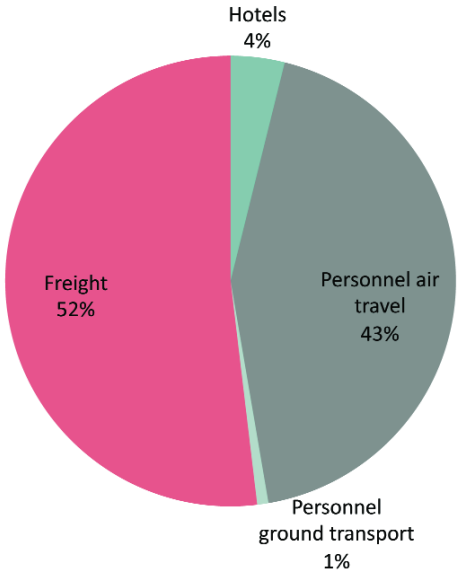
Figure 10 *Percentage of GHG emissions by source for a North American theatre tour*



5.5.4 A North and South American theatre tour

This 9 performance date tour with a touring party of 22 people resulted in 390 t CO_2e (43 t CO_2e / performance, which is almost double our initial value result of 22 t CO_2e). Half of the emissions were produced from freighting production from one location to the next (see Figure 11).

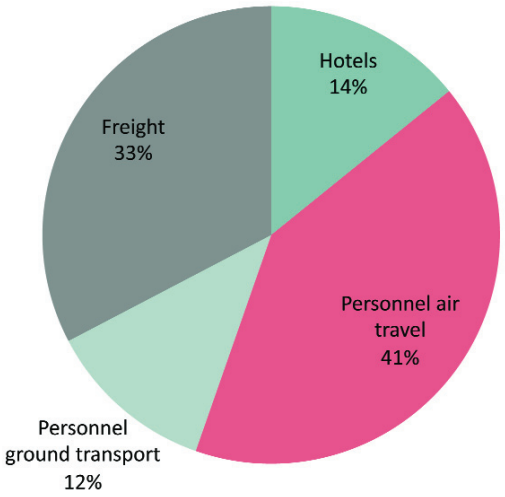
Figure 11 Percentage of GHG emissions by source for a North and South American theatre tour



5.5.5 A European arena tour

This 30 performance date tour with a touring party of 49 people resulted in 351 t CO_2e (12 t CO_2e / performance, which is very close to our initial value result of 10 t CO_2e). The majority of the emissions were due to freighting of production by air and land (33%) and air travel of the band and crew party (41%) (see Figure 12).

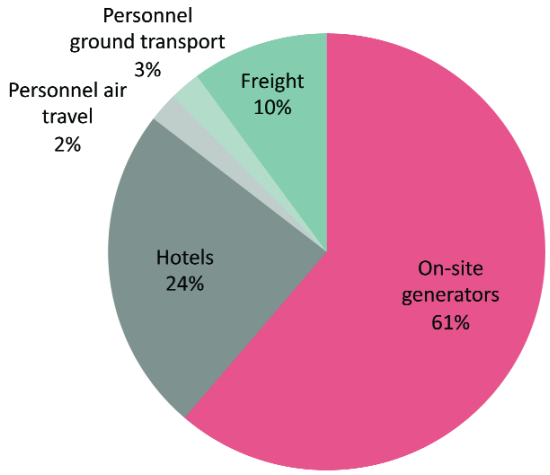
Figure 12 Percentage of GHG emissions by source for a European arena tour



5.5.6 A UK stadium tour

This 11 performance date tour with a touring party of 109 people resulted in 287 t CO_2e (26 t CO_2e, which is our initial value result). Over half of the emissions were from diesel generators to meet on-site power demand (see Figure 13). Stadium tours are generally the only tour types requiring generators as venue electricity mains cannot typically meet the power demand of incoming shows.

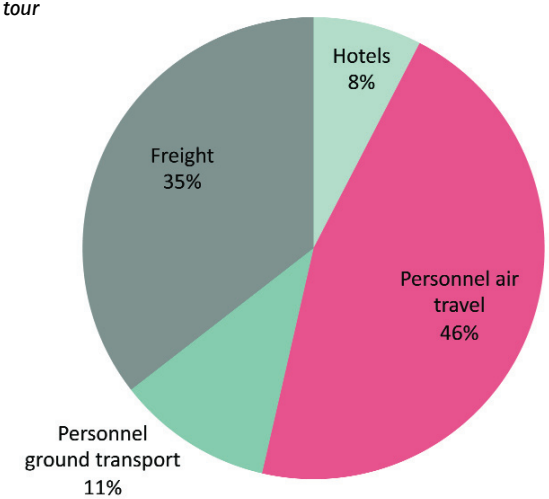
Figure 13 Percentage of GHG emissions by source for a UK stadium tour



5.5.7 A global theatre tour

This 70 plus performance date tour of venue-based and festival performances resulted in 512 t CO_2e from the movement of people and production across continents (see Figure 14). There were approximately 20 people in the touring party. Almost half of the emissions were from personnel air travel and a third was due to freighting production. It was not possible to calculate an indicative average for global tours by tour circuits as sufficient data is not available. However, it is important to build an understanding of these emissions as many successful bands undertake touring on this level and our estimates show that theatre touring is the most emissions intensive level of touring globally.

Figure 14 Percentage of GHG emissions by source for a global theatre tour



6.0 Research approach

This in-depth study has focused on the core activities of touring: movement of people and the production to create the live performance.

The study sought to:

1) Quantify the total annual and per performance greenhouse gas emissions from all scales of touring activity undertaken in the UK and by UK artists touring overseas.

2) Identify practical actions through the business supply chains, which if taken now, pave the way for a touring sector with a minimal environmental impact.

A steering group of experienced individuals from core professions in the live music industry was established at the outset to inform and guide the work. On this group were managers, promoters, agents, suppliers and production managers. Critically this group brokered access into the sector and enabled us to get a good cross-section of tour samples essential for analysis.

This section provides a synopsis of our approach as a detailed technical note is available on our website (www.juliesbicycle.com) with an explanation of the information collection and how it was used to calculate the GHG emissions from band touring.

6.1 Research boundaries

Setting the study scope is critical to understanding the findings, and to ensure that the analysis can be interrogated both on its own terms but also in comparison to other reputable research and data.

6.1.1 Key definitions

I) Environmental sustainability

Environmental sustainability refers to the ability of natural ecosystems to remain diverse and productive, thus being able to support life over a period of time. All human activity is based on these ecological goods and services. Some human activities, such as the excessive production of GHG emissions (including carbon dioxide), has led to the decline in natural ecosystems and to changes in the balance of natural cycles, thus undermining and degrading the capacity of ecosystems to continue supporting life. Living sustainably, for example, by reducing carbon dioxide and other GHG emissions, will ensure the long-term viability and productivity of these ecosystems, providing both humans and other living systems with the capacity to endure. It is in this context that we create a direct link between GHG emission reductions and environmental impacts.

II) Tour

A tour is defined to be one or more performances away from home base (i.e. not in the town or city in which the performer(s)/company is located). The tour samples received have been classified by circuit and by leg.

iii) Tour circuit

Circuit refers to the venues in which artists and/or bands will perform. These are:

- Club (average capacity less than 1,000)
- Theatre (average capacity 1000 to 4,999)
- Arena (average capacity 5,000 to 23,000)
- Stadium (average capacity typically 60,000 plus)

IV) Tour leg

Tour leg refers to the geographic territory in which the tour is taking place.
The territories considered in this study are:

- UK
- Europe
- Other (e.g. North America, South America, and Australasia etc.)

Where a tour is referred to as global it means it covers several/all regions.

6.1.2 Emissions boundary

Table 2 outlines all the main areas of GHG emissions associated with live performance, which are produced directly (in the control of the organisation), indirectly (not in the control of the organisation) or embodied (cumulative emissions through the supply chain) in the goods and services on the tour. The areas of tour activity from which we calculated the GHG emissions were:

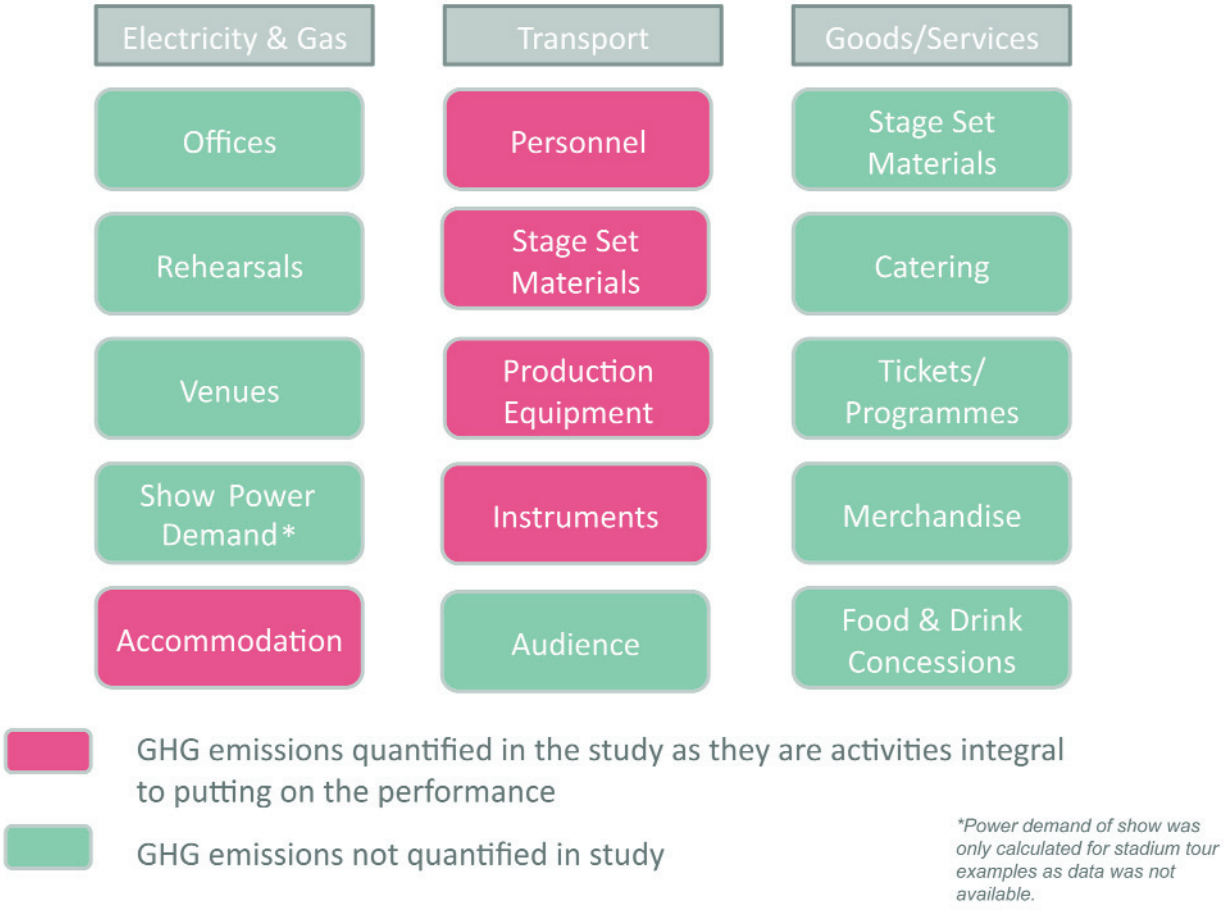
- Transportation of all performers and accompanying crew
- Hotel accommodation
- Freighting of all production equipment
- On-site energy generation for stadium performances.

It was not possible to examine show power demand because apart from stadium tours this information was not available. However, for artist led tours the show power demand is under the control of the band and their production team so ideally should be considered as part of the tour's emissions.

6.1.3 GHG emissions

The most relevant greenhouse gas (GHG) emissions resulting from touring are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), as opposed to others associated with energy production and particular forms of manufacturing. These gases are emitted as the result of combusting fossil fuels for heating, electricity and travel. Carbon dioxide will be the most dominant gas released by the touring activities with CH_4 and N_2O at much lower levels. Almost all the GHG emissions conversion factors used to translate energy use to GHG emissions were those provided by the Department of Environment, Food and Rural Affairs and Department of Energy and Climate Change in their 2009 guidelines to companies for GHG emissions reporting.

Table 2 *Sources of GHG emissions associated with live performance*



6.1.4 Sector boundary

The study has quantified an indicative estimate of the total emissions from bands touring within the UK and UK based bands performing overseas. Total UK touring emission estimates are inclusive of overseas artists performing in the UK, but this does not include the travel of these artists and their production into the UK. It was beyond the scope to collect tour data from overseas artists coming into the UK and there is no data readily available on the proportion of live performances in the UK done by overseas bands. In addition, all of our UK tour samples were from tours that originated in the UK. However, tour samples were used from overseas bands performing in Europe and 'Other' regions to fill in data gaps.

6.1.5 Timeframe boundary

The study has calculated the GHG emissions of touring for 2009. Therefore, the majority of the tour data received is from UK based artists and bands which toured in 2009. The 2009 GHG emissions from touring will form the baseline for future reductions by the industry. Some variation from these boundaries was necessary and a few of the samples collected were from 2008 or 2010 due to tour data gaps from 2009.

6.1.6 Beyond the scope of the study

- Touring or performances for festivals
- Movement of people and production for support acts
- Music performances that have a co-bill rather than a single headliner
- Overseas bands travelling into the UK for a tour.

6.2 Data collection

The study collected several forms of data from which to base the analysis. The results of the study can be found in Section 5.0.

6.2.1 Tour samples

We collected data from 32 tour leg samples by 16 bands and artists which were organised by tour circuits and legs. These samples were used to calculate emissions from touring activities which were extrapolated to produce a GHG emissions profile for the entire UK band sector for 2009. Table 3 breaks down the number of samples collected by tour circuits and legs. [3]

[3] In addition we received a further two global tours (one arena, one theatre), but it was not possible to include these in the performance analysis due to the difficulty of splitting the information into legs.

6.2.2 Interviews with key informants

We talked to a range of people closely involved in touring activities. They included artists, managers, production managers, tour managers, agents, promoters, venues (on programming) and suppliers. The interviews provided us with a 'real-life' context in which to analyse the emissions calculations from the tour samples, and also enabled us to determine the relationship dynamics in the supply-chain of the industry to address environmental issues.

6.2.3 Focus groups with key informants

Focus groups were used to determine relationship dynamics in the business supply chain. The first was with promoters, agents, managers, tour managers, and production managers, and the second with promoter reps.

6.2.4 Secondary sources

Additional data sources informed assumptions underpinning our calculations for venue capacity, and number of tours and performances by UK and international artists based in the UK. The sources for the secondary data used for the study are: New Musical Express (NME); National Arenas Association (NAA); Pollstar Pro and British Recorded Music Industry (BPI).

6.2.5 Data quality

This is the first time the majority of the participants involved have been asked to provide data on the touring activities of the live performance industry for the purposes of calculating the GHG emissions of touring. Many organisations had difficulty providing accurate data (such as the amount of fuel used in trucks or the total number of people travelling throughout the tour leg) because currently this information is not being systematically saved or filed. To the greatest extent possible, results have been based on real data received from our participants. On the occasions when this was not possible, reasonable assumptions were made in consultation with the steering group and other professionals supplying the data. Our research team assisted tour sample contributors as much as possible to help improve the quality of data submitted to the study and made suggestions for continued self-monitoring.

Table 3 *Number of band tour samples received by circuit and by region*

	UK	Europe	Other	Total (venue)
Club	3	1	2	6
Theatre	2	5	5	12
Arena	5	4	2	11
Stadium	1	0	2	3
Total (region)	11	10	11	32

7.0 Emerging technologies case studies

The following section discusses emerging technologies with environmental benefits in the live performance sector in the key areas of: lighting; trussing and rigging; sound; power generators; trucking, tour buses, musical instruments and set design. Julie's Bicycle is not endorsing any of the companies and technologies but is using them as illustrations of positive recent developments for reducing environmental impacts.

7.1 Lighting

7.1.1 Market trends

Lighting technologies offer substantial potential to reduce energy use and carbon emissions. Globally, lighting is responsible for 19% of electricity consumption and therefore a significant proportion of greenhouse gas emissions. Within this, the entertainment/stage lighting sector is tiny but trends in the general lighting market will affect venues and stage lighting. Investing in efficiency measures in electricity consumption is a cheaper way to reduce greenhouse gas emissions than investment in power generation such as photo-voltaic panels and wind power. Regulation of domestic lighting efficiency standards is clearly shaping the market, with phase out of inefficient domestic light sources such as incandescent lamps and some fluorescent lamps required by 2013/2014 in most developed economies.

The transition away from traditional light sources is currently dominated by Compact Fluorescent Lights (CFLs), but Light Emitting Diode (LED) lighting is anticipated to overtake CFLs in about five years time. LEDs now offer greater efficiency than CFLs and can last up to five times longer (and twenty times longer than incandescent lighting). The LED thus offers reduced electricity costs and reduced product and labour costs for replacement. Also, the reduced heat generated by LEDs means less materials are needed to act as a heat sink, resulting in smaller units and more design flexibility, including for luminaries (where the light source sits within a designed fitting). LED costs remain prohibitive to many (despite already offering pay back in the long term), but are dropping at a rate of about 20% per year.

The transition to LED has significant implications for the current global lighting market, as the long life span of the products kills off the replacement market that has been a key revenue stream for the big players. LEDs are a "disruptive" technology that will open up a previously consolidated market – indeed it may take new players to promote LED solutions, as the dominant companies promote the LED alternatives more slowly as they transit away from what was a previous revenue stream. Regulation will however ensure the shift takes place.

7.1.2 Lighting in the live performance sector

Developments in the lighting market will directly affect venues and offices in live performance. Low emission lighting solutions will be installed throughout front of house and back stage in venues as well as in offices. There will also be energy efficiency advancements in stage lighting, but given its particular needs to illuminate spaces intensively for short periods of time these solutions are likely to be somewhat bespoke compared to mainstream lighting requirements.

Lighting has a central role is shaping the aesthetics of a show. With the increasingly demanding expectations from the audience for spectacular events there is great pressure to put on shows with extraordinary lighting features – which, by definition, rarely consider environmental impacts or energy costs. However, striking a balance between the aesthetic and the environmental demands of a product is possible with smart lighting design and technologies. Those in the industry responsible for designing for live performance need to be aware of the benefits and constraints of emerging technology.

To date, environmental considerations are often not the lead driver in the development of new lighting solutions, but some manufacturers, such as Philips, see the market and branding opportunities of creating innovative technologies with strong environmental credentials. These manufacturers in turn require the support of industry suppliers to take up and actively promote the new technologies to their clients, thereby catalysing further research and development from manufacturers.

In recent years there have been a number of technological innovations that enable artistic directors and lighting designers to create a visual feast whilst reducing power demand; and simply by reducing the power demand of the show usually reduces the amount of lighting equipment taken on the road, which in turn reduces transport impacts as well.

7.1.3 Emerging technologies available from lighting suppliers include:

- **GLP (German Light Products GmbH)** has created the Impression, a light fixture that offers a 400w reduction in power demand, weighs 7.5kg and has a lifespan of 50,000 hours for the LEDs (in comparison with a 575w lighting fixture weighing 27kg with a lifespan of 750 – 1000 hours for the light fixture).

- **PRG (Production Resource Group)** also supply 'greener' options including Vari-lite VLX, now manufactured under Philips. This is the next generation of Solid-State Lighting. VLX provides low-energy consumption and reduced maintenance costs with seven replaceable 120w RGB LED chip-sets, 14,000 lumens of output and a 10,000 hours source life. In addition, it draws approximately 30% less electrical current than a tungsten equivalent.

- **White Light** has invested in procuring low carbon technologies as a priority. They invest half of their annual £1.5 million new equipment budget into new LED technology. They have prepared a green guide to lighting to help collate information for lighting designers and riggers to be more aware of environmental issues and to know what low energy lighting solutions might work in specific circumstances.

7.2 Trussing and rigging

The Tyler GT, designed by Tyler Truss Systems, provides environmentally responsible trussing for the live industry by reducing the requirements for trucking: the units can be loaded up with the required lighting equipment and then stored without the need for bulky cases. The truss is made out of aluminium, of which 70% is recycled from scrap. By eliminating excess raw materials, reducing the amount of labour required to move and install the units, and reducing the space required for transportation the Tyler GT achieves a number of environmental benefits.

7.3 Sound systems

While sound systems require less energy than show lighting, they are still a source of GHG emissions both in the energy required to power them and transportation required to move the kit around. Following general technological trends in recent decades, sound systems have increased in ouput while diminishing in size, weight and energy requirements. This trend has in turn reduced the transportation requirements for PA, and the associated transport emissions. There is also a global trend to take less equipment on the road, as more venues have good quality consoles installed and state of the art sound equipment is available.

One example of the energy efficiency achieved in sound equipment is the **Funktion One** – a patented, highly efficient, horn loaded loudspeaker system that it is claimed produces at least four times more output than comparable products.

7.4 Power generators

Generators are typically not required in venue-based tours, but are needed for music festivals and sometimes for site-specific and stadium performances. Most of the time diesel generators are used. However, there are companies that offer generators powered with renewable energy sources, for example:

- **Firefly Solar** is one of the first companies in the UK to provide solar power generators to live music events. They have a range of generators in their fleet that can meet power needs for up to 5,000 people, and their generators are used at over 50 events each year including many of the major music festivals.

- **Midas Productions (UK) Ltd** provides biofuel generators throughout the UK, and source their biofuel from recycled vegetable oil collected within the M25 radius. They complement this service with road and delivery vehicles running with B100 biofuels. Ninety percent of the fuel will have biodegraded in just 21 days.

- **Power Logistics** work with clients to reduce the amount of equipment required on-site as well as offering alternative biofuels for use in generators.

See the Hot Topic piece on biofuels page 35 for more information.

7.5 Trucking & tour buses

Fuel efficient vehicles can significantly reduce the GHG emissions produced from transporting equipment. Specialised tour trucking companies are investing substantial amounts of money to improve the fuel efficiency of their vehicle fleet, for example:

- **EST** upgraded their fleet to include a further 14 Euro 5 trucks, which produce particle emissions 25% below the enhanced low emission vehicles (LEV). ES Group has set-up an environmental management system to run in line with their 2010 ISO14001 assessment.

- **KB Event** remains the only BS 8555 accredited trucking company in the UK, certification which demonstrates they have integrated an environmental management system into their business operations. They have invested over £1 million updating their fleet including converting a number of their existing vehicles to meet the requirements of the London Low Emissions Zone (LEZ). They have replaced their larger trucks with the efficient Euro 4 vehicles featuring exhaust gas recycling.

- **McGuinness Forwarding Ltd** worked on Radiohead's most recent tour for which they purchased Euro 5 vehicles that used Ad-Blu additive. This additive reduces and minimises harmful emissions in the fuel. Each vehicle has its own independent air conditioning unit that runs off battery which means the engine does not have to be left idle to maintain comfort levels inside the vehicle.

- **Tigertours Ltd** have recently invested £200k in new Euro 5s to update and expand their fleet, replacing all Euro 4 vehicles. They service their vehicles before and after hire and regularly check tyre pressures to optimise fuel efficiency.

7.6 Musical instruments

Many musical instruments are made from woods that are sourced from the world's tropical forests. These forests are essential for biodiversity, habitat, ecosystem services (such as fresh water), storing carbon from the atmosphere as well as supporting the livelihoods of millions of people. Therefore, ensuring musical instruments are made from well managed forest is fundamental. Towards this end more and more manufacturers are turning to tonewoods certified by the Forest Stewardship Council (FSC). For example, Taylor, Martin, Gibson, Fender and Yamaha guitars are working with Greenpeace as part of the Music Wood Coalition seeking to stimulate the supply of FSC certified Sitka spruce – the species most commonly used for soundboards.

The Yamaha Corporation has created Yamaha Forest in a deforested area of Indonesia where over 150,000 trees are being planted on 120 hectares. The company has reduced its use of black coating glaze for Clavinova products by 42%.

The Agência Bambu de Conhecimento project set-up in Brazil by Raphael Moras de Vasconcellos and Eduardo Giacomazzi has created the world's first digital bamboo guitar alongside MODO Design using sustainably sourced bamboo.

7.7 Stage set construction and disposal

Sets are often used to enhance the performance platform for the artist on tour, embodying the show's artistic vision. Current industry practice is to transport the set with the artist whilst on tour around the world and dispose of it when the tour or specific leg is over (unless the set consists of aluminium staging or rental gear which is usually hired and returned at the end of the rental period – one example of this is LiteDeck by LiteStructures). The transporting and disposing of stage sets and designs can produce a large amount of GHG emissions and can end up being very costly in the production budget. This makes the construction and planning of sets a significant consideration when preparing budgets, and hiring the production team and crew. Be it the materials sourcing, the construction process (including painting and decor), or the storage and disposal methods, the lifecycle of a stage set under current industry practices is wasteful and poses a challenge to environmental sustainability that has so far been overlooked by the industry.

Challenges

1) Live music events have more varied sets than any other industry, ranging from metal and aluminium structures consisting of several floors, hydraulic lifts and turning circles, to hand-made props and set backdrops made from woods and fabrics. When determining the sourcing and the type of materials used to construct stage sets, props and backdrops, the main consideration is the budget available to realise what the artist or event producers want from the show. Whether it is hand-crafted or specialist props, or stage sets and backdrops, each material used comes with its own environmental credentials and associated costs. For example, whereas wood would be considered biologically carbon neutral, aluminium and steel are associated with an energy-intensive manufacturing process which requires electricity – this translates into the burning of fossil fuels and the generation of GHG emissions. When wood is being used for set construction, different species will have varying environmental credentials; for example, plywood, depending on the method of harvesting, transportation and processing, can be very environmentally destructive, but if used in whole sheets and Forest Stewardship Council (FSC) certified, then it can be both sustainably sourced and recyclable.

It is this complexity that means early engagement by the creative teams and production managers is crucial in creating and delivering an environmentally sustainable set, whilst remaining true to the creative vision of the artist or the event producers. A lack of awareness means that construction materials end up being chosen regardless of their environmental credentials, with production managers and creative teams resistant to switch to newer, more sustainable materials.

2) A critical consideration related to budget is storage of the set when not in use. A tour will often run on a tight budget which cannot accommodate storage facility fees, particularly when the possibility of re-using the set in the future is uncertain. An artist might not know at the end of a tour, when he/she will next tour, and even if they do, the tour is likely to have a completely different look, making the set unusable or an unnecessary expenditure to keep. The end result is ususally landfill disposal as most production managers of tours and events are unaware of local recycling centres, or locations where sets can be suitably recycled or reused.

3) An artist and their production team are also constrained by practicalities when planning a tour, such as the need to transport the set with the artist as opposed to sourcing the materials and constructing it locally. With short performance periods in each locale, it is often unfeasible and impractical to construct the set locally. The end result is the generation of GHG emissions produced by the various modes of transportation (e.g. planes, ships, trains, trucks) carrying the set around the world.

So what can be done?

Scenery Salvage, based in London, is creating a pioneering model of set storage, re-use and recycling for theatre and TV industries that could be extended to the music industry. The company buy props from companies that no longer need them, and re-sell them at reduced prices from a centralised online catalogue. They are also able to pick-up, store and recycle sets, which customers pay for per tonne of weight. Scenery Salvage are looking to expand capacity and reach, by relocating both office and reclamation centre to one site that will be more centralised, with potentially a biomass boiler and biodiesel generator on site and possibly creating regional satellite hubs around the country.

Until then however, artists and their production teams have an obligation to do what they can to ensure that the set construction and disposal process becomes as sustainable as possible.

- In the case of larger tours, where a whole creative team is involved, the team should be employed early on to develop and share an artist's sustainability and creative vision for an event or tour. Becoming involved early on in the process will enable them to source sustainable materials and/or where possible, rent components.

- Renting stage decking and structures can easily help to reduce brand new manufactured aluminium and steel components. Particularly in the case of steel and aluminium construction there are several suppliers who provide steel deck and stage construction on a rental basis. This means once the pieces are manufactured, they are purchased by a rental supplier, who then rents the components (in different sizes) to production companies according to their specifications. The parts are then returned, and sent out on the next job as and when booked by the rental company.

- For companies working in creative design and set construction on behalf of the music industry, owning storage space will save the costs and carbon emissions of constructing and manufacturing the same sets (or similar) in the future, by simply re-using older sets.

- If disposal is the only option, production teams need to learn about the different disposal options available, including the potential use of companies such as Scenery Salvage. The production team should also liaise with local partners (whether they are promoters or venue staff) in advance of the touring date or event in order to ascertain local recycling centres and dispose of stage sets in the most sustainable way possible.

- It is also important to carefully consider whether all parts of the production are worth freighting while on tour or whether certain parts can be constructed locally.

8.0 Hot Topics

The following set of expert pieces cover a wide range of high-profile issues or hot topics on sustainability that are relevant to the music industry.

Hot Topic 1

Governance: for the record, we must change the system

By John Elkington

The news that Michael Jackson was working on a song about climate change not long before his death highlights at least two things. First, it underscores the fact that, in fits and starts, the global warming issue is pushing into the popular mainstream. And we should welcome that. But, second, it also spotlights the uncomfortable fact that we are still addressing what looks set to be the defining challenge of the twenty-first century with sporadic, voluntary and often self-serving initiatives.

Clearly, if a best-selling pop star wrote a song and if it became a best-seller and if it then persuaded people to change their thinking and if that, in turn, persuaded large numbers of us to change our behaviour, then we would have some degree of cultural lift-off. But that would be a rare event indeed.

So, let's celebrate individual initiative – and let's encourage people to make a difference, however small. But let's also remember that our economic, social and political systems rarely change because we think it would be a good idea. Here's the rub: if we want to move beyond changing individual hearts, minds and behaviours to the necessary transformation of cultures, paradigms and even civilizations, then we had better get good at governance.

Simply put, this is the activity of governing. No, I know, but hold on in there. Those who govern define expectations, they grant power and, crucially, they verify and incentivise performance. So far, so boring, but here's the thing: unless we get the governance dimension of our climate change responses, we are – to put it indelicately – screwed.

Look elsewhere in *Long Horizons*, *First Step* or the Julie's Bicycle website[4] for guidance on why climate change is happening, why it is important, who is going to be impacted, how the music industry is currently responding – and what it might usefully do in future. My theme is the art and science of governance, global governance, national governance and – crucial here – industry, corporate and organisational governance.

In headlines, this is about what priorities get set, how they are tackled and who gets rewarded – or punished – as a result.

Let's start with the big picture and global governance. No question, international institutions like the United Nations, the OECD, the World Trade Organisation, the World Bank and the World Economic Forum pay much more attention to sustainability issues – including climate challenge – than they once did. But the unravelling of the UN COP15 climate conference in Copenhagen late in 2009 underscored just how weak global governance currently is when it comes to such issues. Effective global governance will come, but probably only – as in the case of CFCs – when we have discovered climate's equivalent of the Antarctic Ozone Hole.

[4] www.juliesbicycle.com

Focus down to the national level – or regional level in such cases as the EU, NAFTA or ASEAN – and the situation improves a little, but questions of growth, employment and investment still largely drown out those who argue for a shift to cleaner, greener forms of development and growth. But there are bright exceptions, among them South Korea, whose President has declared the ambition that the country will become a hub for low carbon, green growth over the next 60 years.

Still, the oil spill disaster caused by the sinking of the Deepwater Horizon rig off the Louisiana coast has dramatized the fact that even President Obama has so far failed to put in place the governance, regulatory, compliance and other systems needed to switch the United States onto a low carbon, green growth path.

Recently, we looked at the whole process of disruptive innovation – and the scaling of new solutions to challenges like climate change – and developed a simple, 5-stage 'Pathways to Scale' model of change.

In the model, Stage 1 is Eureka! – the creative moment where new opportunities for innovative solutions become apparent. Stage 2, the Experiment, is where entrepreneurs test, prototype, fail, learn, and adapt new solutions. It is the early stage venture. Stage 3, the Enterprise, is where experiments become organisations and initiatives with more developed business models, invested in by a broad range of investors. Stage 3 is about growing a business.

Yet if anything close to system change can begin to happen, there is a need to shift the spotlight from individual enterprises to an organisation's or sector's wider influence in society and markets. Stage 4, focusing on the creation of an Ecosystem of change agents, is about creating new markets, incentives, and frameworks for solutions to diffuse and mainstream. Accelerating change is critical to embed the new cultural codes and forms of governance into the mainstream functioning of the Economy, represented by Stage 5.

While stages 1-3 are extremely important, the main focus of our attention currently is on the transition from Stage 3 to Stage 4. Moving from individual business models to broader ecosystems requires collaborative forms of leadership. This is where Julie's Bicycle and its partners are operating.

Ultimately, if anything like a truly sustainable and equitable future is to be achieved as the world pushes toward a human population of 9 (or even 10) billion, campaigns and entrepreneurial initiatives must scale up further to Stage 5 system change – typified by broad – based market and societal adoption of new mindsets, models and technologies. Success in moving from Stages 4 to 5 will involve the transformation of political priorities, governance process, market rules and cultures. Here is where the music industry can play a pivotal and transformative role. Touring – the international communications tool par excellence – can be one crucial, living vehicle for propagating the relevant messages and information, and for modelling the appropriate new behaviours.

Finally, in addition to the UK music industry's accelerating efforts to tackle climate change, it would be wonderful to see sector leaders doing two things. First, ensuring that the related priorities, targets and initiatives are hard-wired into their own governance mechanisms – and into the agendas of their Boards. And second, supporting the artists and creators, industry innovators, entrepreneurs and venture investors who are driving the transition towards a cooler, fairer economy.

Hot Topic 2

Putting a price on what we can't always see

By Helen Heathfield and Christina Tsiarta
Julie's Bicycle

Our economy is totally dependent upon goods and services from the ecosystems that surround us, such as water purification, soil creation, pollution dilution and waste treatment. One such ecosystem crucial for our carbon cycle is the capacity of our oceans, vegetation and soil to absorb carbon emissions. Despite being completely reliant on these ecosystems, our economy does not recognise, and therefore value these goods and services in financial terms, anything like sufficiently. A United Nations programme is currently seeking to address this problem. The Economics of Ecosystems and Biodiversity (TEEB) study is finding that the costs of conserving biodiversity compared to the benefits of doing so are in a ratio of 1:10 – 1:100. TEEB is expected to report this summer on how policymakers can make sure that business reflects the true costs and benefits.

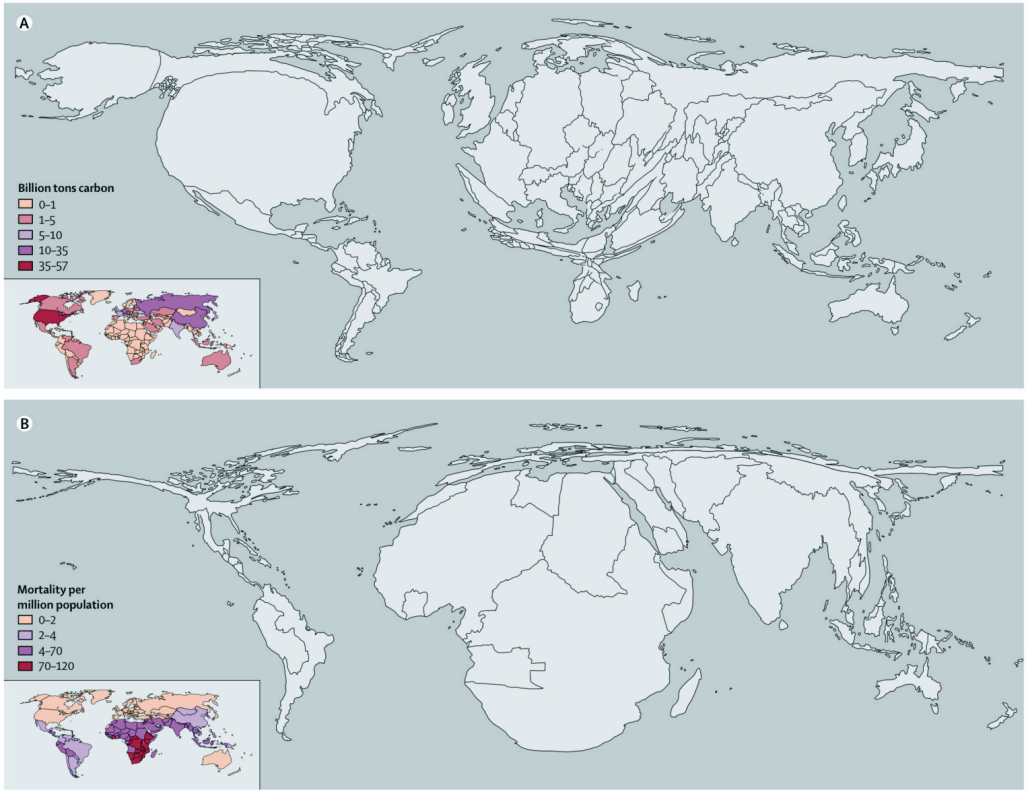
Take for example felling a tree to make a musical instrument or sheet music. Some of the costs included in the financial modelling of this product might be running the chainsaw, paying the lumberjack and transporting the log. Costs excluded might be the loss of rainfall management, a home for an orang-utan, a livelihood for an indigenous person, the soil the tree roots were holding and the future capacity of that tree and soil to absorb carbon from the air. These implicit costs are rarely factored in to the economics of a musical instrument or paper manufacturing.

Economists have termed this an externality: simply put, when a price does not reflect the full costs. Positive externalities are commonplace and unnoticed: for example a beekeeping business generating revenues from honey while the surrounding farmers receive a free pollination service.

The classic negative externality is the example of a factory polluting a river and, as a consequence, fishermen downstream catching fewer fish. The factory pollutes for free while the fishermen pay the costs of that pollution.

Climate change is perhaps the most dramatic example of global negative externalities. The illustration below (Figure 15) depicts country size according to responsibility for climate change 1950-2000 and highlights the distribution of four climate-sensitive health impacts during the same period. This shows that those generating the emissions are not those suffering the consequences.

Figure 15 Comparison of undepleted cumulative CO_2 emissions by country for 1950 (A) - 2000 (B) and the distribution of climate-sensitive health consequences (deaths from malaria, malnutrition, diarrhoea and inland flood) Source: Lancet 2009



If the negative externality of the factory versus fisherman is compared with the externalities associated with climate change it becomes clear what the scale of climate change externalities might be:

Factory v fishermen	Climate change
Only the factory is polluting, the factory will understand this, know it can stop and how much it will cost.	Everyone is responsible for emissions, we rarely have much information about how much of emissions we are responsible for, we are uncertain how we can emit less and there is huge uncertainty of what it costs in externalities.
Only the fishermen are affected and they know how much the pollution is costing as a result of loss of fish.	Everyone is affected – people are dying now as a result of climate change and it will affect all of us in the future though we are not sure exactly how or when. It is difficult to put a value on human life and whole ecosystems such as coral reefs.
The fishermen have a legal and financial system that can help identify the factory, the harm and demand damages.	Those affected now often have less economic and political power than the large emitters. Our economic and political systems are poor at accounting for future costs to ourselves.
The pollution has a short term impact and then the fish stocks bounce back.	We are now feeling the impact of emissions from 30-40 years ago. Our current emissions will have impacts for centuries. Some impacts are irreversible, such as species extinction and loss of land to sea level rise.

To solve an externality a value needs to be calculated for the damage so that it can be 'internalised' – i.e. accounted for within our economic system. This is relatively straightforward for the factory v fishermen example: the fishermen sue the factory. However the complexities of climate change expose the legal system as totally inadequate and present many barriers to businesses including externality costs in their prices. Individuals seeking to include environmental and ethical issues in their purchasing decisions are often confused. The size and complexity of the externalities requires centralised government intervention to make prices more accurate.

The previous and current UK governments have recognised their role in internalising the externality of climate change. In 2006 the UK government commissioned a study to consider the external costs of climate change. The resulting Stern Review (after Lord Stern, review lead) was the first attempt by any Government to understand the scale of the global economic impact of climate change. In 2007 Stern reported that if warming of 5°C occurred, the costs of adaption to developed countries would be 5-10% of GDP as compared to a 'no climate change' world, and that developing countries would suffer costs above 10% of GDP. The Stern Review estimated that the costs of avoiding this scale of climate change through mitigation of emissions represented 1% of GDP, ergo climate change avoidance is cost effective. Since publication of the Stern Review, Stern has acknowledged that his projections were adaptation cost-conservative, underestimated the sensitivity of the climate and too cautious about the benefits of avoiding climate change through emission mitigation.

So how best to internalise the costs of climate change: in other words to put a price on carbon? Economists argue for two approaches:

- **Fix the price**: estimating the costs of climate change and levying a tax that equals those external costs. For example in the UK, electricity users pay a Climate Change Levy on their bills. Despite best efforts, a tax may still not equal all external costs or reflect everyone's approach to the risks resulting from climate change;

- **Fix a limit on the amount of pollution**: setting a limit on emissions and then allowing emitters to trade in emissions. This sets a price for emissions through the creation of a market where carbon is traded like any other commodity, such as the EU Emissions Trading System. Industrial lobbying and uncertainty about the extent emissions convert into climate change impacts can result in the limit being too high.

New tools and frameworks to protect the environment we all fundamentally rely upon are urgently needed. Our current economic model, based on the traditional capitalist principles of a free market, competition, and private ownership of the means of production, is unfit for purpose in this new context. It needs to be redesigned to reflect environmental costs and benefits. The UK Government is developing its work on carbon valuation to help design policies effectively: see the accompanying box "How much does carbon cost?".

Tours need to recognise that there are costs excluded from the current budgets, and that government action will internalise those costs, penalising activities with high emissions. Cutting emissions now will save costs both to future tours and to the climate.

How much does carbon cost?

The financial valuation of carbon enables both government and market instruments to account for the costs associated with climate change. The value of a tonne of CO_2 is contingent on an emerging appraisal of the damage that CO_2 does. The UK government's approach to valuing carbon is based on estimating the likely costs of meeting specific emissions reduction targets.

Carbon valuation will ensure that policies the UK Government develops are consistent with the emissions reductions targets that the UK has adopted nationally, as well as with the European Union and United Nations. Giving a value to carbon helps the Government fully account for climate change impacts in appraising and evaluating public policies.

This is a new approach to carbon valuation, which until recently was implemented as a 'shadow price', and follows the EU's Climate and Energy Package (2008) rationale. It splits emissions into:

- traded sector - those emissions covered directly or indirectly by the EU Emissions Trading System (ETS);
- non-traded sector - those emissions not covered by the EU ETS such as transport fuels.

The distinction, which leads to two sets of carbon price estimates, will enable more accurate policy appraisal which will take into consideration the costs and benefits to the UK. These prices will be regularly reviewed and revised.

For the purpose of appraising policies that affect emissions in sectors covered by the EU ETS, the traded price of carbon is recommended. The short term traded price of carbon is currently set at £22 per tonne CO_2e, with a range of £12-£27.

For policies that affect emissions that are not traded, the short term non-traded price of carbon is currently set at £52 per tonne CO_2e, with a range of £26-£78.

Furthermore, the Government is reasonably assuming that from 2030 a global carbon market will be in place, and therefore a consistent price of carbon will apply to all emissions. The long term traded price of carbon is estimated to be £70 per tonne CO_2e in 2030, with a range of £35-£105. This price will be added to the price of goods and services, rather than being used to appraise policy choices.

It is possible to use the government's current estimate to give an illustration of future cost increases, assuming the external costs of climate change are internalised.

For example, the emissions from a tour relate to the transport emissions, which are not traded. Using a tour with emissions of 512 tonnes CO_2e, and multiplying that by the current price of non-traded carbon of £52 per tonne of CO_2e, will result in £26,624.

This is the amount of money the tour can expect to pay, for example through future tax changes if emissions stay constant. It is therefore a useful figure to consider when investigating emission saving actions, as anything below that amount will be a cost-efficient investment.

Hot Topic 3

Carbon Offsets: cop out or climate winner?

By Dr Adam Bumpus
University of British Columbia, Canada

Carbon offsetting is a mechanism that has been used by governments, companies and individuals in order to attempt to reduce the environmental damage of their activities. The performing arts sector, especially music, is using carbon offsetting as a route to address some of the environmental impacts of their activities. Carbon offsetting should not be used as an alternative to direct actions which reduce emissions. Carbon offsetting projects have differentiated environmental and social benefits which need to be understood. This note provides an explanation of what carbon offsetting is, how it works, and guidance on how to choose a carbon offset investment.

What exactly is carbon offsetting?

A carbon offset is a mechanism that allows a company, organisation or individual to reduce its environmental impact on the atmosphere in one area by investing in projects that reduce greenhouse gas (GHG) emissions in another.

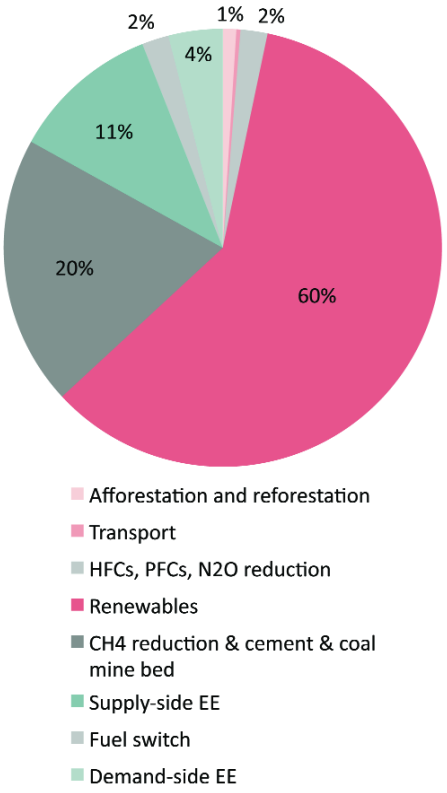
Offsets are controversial. Some offset projects have questionable emissions reductions, create unwanted local effects and open the possibility for fraud and profiteering by 'carbon cowboys'. On the other hand, carbon offsets are popular because they are often cheaper, faster and easier than domestic emissions reductions. Often carbon offsets are carried out in developing countries and in some circumstances projects have led to significant local benefits, assisting communities with direct financial benefits or project co-benefits such as access to electricity. Carbon offsets are neither the solution to climate change, nor the antithesis of carbon mitigation action. If carried out correctly and as part of a wider climate change strategy offsets can create both atmospheric and social benefits.

How does carbon offsetting work?

Project types

Carbon reductions can come in the form of removing carbon directly from the atmosphere, such as planting trees to increase carbon sequestration, or by investing in energy efficiency or new clean technology to replace fossil fuel burning. The difference in emissions that would have been emitted and the current, lower emissions (i.e. because of the new project investment) create reductions that are traded as metric tonnes of CO_2 equivalent (i.e. carbon credits). Many types of projects are used in carbon offsets. These range from industrial gas destruction to community-based agro forestry (see Figure 16).

Figure 16 Number (%) of CDM projects in each category (source: UNEP Riscoe, Feb 2010)



Markets for creating reductions

The reductions and transference of credits take place in two broad market categories. These markets differ in governance, size, project types and prices (see Table 4 below). Firstly, the compliance market includes the Kyoto Protocol's Clean Development Mechanism (CDM) and Joint Implementation (JI). Secondly, the voluntary carbon offset (VCO) market is not regulated and is used by organisations not bound by Kyoto to offset their emissions primarily for public relations and for reasons of corporate social responsibility (Hamilton et al., 2009). Although traditionally the voluntary and compliance markets differed in project types, credit sourcing in the CDM is increasingly influencing the voluntary markets as project developers sell Verified Emission Reductions (VERs) while awaiting CDM registration (e.g. 32% of project types are Hydroelectricity in both CDM and VCO markets).

Evolution of offset markets

Since the mid-2000s the carbon offset markets have evolved significantly in terms of knowledge, practice and their effective use. More recently, the Clean Development Mechanism (CDM) is being reformed away from the 'project-based approach' to programmes of activities (i.e. reducing emissions of a whole city) or reductions of emissions by industrial sector (i.e. setting standards for emissions reductions in a specific industry). These aim to provide cheaper emissions reductions at scale. In addition the voluntary market is increasingly self-regulating in the context of consumer awareness around carbon offsets. This is important to emerging markets, like the USA, that are looking to use credible carbon reductions in future climate change policy. Increasingly the compliance and voluntary markets are merging, as self-regulation increases.

Offsetting should not be seen as the immediate go-to option for carbon management. Instead it should come after all reasonable action can be made to reduce operational emissions. The UK Carbon Trust has suggested a useful way of engaging offsets through a three stage process:

1. Focus on direct emissions reductions through efficiency;
2. Look at reducing indirect emissions up and down the supply chain;
3. Develop an offset strategy.

Table 4 Characteristics of the compliance and voluntary carbon markets (source: Capoor and Ambrosi 2009; Hamilton et al. 2009).

Market	Rationale	Governance / Standards	Market Size & Value (2008)	Average credit price (2008)
Compliance	Cheap compliance under Kyoto regulations	*Governed by UN processes:* Clean Development Mechanism (CDM) Gold Standard CDM Joint Implementation	1481 million metric tonnes US$33 billion	US$16.78/ tCO_2e
Voluntary	Public relations and Corporate Social Responsibility	*Outside of formal regulation:* Voluntary Carbon Standard Gold Standard VER Climate Action Reserve	123.4 million metric tonnes US$705 million	US$7.34/$tCO_2e$

Guidance on what to look for when purchasing a carbon offset for your tour

Rather than project type or size, the best way to ensure credible carbon offsets is to use a credible standard. The Clean Development Mechanism (CDM) is the most regulated standard, but the Voluntary Carbon Standard is increasingly seen as an alternative for project types and geographic regions not allowed under the CDM. For organisations that want to promote the local community development stories associated with carbon offsets, then the Gold Standard (GS) or the Climate Community and Biodiversity Standards (CCBS) will help source credits that have explicitly channelled finance into development projects. Any credible standard should produce offsets that are additional to business as usual practices, measureable, reportable and verifiable. Standards should also encourage the use of a carbon registry to track offset credits in order to prove that they have been retired (taken out of circulation) when they are bought.

Conclusions

Carbon offsets have matured since they first became mainstream climate mitigation tools in the late 1990s and early 2000s. The markets have evolved significantly, and there are choices in both the compliance and voluntary markets for organisations wishing to purchase offsets. A robust offset strategy involves achieving internal reductions as far as possible, and then sourcing carbon offsets that are registered to credible standards and tracked through carbon registries. Carbon offsets can be forces for good, but they should be considered as a tool in the box of climate solutions, not as an end in themselves.

HotTopic 4

Up in air or out to sea?

By Tristan Smith
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International touring is, by definition, contingent on travel – often by air and sea. However, aviation and shipping rely on fossil fuels and, in the short to medium term there are no viable alternatives. Both these sectors are growth sectors and therefore it is inevitable that the greenhouse gas emissions they generate will also increase. This note gives an overview of the environmental issues associated with air and sea travel, where government policy is heading and some guidance to reduce environmental damage.

Why the environmental concern about aviation and shipping?

Our best guess at the moment is that anthropogenic greenhouse gas (GHG) emissions created by aviation and shipping are of a similar magnitude – each accounting for approximately 3% of global emissions. Analyses to break down that figure for the EU and UK return similar estimates of more localised proportions. Given such a diminutive share of the carbon problem, and considering the complexities of regulating international businesses, it is tempting to focus on the bigger carbon criminals; agriculture, industry, power generation and the like.

But aviation and shipping are the workhorses of globalisation. Together they move an overwhelming majority (80% of global trade travels by ship) of the raw materials, fuels, manufactured products and labour force around the world that has been fundamental to high consumption lifestyles typical of the West, as well as the inexorable industrialisation of China and the Far East.

As a result, both sectors have experienced feverish growth rates over the last few decades. Growth projections assuming business as usual suggest that, if we fail to control emissions from aviation and shipping, they could contribute as much as 30% of anthropogenic emissions by 2050. If that happens we will be left wondering why we ignored such a large and fundamental part of the problem.

Beyond the headline figures on emissions proportions, both shipping and aviation have separate and additional climate challenges. Aircraft emissions are complicated by the physical and chemical impacts of their emissions on the upper atmosphere. Some analyses apply a metric or multiplier to the quantity of GHG's emitted by a flight in order to produce a more accurate representation of its climate impact.

Shipping's dirty secret is that it burns some of the lowest grade fuel that we extract from the ground. When crude is distilled to produce petrol and diesel for road transport, the high sulphur content 'heavy fuel oil' is a comparatively cheap by-product and consequently the fuel of choice for the cost conscious shipping industry. Acid rain, smog and health issues associated with burning high sulphur fuels such as heavy fuel oil and coal have led to legislation that has all but banned it from most of its previous applications.

The regulatory complexity and the 'out of sight, out of mind' nature of the shipping industry has meant that burning high sulphur fuels in ships has gone unchecked. Through the International Maritime Organisation (IMO), there is now a framework in place to bring shipping's sulphur emissions down from current levels (about 4.5% of exhausted emissions) closer to that of a modern car. This will be achieved either by switching to low sulphur fuels, or fitting technology to ships that will 'scrub' the sulphur from the engine's exhaust. Similar regulatory attention is being paid to nitrous-oxides and particulate emissions.

One way to solve the land-based anthropogenic GHG problem is to decarbonise energy supply. This might involve increased provision of renewable energy to the grid or the revival of the nuclear power industry. However, it is not easy to plug a plane or

a ship into a wind turbine. For these reasons neither the aviation nor the shipping sector currently foresees an imminent switch away from liquid fossil fuels. The physics of flight constrain planes to energy dense fuels and compact high-power–to-weight ratio engines, which currently limit their options for large long distance aircraft to gas turbines burning aviation fuel (which is currently distilled from oil).

Ships are less restricted from a technological perspective, and have more space and carrying capacity to explore the application of emerging (or recurring) technologies. The motive force for global trade was originally derived from the wind. Tea, wool, spices and many staples of our ancestors' lives were distributed by sail power and some now see the combined challenges of high fuel prices and GHG emissions stimulating resurgence in wind powered shipping. Many modern ships are too large to be powered wholly by sail, and nor would modern expectations of punctuality tolerate such a whimsical service. However, giant kites, flettner rotors (a rotating column which generates lift from the wind) and folding deployable wings have all been studied, and in some cases trialled on large ocean-going ships, to investigate their technical and economic viability. Similarly, solar panels can be used to augment the power generated through internal combustion and their integration into ship design could become commonplace in the future.

Renewable power sources are not reliable and so future ships and planes still need to carry either fuel or energy storage that can be tapped into when the sun stops shining or the wind is not blowing. Biofuels are the most obvious technological answer because they require minimum disruption to our existing liquid fossil fuel infrastructure (See biofuels hot topic). Indeed, blends of biofuels (where biofuel is mixed with fossil fuel to reduce the modifications required to existing engines but incorporate a proportion of the benefits of a low carbon fuel) are already in use. However, the true sustainability of this miracle cure to mankind's oil addiction is now being questioned. As demand for biofuels in all sectors increases, constraints on supply due to the large surface areas and resources (e.g. water) required for their production are likely to constrain their viability. This leaves synthetic fuel, such as hydrogen, ammonia and methanol. Low carbon generation of these fuels is technologically feasible, but the high costs associated with this will prevent their widespread uptake until sufficient regulation is in place.

Government aviation and shipping policies

Aviation and shipping are both included in the UK government's commitment to reduce GHG emissions by 80%. However, it is hard for the UK to act without international collaboration because both are 'mobile' industries that could easily re-route to hubs in neighbouring countries, with negative consequences for the UK's economic growth. This dilemma is epitomised by the current debate regarding the expansion of Heathrow. The turgid progress of global negotiations witnessed at Copenhagen in December 2009 suggests that international consensus on emissions reductions and a framework to enforce it is a long way off. Progress on this international framework is crucial before effective global regulations on aviation and shipping can be used to drive and incentivise emission reduction in these sectors.

Fortunately, as we await those global commitments, the EU has been busy pioneering a GHG Emissions Trading Scheme (ETS) which places caps on the GHG emissions in certain sectors and provides a market so that the higher emitters can buy 'permission' to emit GHG from lower emitters: this effectively redistributes the burden of GHG emission reduction to the emitters for whom the cost implications are lowest whilst ensuring the cap provides a simple high level control that obviates the need for micromanagement of many industries and sectors. This ETS is now in its second phase and in 2012 will start a third phase that will include aviation within its scope. The terms for including aviation mean that any flight landing or taking off from the EU will be covered (i.e. even those to and from non-EU destinations) and so depending on the market price of carbon this could start to drive up flying costs and encourage adoption of lower carbon technologies and operating practices. Like fuel price forecasts, carbon prices will fluctuate and so it is hard to assess the scale and timing of the impact of this regulation. Current expectations are that even by 2020 price effects created by the EU ETS are unlikely to exceed 50% and could be a substantially lower portion of ticket cost.

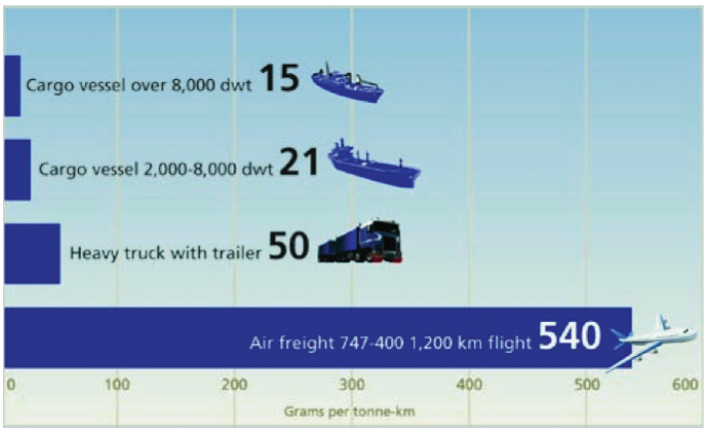
Shipping is further behind aviation from a GHG emissions regulation perspective. The United Nations Framework Convention on Climate Change (UNFCCC) has delegated the responsibility of developing emissions regulation for shipping to the IMO, a UN agency. A variety of tools that could form the basis of emissions reduction implementation is under discussion, including a global ETS for the shipping industry, but all currently face significant technical and political challenges. As a result, only voluntary energy efficiency standards have been introduced so far, and it is expected that it will take some time before legally binding global regulations are introduced. The EU is concerned about the rate of progress at IMO, although it recognises that only global regulation can produce the fundamental changes in the sector that are required for it to achieve a substantial reduction in emissions. To bring the subject into close focus the EU is threatening that should the IMO make insufficient progress towards introducing regulation over the next two years it may incorporate shipping into the EU ETS, perhaps following the model applied to the aviation sector.

So, without substantial regulatory impacts on the horizon, unless we see a dramatic increase in fuel price due to scarcity of supply it is unlikely that in the next ten years we will see significant changes to the aviation and shipping sectors, or to the planes and ships on which freight and passengers travel. This means that emissions reductions are only likely in the shorter time scale if individuals and businesses make careful decisions about how much demand for these sectors they create. Only travelling when absolutely necessary and ensuring that preference is given to sourcing raw materials and products locally is the most effective and immediate response that individuals and companies can take.

Guidance for reducing aviation and shipping emissions when touring

Air freight is easily the worst emitter, and whenever possible preference should be given to transport by ship, even over rail and road transport, although clearly any decision must be based on the details of the specific route (See Figure 17). Unfortunately, the timescales associated with global freight movements by ship may not be consistent with a hectic touring schedule. Perhaps ports will become the preferred concert venues of the future - you could do worse than Sydney, New York and London.

Figure 17 Grams of CO_2e per tonne-km associated with each type of freight



Source: NTM (Swedish network for transport and the environment) – cited in British Chamber of Shipping (2009)

When it comes to passenger transport, it is harder to generalise about the relative GHG impacts of different types of transport. Whilst long distance sea passages are still possible, either on a modern liner like the Queen Mary II or by hitching a lift on a container ship, factoring in weeks of travelling time, romantic though the voyage could be, is a luxury few busy people can afford. Because we demand short passage times, ferries have been getting faster. Even the Queen Mary II travels at approximately 35 mph, in order to keep the voyage length to a week. Combining such higher speeds with the space and levels of comfort that passengers demand mean that in practice a switch from flying to travelling by sea in our current passenger ships would rarely result in significant emissions savings.

If aviation is the selected mode of passenger transport then you can make some contribution by choosing the most efficient type of flight. The equation is simple: it's all about getting the most people into the largest possible plane flying your route. Unfortunately this means that the responsible thing to do is to shun being pampered in first class, as first class seats reduce the number of more spatially efficient economy class seats you can fit on a plane and therefore increase the GHG. Airlines would stop fitting out large areas of their aircraft to higher class travel if there was no longer the customer demand for this service.

So to sum up, the choice when it comes to travelling or moving equipment long distance is between a bad option (a combination of land and sea transport) and a worse option (flying). As is so often said about GHG emissions, there is no silver bullet which can be applied to revolutionise either of these sectors. However, there are steps being taken to bring in regulation which will provide a framework for implementing change in the future. In the meantime, the best advice if you want to create the minimum GHG impact is to take your time and to enjoy your journey. Take a slower ferry and enjoy the views from a train – its better than the cloudscape you see from the window of an aeroplane.

Hot Topic 5

Biofuels: solving our climate and oil woes?

By Alexandra Morel
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The Issue

The live performance sector has shown a particular interest in biofuels as offering a partial solution for reducing the environmental impacts of tour travel, and a significant number of iconic artists, especially in the US, have used biodiesel in their trucks and buses. However, concerns about the environmental benefits of biofuels remain. This is a short overview of the science and policy and some guidance.

What are biofuels?

In the quest to reduce burning fossil fuels alternative fuels are being developed. One such group of fuels is biofuels, which refers to a wide range of plant material used to create the fuel. There are three "generations" of biofuels, a term which refers to the type of plant material used to create the fuel.

The best-known "first generation" fuels are ethanol and biodiesel. Ethanol is produced from fermented sugar, which can be derived from corn, wheat, sugar cane and sugar beet. It can be blended with petrol and gas or be used on its own in a flex-fuel vehicle (a vehicle adapted for its use). Biodiesel has similar properties to petroleum diesel. It is produced by processing vegetable oil, such as soybean oil, palm oil, rapeseed/canola oil, wild flaxseed oil and waste cooking oil.

"Second generation" biofuels are meant to overcome the dilemma of using a plant material that is also a food source, explored below. Ethanol can be derived from cellulosic material (e.g. pulp and paper byproducts, switchgrass, corn stover, etc.) or for biodiesel inedible oil such as from the jatropha plant. There are several methods for converting cellulose to a usable biofuel.

Finally, algae are considered a "third generation" plant material for biodiesel. Unfortunately few of the second and third generation technologies are economically viable at present.

Controversy surrounding biofuels is manifold. First generation fuels compete with food production, causing spikes in food prices and/or displacement of food cultivation to currently un-cleared lands. This latter issue can take many forms and has been given the name indirect land use change (ILUC). Often these new areas are in tropical countries that are not limited by temperate seasons, have plentiful solar radiation and (ideally) ample rainfall.

In many parts of the world this is linked to the clearance of logged

rainforest, loss of biodiversity and displacement of local communities. Expansion of agricultural commodities (not specific to biofuels) has already been the cause of considerable rainforest loss in Southeast Asia; however, in the potential race to produce enough "green fuel" greater attention is being paid to Sub-Saharan Africa and South America by multi-national biofuel companies. Tanzania is an example where several American and European companies interested in producing biofuels for export have been accused of displacing local farmers. In addition, sections of the vast tropical forest of the Congo Basin have been sited for extensive oil palm plantations to meet some of China's demand for biofuels.

Aside from the obvious **human rights issues** associated with the land-grab are the environmental consequences of this expansion. The question of carbon savings is key if biofuels are intended to be a carbon-mitigating measure.

Carbon emissions can result from the clearing of carbon-rich forest; loss of carbon through soil erosion; addition of fertilizers to grow biofuels (including the embedded emissions from fertilizer production and Nitrogen Oxides (NO_x) emissions after application) and transport of feedstock before its conversion.

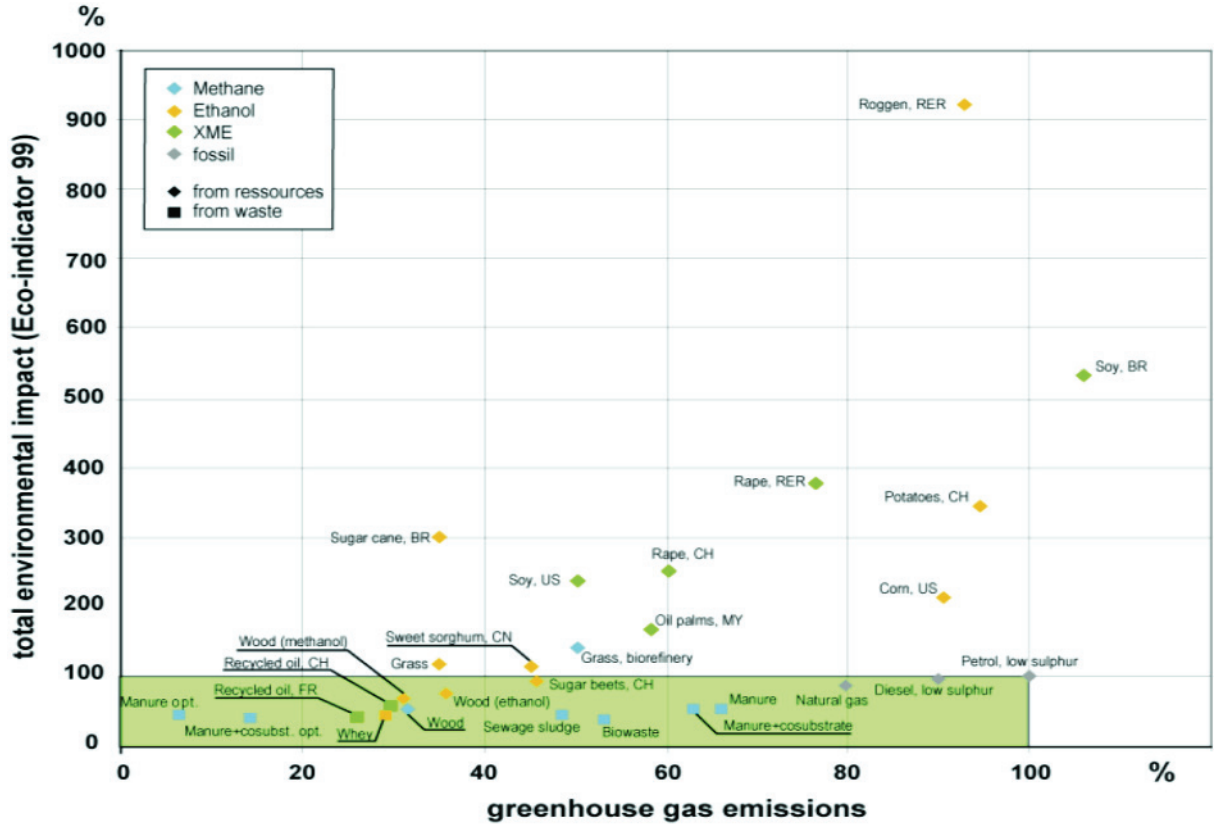
In order to have a greenhouse gas saving, production of a biofuel should not release more carbon than would have been emitted by combusting the same volume of fossil fuel. Currently, the carbon emissions from combusting the actual biofuel is not included in a carbon lifecycle analysis of the fuel, due to the assumption that the carbon released through burning can be reabsorbed through the re-growth of the biofuel feedstock.

The energy balance of a biofuel refers to the amount of fossil energy used to produce a biofuel compared to how much energy the biofuel has available for combustion. The carbon saving and energy balance among biofuels is significantly different across plant materials. For example, US corn-ethanol barely breaks even both in terms of carbon savings and energy balance; while, Brazil's sugarcane ethanol has roughly eight times the energy benefit. Swiss researchers have provided a helpful graph comparing biofuels from their net energy saving benefit (see Figure 18). This graphic shows the estimated carbon savings of the fuel and also their "total environmental impact" described by a single eco-indicator value.

Government biofuels policies

Currently biofuels are having a difficult time competing with the relatively low price for crude oil, and therefore its respective industries are buoyed by government subsidies and mandates. The EU has one of the largest biofuel mandates as part of its **Renewable Energy Directive (RE-D)** which stipulates that 10% of the EU's transport fuel must come from renewable fuels by 2020 (EU 2009). This policy has been blamed for much of the international hysteria to produce biofuels. As a means of ameliorating the impacts of this mandate, the recently published RE-D provides detailed sustainability criteria, including the requirement that the biofuel used must have a 35% greenhouse gas saving compared to the relevant fossil fuel it is replacing. However, it appears increasingly likely the EU will be reducing its mandate due to a recent study capping the "sustainable" volume of biofuel at 5.6%, after which negative impacts such as ILUC will overwhelm any carbon savings of the policy. At the same time, not all biofuels sold in the EU necessarily meet the sustainability requirements

Figure 18 Greenhouse gas emissions versus environmental impacts for several biofuel feedstocks, including wastes (Source: Zah, R. et al. 2007).



because only biofuel counted toward the RE-D's mandate must meet these criteria. Unfortunately, even the sustainability of these volumes is unclear, as many of the leading fuel retailers in the UK have not properly reported the source of their fuels to the Renewable Fuels Agency (RFA).

The US has both a mandate - the Renewable Fuel Standard (RFS) - that requires fuel blenders to use 36 billion gallons of renewable fuel by 2022 and significant subsidies for biodiesel blending of $1.00 per gallon of blended biodiesel. This policy has affected the viability of the EU biodiesel industry due to the phenomenon known as "splash and dash", whereby biodiesel produced in other parts of the world are brought to a US port and blended with 1% petroleum diesel in order to receive the tax credit. It is then taken to Rotterdam where it is "dumped" on the EU market. The German government responded by establishing a ban on 20% biodiesel blends from the US, but this does not stop cheap 19% biodiesel blends being traded. Nevertheless, the US biofuel industry (particularly the ethanol industry) is suffering from narrow margins and uncertain markets.

The US biofuel industry recently benefited from an Environmental Protection Agency (EPA) ruling, which increased the ethanol blending volume to increase from 10% to 15% in gas/petrol based on findings this blend could be used in conventional engines after 2001. This effectively increased ethanol demand by 50%, thereby allowing for further investment in the industry. It is possible to purchase an 85% blend of ethanol, which can only be used in a flex fuel vehicle (FFV). This new ruling also includes greenhouse gas saving requirements of 20% for any new biofuel producing facility (e.g. corn starch-based ethanol powered by natural gas, biogas or biomass), 50% for biomass-based diesel or advanced biofuel and 60% to be classified as cellulosic biofuel (EPA 2009). The EPA is continuing to develop environmental rules regarding the treatment of indirect land use change (ILUC) for their greenhouse gas savings estimates and carbon savings for biofuel plant materials, asking for support from the National Academy of Sciences.

Parallel to these efforts, the Roundtable on Sustainable Biofuels (RSB)[5] is developing sustainability criteria. It is following developments in other certification schemes such as: the Roundtable on Sustainable Palm Oil (RSPO), the Roundtable on Responsible Soy (RTRS) and the Better Sugarcane Initiative (BSI).

Guidance on what you should look if wanting to source biofuels

If sourcing biofuels in the EU, it is important to be sure it meets the RE-D requirements (especially if it has been imported). Alternative certification is not an adequate assurance of the fuel's carbon benefits. For example, the RSPO does not have greenhouse gas emission requirements yet, therefore there is no guarantee that the biodiesel is reducing or preventing carbon emissions. Hence, meeting the EU RE-D requirements is the most important for the carbon savings of the biofuel you purchase. However, by buying a biodiesel produced from edible oil there is always a concern the same volume of oil may be consumed as food from a cheaper less environmentally responsible source. Nevertheless, you can always refer to Figure 18 to see the impact of the plant material in question.

Biofuel derived from waste products (such as used cooking oil or animal carcasses) has minimal environmental and carbon issues, so is the most straightforward to source.

In the US, the EPA is in the process of developing similar environmental regulations to the EU; however, most of the biofuel available has been produced domestically and therefore the relative impact of the feedstock can be assessed from Figure 18.

Where to source biofuels

If your tour wants to use biofuels in trucks, buses and other vehicles it is easier to source biodiesel separately, as ethanol is usually blended with petrol and can only be used in flex-fuel vehicles in its pure form. Make sure to source biofuels in Europe that meet EU RE-D requirements.

Updated information on EU biodiesel regulations: http://www.ebb-eu.org/

To identify stations selling biodiesel globally: http://findbiodiesel.org/.

For stations in the US that sell E85: http://e85vehicles.com/e85-stations.html

For a guide to buying biodiesel in the US: http://www.biodiesel.org/buyingbiodiesel/guide/

Useful Sources

Low-Impact Living Initiative (LILI) (useful links on biofuels): http://www.lowimpact.org/linksbiofuels.htm

Scientific Facts on Liquid Biofuels for Transport: Prospects, Risks and Opportunities. (peer reviewed). Green Facts: http://www.greenfacts.org/en/biofuels/index.htm#2

[5] The Roundtable on Sustainable Biofuels (RSB) (2009). RSB Principles & Criteria for Sustainable Biofuel Production. École Polytechnique Fédérale de Lausanne (EPFL), Lausanne

Hot Topic 6

Leisure travel: the untapped savings

By Dr Jillian Anable
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Audience travel is the largest cause of greenhouse gas emissions in the performing arts sector. However, leisure travel has had little attention by government policy-makers, transport operators, and researchers to understand the travel choices and how these choices could be shifted to be more environmentally sustainable. There is incredible scope to reduce leisure travel emissions and have a knock-on effect in other areas of travel. This note provides an overview of why a focus on leisure travel is so important to target and what can be done to reduce its environmental impact.

Why leisure travel is important?

The apparently insatiable demand for the movement of goods and people, particularly by road and air, means that the transport sector is consistently responsible for around a quarter of carbon dioxide emissions in developed countries. About two-thirds of these emissions are accounted for by individual passenger movements, and the rest by freight demand. Most importantly, transport is one of the few sectors of the economy where emissions continue to increase year on year despite improvements in vehicle efficiency and the increasing potential for some journeys to be substituted by information and communication technology.

Policy, media and research attention focuses on the plight of the (urban) commuter, the problems created by the increasingly car oriented journey to school and, more recently, the unprecedented growth in air travel. This is despite the fact that, in the UK, these segments of transport activity currently account for only 24%, 2% and 2% respectively of domestic emissions from personal transport.[6]

By contrast, leisure travel, in all its guises (but not including shopping), is responsible for around 30% of personal travel emissions and represents one of the only journey purposes with essentially universal participation. Importantly, nearly everyone participates in some kind of discretionary activity away from home at some point whereas, at the very most, only around 50% of the population travel to work, have children in school or fly in any one year. More poignantly, in terms of car dependency, leisure comprises one of the fastest growing sectors of car based travel demand. This applies to the UK context but will be typical for many western economies.

Yet, apart from the occasional focus on holiday traffic 'mayhem', leisure travel rarely hits the headlines or is afforded the policy and research attention it deserves. It is also true to say that within the black box of 'leisure' which encompasses a diverse array of activities, we understand little of the contribution of specific demands such as audience travel to cultural events.

Government transport policies

It is true to say that leisure journeys present a particular set of challenges for policy that is attempting to encourage lower carbon choices. In the study of leisure sociology and psychology, most authors agree that leisure participation is an expression of identity, personal values and attitudes. Precisely the same factors closely associated with leisure also conjure up notions of a state of mind connected with the 'love affair with the car' such as freedom of choice, freedom from obligation, liberty and free access, enjoyment, relaxation, a lack of evaluation, voluntary participation, and so on. Consequently, for policy to be successful in this area, interventions need to replicate the necessary conditions for this state of mind to be created whilst using transport modes other than the car.

In very broad terms, the options for policy to reduce carbon emissions fall into four categories: each tackling a main source of energy demand and emissions from transport. These include policies, which incentivise, invest in or regulate for:

(i) The technical efficiency of engines used to power the vehicles

(ii) The operational efficiency with which vehicles are used, including their occupancy and how they are driven

(iii) The mode of transport used to meet a given demand

(iv) The demand for movement (distance travelled), itself derived from the need or desire to access goods and services and largely determined by land use patterns.

In the UK and elsewhere, the overwhelming balance of effort lies with technical solutions at the expense of attempts to alter mode choices and patterns of movement. The UK's low carbon reduction strategy for example, published in July 2009, expects 94% of the carbon savings from the sector by 2020 to come from technical based solutions, mainly improvements to car efficiency.[7]

On the one hand, the push for further improvements in vehicle and fuel technologies to reduce the environmental impacts of motorised transport without limiting distances travelled is an obvious priority. However, this emphasis leaves the problem that travel demand is growing faster than capacity possibly can. It also ignores the problem that efficiency gains can be offset by the uptake of vehicles with greater power and additional features and neglects the social issue that a significant share of the population cannot drive or does not have access to a car, for reasons of income, age, or ability.

The emphasis on vehicle and fuel technologies ignores the increasingly large body of evidence now pointing to the potential for the right combination of incentives, service improvements and information to alter travel choices over relatively short time periods, for many different types of journey at low cost. This evidence comes from the relatively recent attempts to address problems of ever increasing demands for road space by focussing on a range of activities defined as mobility management. This broad approach is aimed at encouraging the use of alternative modes by changing behaviour on behalf of organisations and individuals and utilises interventions such as travel plans, ticketing and pricing

[6] Department for Transport (2008). Carbon Pathways Analysis: informing development of a carbon reduction strategy for the transport sector. Department for Transport, London

[7] Department for Transport (2009). A Carbon Reduction Strategy for Transport: Impact Assessment. Department for Transport, London

alterations, car clubs and car sharing schemes, personalised journey planning and promotional campaigns.

The important point is that the definition of 'behaviour change' in mobility management is not simply restricted to mode choice and 'getting people out of their car'. Solutions are built around making the best use of the available infrastructure and this relies, at least in part, on the cooperative behaviour of transport users, with car sharing being a common example of a means by which considerable efficiency savings can be made. It also involves using the transport mode most appropriate for each journey, flexible use of travel time and route choice. Most of all it involves increasing understanding of travel behaviour and the reasons for individual journeys within specific contexts and organisational settings in order that interventions can be designed and targeted accordingly.

This is where the lack of emphasis on leisure travel, and especially travel to cultural events, has been an incredible missed opportunity. Successful mobility management requires tapping into social influences on individual's decision making and altering the bounds of what is considered 'normal behaviour'. What could be considered more influential than popular culture and the associated social networks as a source of inspiration, creativity and alternative behaviour?

Guidance for how to reduce audience travel emissions

Targeting audience travel to venues hosting festivals, music, sporting and theatrical events has the potential to have an impact much greater than the sum of its parts. By altering aspirations, experiences, information channels and behavioural norms, successful changes achieved in audience travel behaviour could have a trickle down effect and help to embed lower carbon choices into a wider set of travel decisions. For instance,

- The development of sophisticated information communication technology tools to facilitate car sharing could add to its position as a viable alternative to single occupancy car travel for a number of journey purposes
- Exposing people to the benefits of coach travel could have far reaching impacts given that it is the most efficient mode of transport over longer journey distances
- Altering just a small proportion of long distance journeys to cultural events could have a disproportionately larger impact than altering a larger number of short distance commuting and school travel journeys
- Stimulating the market for 'green' car hire and car clubs could even have the potential to reduce car ownership and the development of associated car dependent lifestyles.

The latter is based on the fact that many people are car owners and own large family cars chosen with the relatively infrequent number of annual leisure and holiday journeys in mind. Helping to alter car purchasing patterns and a shift away from owning large cars which are primarily used for single occupancy short urban journeys could have a far reaching impact on emissions from the transport sector.

Efforts to influence audience travel patterns necessitate excellent partnership working between transport operators, promoters, local authorities and venues. As the transport psychologists and sociologists suggest, the key will be to create and market journey experiences which rival the independence, flexibility and perceived lack of stress offered by the private car. The journey experience itself needs to become an integral part of the whole cultural and leisure experience. This includes integrated methods of payment which at least offer the illusion of 'free travel' to rival the often perceived 'free' marginal costs of car travel. Information between all the relevant actors needs to be shared to develop targeted and innovative information and exploit existing social networks. Most importantly, lower carbon alternatives need to be aspirational experiences to alter social norms and expose audiences to alternative ways of doing things which, if mainstreamed into everyday life, could have far reaching consequences on emissions from the transport sector.

Hot Topic 7

Snacking on emissions

By Dr Rebecca White
University of Oxford

Eating and drinking are absolutely central part of live performances – whether that be in keeping artists and crew going through intensive work schedules, or for audiences as part of the live event experience. Large quantities of food and drink are consumed, for which considerable resources are required in the production stages; and when we don't finish our food and drink, these resources effectively go in the bin, so there is also the issue of waste. Both food production and disposal leads to the emission of GHGs, alongside other environmental impacts.

There are plenty of good reasons to engage with reducing food's GHG impact including economic, environmental and marketing drivers. Through awareness and targeted action by those responsible for food provision in the live performance sector, GHG emissions can be reduced. This sheet is aimed at those who procure food, lease catering tenders and cook/ prepare food in the live performance sector. A brief introduction to the GHG emissions of food is provided here, alongside the policy context and some guidance.

Food – a climate change contributor

Food is thought to be responsible for 20-30% of our national GHG emissions[8] (Audsley, Brander et al. 2009). Similarly, at the EU level food has also been calculated to contribute 30% of total emissions. Climate changing gases arise at all stages of food production,

[8] This figure includes all the emissions from food that we consume in the UK, whether that food has been made in the UK or abroad. The higher figure of 30% also includes emissions from changes in land-use (e.g. cutting forest to grow animal feed) that can arise in the process of making some foods.

preparation and disposal. See Figure 19 for a diagram of two supply chains for foods commonly sold at live performance venues – beer and beef burgers. These also happen to be relatively GHG intensive food stuffs.

Farming in particular, through the production and use of fertilisers, the creation of feed for livestock, the emission of methane (CH_4) burps from ruminant (cows, sheep) digestion and nitrous oxide (N_2O) from soil[9], emits comparatively more GHGs than other stages of the food chain. That is not to say however that other stages of production – whether that be transporting food, processing, manufacturing, packaging or cooling it – do not also warrant looking into. In fact, in many cases it can be easier to reduce emissions from the non-farming stages as methane and nitrous oxides in particular are harder to measure and manage.

The impact of climate change on food

Climate change will also impact food in the longer run. As the climate changes the conditions for growing food will alter. While it is anticipated that this might be beneficial for northern latitudes in the shorter term to 2050, it is likely to have a negative impact for less developed countries in mid to low latitudes. Assuming we continue to emit greenhouse gases globally at the current rate, towards the end of this century climate change is expected to have an increasingly negative effect on agriculture across all countries (Parry et al 2007). Extreme weather events will also affect distribution and other production infrastructure.

Government policy on food and climate change

The government has signed up to 80% reductions in GHG emissions by 2050 – a large target that will affect each stage of the food chain. To date the food industry has not been specifically targeted by regulations to reduce emissions although a number of policies, such as the climate levy (a tax on energy) and the EU Emissions Trading Scheme do affect some parts of the supply chain.

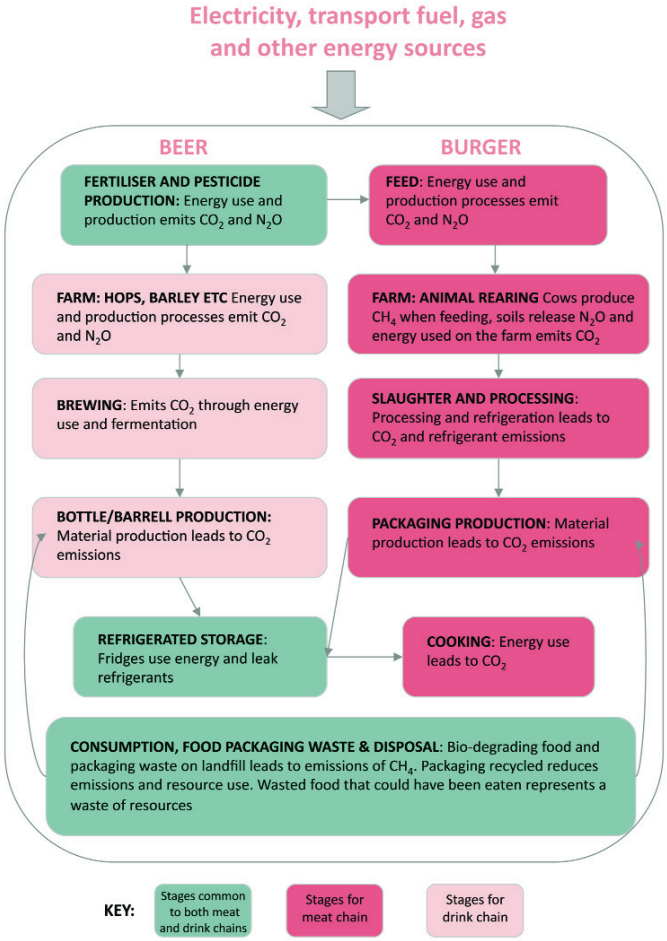


Figure 19 Sources of emissions from food consumed in the UK

The most specific development for encouraging the food and drink industry to assess and improve environmental performance has been the Food Industry Sustainability Strategy, an industry lead initiative, and PAS 2050, a product carbon footprinting and labelling scheme developed by the Carbon Trust.

Table 5 Approaches to reducing food and drink GHG emissions

Approach	Example Action
Increase efficiency of production	Consider the energy use of your premises, appliances and transport modes. When it comes to replacing equipment (if not before) use energy ratings, labels and advice to buy the most efficient.
Reduce waste	Monitor how much food you buy-in and have to dispose of. Minimise packaging. Recycle and assess the viability of installing compost facilities or an anaerobic digester to recover energy from food waste.
Change production and disposal to eliminate GHG intensive stages	Consider having freely available water fountains/drinking water taps. Consider using the Incredible Cup company at your event to reduce plastic waste by using their re-usable cup system, which has successfully been implemented at large venues, arenas and stadium events.
Reduce consumption of GHG intensive foods	As a general rule minimise animal products as these are more energy and resource intensive. Offer customers, artists and crew good quality and imaginative vegetarian options. Procure local and seasonal food.
Change to no/low carbon energy sources	Source your energy from a renewable energy provider or generate your own renewable energy, e.g. using solar PV for electricity, heat pumps or solar thermal to heat space and water, and anaerobic digestion to turn your waste into electricity.

[9] CH_4 is a greenhouse gas 25 times more powerful than carbon dioxide. N_2O is a greenhouse gas 298 times more powerful than carbon dioxide.

Voluntary initiatives underway

Adnams - A brewery that has developed an environmental and social policy that shapes their business development. They have taken a number of environmental initiatives such as producing a carbon neutral beer and a distribution centre with grass roof, rainwater collection, renewable energy sources, and environmentally benign materials and design. To learn more go to: http://www.youtube.com/watch?v=_YjlAqc8opY

E-CO_2 - The E-CO_2 Project seeks to carbon footprint farmers and growers, and gives advice on renewable energy generation on farms. They have been working with McDonalds.

Large Retailers - Retailers are taking increasing interest in the greenhouse gas emissions in their supply chains, including carbon labelling. For example Tesco is working with dairy farmers to examine emissions in the supply chain and opportunities for improvements.

Guidance to the live performance sector

There are a number of strategies that will reduce the emissions created by food and drink consumption. Table 5 outlines 5 broad approaches and gives examples of the types of actions that can be taken under each approach.

Suggestions for venues

- Develop a sustainable procurement policy for food and drinks.

- Learn about the environmental impacts of food and drink sold at the venue.

- Assess the energy used for food and drink provision and identify opportunities for energy savings.

- Work with contracted food and drink concessions to offer consumerables with low environmental impacts.

- Communicate efforts to reduce the environmental impact of food and drinks to audiences.

Suggestions for incoming productions

- Hire caters with environmental policy and credentials.

- Ask venues about their food and drinks procurement policy and about the actions they are taking to reduce its environmental impacts. This could be part of a green rider.

Finally, some links for further reading and watching:

The Food Climate Research Network - lots of information, research and reports: http://fcrn.org.uk/

Low Carbon High Potential video about SMEs and the environment: http://www.youtube.com/watch?v=_YjlAqc8opY

Sustain - lots of food-environment-society information, especially initiatives.: http://www.sustainweb.org/

WRAP - All things resource efficiency, recycling and waste.: http://www.wrap.org.uk/

Business in the community: http://www.bitc.org.uk/

8

Hot Topic 8

Merchandise: a hidden emissions trail

By Catherine Bottrill
Julie's Bicycle

Along with ticket sales merchandise is an important revenue stream for the live performance industry. Many bands as part of their tour will create a range of memorabilia merchandise from t-shirts, sweatshirts and bags to flip-flops, cups and key chains to sell to their fans at shows. These goods all have an environmental impact and therefore a carbon footprint as the result of the material use, its sourcing, manufacturing, distribution, use and eventual disposal. Bands and music companies can reduce the environmental impact of their merchandise by making informed procurement choices. This is an important responsibility on behalf of their audience as they hold the choice on behalf of their fans between purchasing the more or less environmentally responsible goods. Furthermore, procurement choice by bands and music companies towards environmentally (and also socially) responsible goods will help mainstream the 'green' market rather than remaining niche.

This merchandise piece outlines: why it is important to consider the emissions of goods; what mechanisms are available to assess and reduce emissions of goods; and guidance to bands and music companies on how to make informed procurement decisions about what merchandise to offer audiences.

Goods have a big slice of the global emission pie

The greenhouse gas emissions from the goods we buy are significant. Newly published research by the Carnegie Institution of Science in the United States examining the global flow of GHG emissions from goods has found that **an additional 30% of developed countries emissions are sourced outside their national boundaries** and more often than not are sourced in developing countries that have carbon intensive manufacturing processes (Davis and Caldeira 2010).

Britain was found to be the highest exporter of emissions in Europe, behind only the United States and Japan globally. Britain's emissions from goods imported from abroad was estimated to be 253 million tonnes of GHG emissions a year, in addition to the approximate 575 million tonnes produced within the country's borders (Decc 2010c). Based on population figures this equates to 4.7 tonnes of emissions per person over and above the annual average of 10 tonnes per person.

Therefore, targeting GHG emissions from goods is pivotal if climate change is to be mitigated. At the Copenhagen climate talks in December 2009 developing countries strongly voiced the importance of setting national emissions targets to reflect domestic emissions and therefore to adjust emissions calculations so that they reflect the export of emissions - which should be assigned to the importing countries.

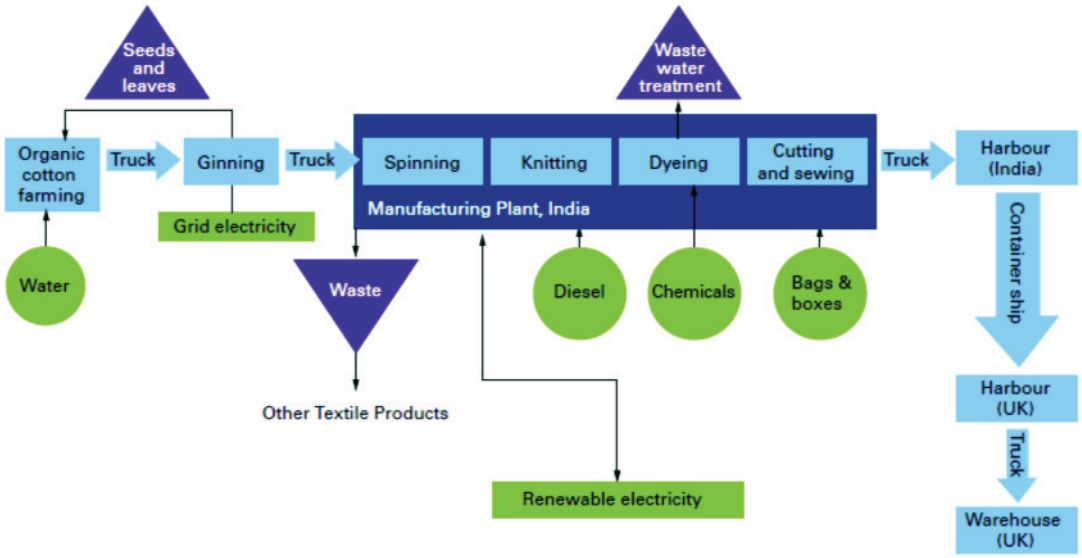
Assessing the emissions of goods

Calculating the emissions embodied in a product is complex as they will be spread across multiple businesses and are rarely contained within a single national boundary. This means the carbon footprint of goods is hidden - unlike direct emissions. For example, it is relatively easily to calculate the emissions released from burning fossil fuels in your car, but much harder to calculate the emissions resulting from the construction of your car because you have to decide how far to look into the manufacturing supply chain, and good quality data is not always available.

However, standard methodologies are being developed which make it possible to assess the GHG emissions produced through the production, distribution, use and eventual disposal of goods (known as lifecycle assessment). For example, the UK Carbon Trust has developed and piloted with a number of companies the PAS 2050 methodology for the GHG emissions assessment of goods. This, and other relatively similar methodologies, are in the early stages of development, and therefore only a handful of goods have fully assessed their lifecycle GHG emissions. However, the advantage of goods following a standardised assessment of GHG emissions is that companies will be able to understand the emissions at each stage, thereby identifying and targeting reduction opportunities. A further advantage is that as more like-for-like goods assess their GHG emissions and make this information available it will be possible to make comparisons between goods. This will be beneficial to the companies as a measure of their product's environmental performance, but also to consumers wanting to make environmentally informed purchase choices. The route for making this information available and transparent is via the carbon labelling of products accredited using a standard GHG emission assessment, such as the PAS 2050 standard.

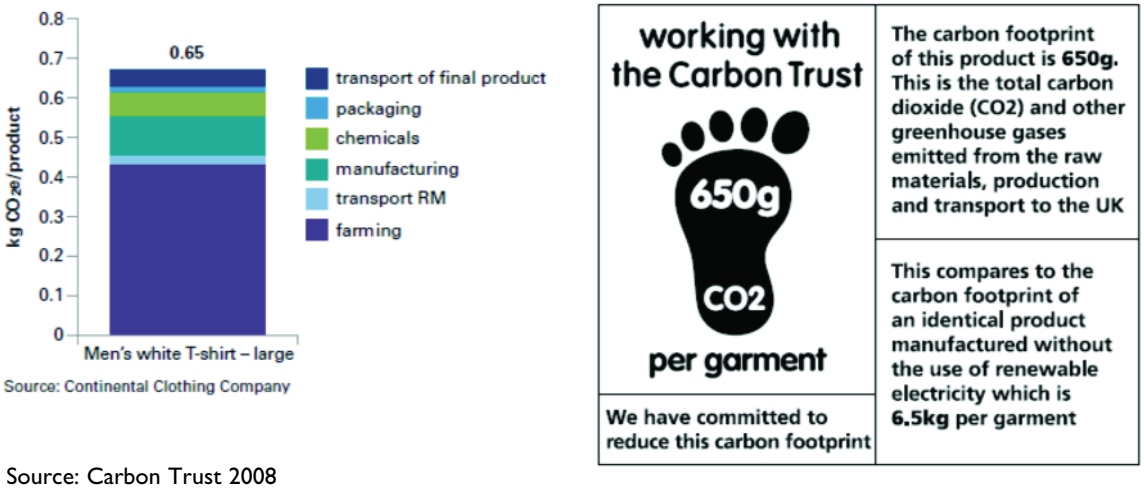
Continental Clothing Company, a business-to-business clothing company supplying the music industry, participated in the Carbon Trust pilot scheme with companies to test the PAS 2050 standard and be accredited with a product carbon label. Continental Clothing participated in scheme for their Earth Positive clothing range. The t-shirt is made with 100 per cent certified organic cotton produced using natural irrigation. The production facility in India is powered by a local wind farm; cotton waste generated is either used as an organic fertilizer or, for other textile and upholstery products, manufactured locally. Dyes are made in a controlled environment where wastewater is thoroughly treated. All shirts are packed using biodegradable or 100 per cent recycled materials. A 'no airfreight' policy ensures that all goods are shipped by sea (see Figure 20).

Figure 20 *B2B Process Map: EarthPositive Shirt Supply Chain*



Source: Carbon Trust 2008

Figure 21 Continental T-shirt carbon footprint



Source: Carbon Trust 2008

Continental Clothing PAS 2050 assessment set the GHG measurement boundary from the farming of the cotton for the production of a large men's t-shirt through to the delivery of the t-shirt at their UK distribution warehouse. The Earth Positive t-shirt PAS 2050 assessment was able to demonstrate considerable carbon savings compared to a conventional t-shirt with the same emission boundary (which Continental Clothing also produces). An Earth Positive t-shirt has a carbon footprint of 650g CO_2e, which is 90% lower than a conventional t-shirt of 6.5 kg CO_2e (for product comparison a CD in plastic jewel casing is more than 1 kg CO_2e) (see Figure 21). This is primarily due to the Earth Positive t-shirts being manufactured in a facility using renewable energy and the PAS 2050 assessment identifying this phase as having significant energy requirements. The assessment and subsequent carbon label does not include the product use phase, which for a t-shirt is considerable because of the energy used to wash clothing. However, the company has grasped as much control as they can in order to significantly reduce their emissions and, by using the carbon label, engage their customers in the environmental issues embodied in clothing.

Guidance to bands and music companies

The range of goods becoming available with strong environmental credentials will increase in coming years with increasing regulation and with companies seeing the business opportunity of being a brand leader. Bands and music companies, like the goods producers themselves, are likely to gain reputational benefits from being associated with environmentally responsible products. Presently the Earth Positive range is the only merchandise available with a carbon label, but there are a number of other merchandisers that have made serious commitments to addressing environmental (and social) issues.

In deciding a merchandising deal for a tour it is crucial to ask the right questions of suppliers:

- What steps have they taken to reduce environmental impacts?
- Have they been awarded any independently verified accreditation for their efforts?
- Can they provide you with evidence?

Then once the merchandise is on the tour avoid air freighting it to venues.

Appendix 1 - Guidance, tools, awards and regulation

Name, category, link	Description
Guidance	
Air Traffic Control http://atctower.net/atc/tiki-index.php	US-based organisation that connects the music community to social action, addressing energy and environment but also humanitarian issues.
Best Foot Forward bestfootforward.com	Carbon and ecological footprinting experts, conducted analysis for Radiohead.
Eco Action Partnership Ecoactionpartnership.com	Consultancy offering guidance on sustainable event management and ethical PR.
Julie's Bicycle juliesbicycle.com	Not for profit offering free resources, research and initiatives to support GHG emissions reduction in the creative industries.
Reverb reverbrock.org	US-based organisation that educates and engages musicians and their fans to take action toward a more sustainable future.
Sustainable Events Guide sustainableeventguide.com	A practical guide to reducing the environmental impacts of large events.
Sustainable Touring sustainabletouring.com	Team of specialist music and media sustainability consultants who provide in depth support in all areas of event management.
Online Tools	
Eventberry eventberry.com	Provides step by step support for achieving BS 8901 (see below), identifying all documentation required, providing check lists, database and project management functions.
IG tools juliesbicycle.com/ig-tools	Free online tool that automatically calculates an "audit snapshot" of the GHG emissions produced by tours (by leg), offices and venues (annually). Results are measured against industry benchmarks where available.
SMEasure smeasure.org.uk	Free online tool that tracks a venue or office's weekly energy use and GHG emissions. Analyses performance against external temperature and identifies over/under-spend. Provides projected EPC ratings.

Name, category, link	Description
Awards, Certifications, Standards	
BS 8555	British Standard (ISO) guidance for any organisation wanting to set up a system to ensure improvement of environmental performance. Particularly suited to small to medium companies (SMEs) wanting a clear phased approach before moving to ISO 14001.
BS 8901	British Standard (BS) guidance for events organisers, venues and suppliers wanting to set up management systems that ensure improvement of sustainability performance. (environmental, economic, social). Events organisers, venues and suppliers can be certified to this British Standard.
ISO 14001	International Standard (ISO) guidance for any organisation wanting to set up a system to ensure improvement of environmental performance.
Carbon Trust Standard carbontruststandard.com	For companies (including venues) who wish to demonstrate reductions in GHG emissions.
Carbon Reduction Label carbon-label.com/	Assesses the GHG emissions of products (eg beer or t- shirts) using the PAS 2050 life cycle methodology.
Green Tourism Business Scheme	In the music industry, most suited to iconic venue owners who wish to demonstrate their sustainability credentials to the tourism market.
Industry Green juliesbicycle.com/industry-green	For creative industry companies (including venues and festivals) who wish to demonstrate reductions in GHG emissions.

Note: Many Standards and Certification schemes use internationally recognised protocols that are freely available, for example the GHG Protocol provides guidance for organisational footprinting. These are however quite technical and not recommended for complete beginners to carbon accounting.

Regulation	
Carbon Reduction Commitment environmentagency.gov.uk/business/topics/pollution/98263.aspx	Mandatory GHG emissions trading scheme for large businesses whose annual half-hourly metered electricity use is above 6000 megawatt-hours (MWh) (approximately over £500k per year). Affects large music venues and venue groups.
Display Energy Certificate	Mandatory for any building occupied by a public authority or institution and more than 1,000m2 in floor area (including venues) – requires external assessment of building energy use, including A to G ranking.
Energy Performance Certificate	Mandatory for any building being built, sold or rented (including venues) – requires external assessment of building energy use, including A to G ranking.

Appendix 2 - How Touring Works

Over the last decade the core business of music has focused on two growing markets: live and digital. Revenue streams from distributing recorded music (especially in physical format) are shifting rapidly; labels and publishers have had to muster strenuous arguments about the value of music in order to maintain digital revenues in the face of a culture where music can be accessed, albeit often illegally, for free.

In the past an artist would tour to promote a new album. Touring was considered a vital promotional activity that would stimulate album sales but usually generated a net loss. Now the revenue dynamic has turned on its head and it is the tour that generates profit. An artist may still lead off a tour with a new album but now the album is more likely to be the loss leader.

Sales of tickets and merchandise have become the primary revenue stream for artists and investing music companies active in the live performance sector. It is no longer essential that touring artists have a new album to promote: a good show and strong performance skills are, however, a pre-requisite.

Touring is highly responsive to market demand and planning is predicated on anticipated ticket sales. The projected market demand will influence when and where a tour takes place, and on what level. Top-selling artists will command arena tours and up and coming bands will tour summer festivals. Tours are subject to change: if show tickets are selling well the tour may be extended with new show dates and sometimes moved to bigger venues; conversely poor ticket sales will result in cancellations.

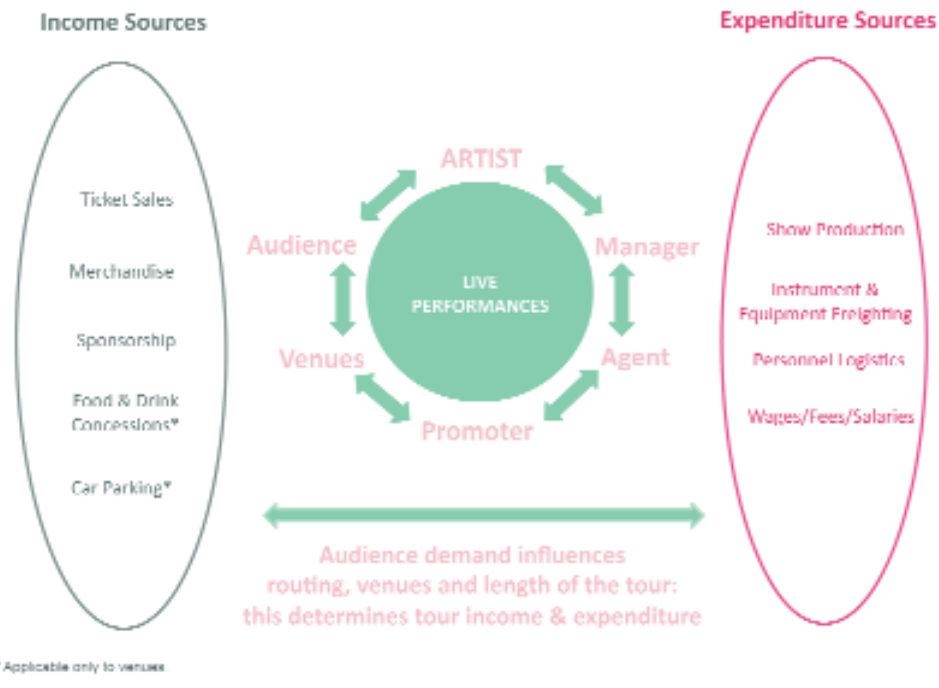
The promoter provides the upfront investment to finance a tour and therefore takes the greatest risks. Establishing new artists requires significant investment and promoters may choose to incur a financial loss on the initial tour but hope to make a net profit on the strength of ticket sales for the second tour. This requires the promoter to speculate on the artist's likely career trajectory.

It is not uncommon for artists that become popular very quickly to jump tour circuits so they move quickly from club to theatre and even possibly to arena level with their first or second album.

Relationships

Planning a tour involves industry collaboration across many roles: artists, management, agents, promoters, venues, production and logistic suppliers and ticket agents. A tour will typically start with internal discussions with the artist and their manager followed by their agent who will negotiate the finance and bookings with promoters. A tour will be finally determined on the basis of income (fees, ticket sales, sponsorship, and merchandise sales) and expenditure (production freighting, personnel logistics, wages and venue hosting fees) (See Figure 22). The budget based on anticipated income will be set along with the routing schedule. Then it will be the production manager's responsibility to ensure the equipment and staging determined by the show design can get from one venue to the next within the budget and constraints of the venue (e.g. stage size). The tour manager will oversee the travel arrangements and logistics on the tour. The production and tour manager roles are likely to be conflated for club touring circuits. The production and tour manager will liaise with the promoter representative to ensure technical specifications are met at the venue in preparation for the performance.

Figure 22 *Core relationship determining income and expenditure in band touring*



Trends

- Tours are increasing due to the demand for live performance as artist income and industry revenues are diminishing with physical recorded music sales declining as we shift to digital music delivery.

- Tours are expanding to new international music markets, particularly Asia, the Middle East and South America as these countries grow in wealth and UK artists get exposure through the internet and media channels.

- Few bands are able to do stadium tours because only a limited number of acts can attract sufficient audience numbers. There has been almost no new stadium acts since the launch of Internet. This is because the Internet enables music audiences to more easily fragment around listening preferences whereas before they only had the choice of a few TV and radio channels so an artist could more easily become a juggernaut success.

- The number of arena and large theatre tours are increasing because with the consolidation of venue-management/ownership by multinational companies (especially in Europe and the United States) economic efficiencies have been possible to achieve.

- More theatres are installing high-quality sound systems and lighting which will lessen the need for artists to travel with their own production equipment. It is not inconceivable that the production upgrades of venues will negate the need for the movement of extensive production at the theatre level, especially in some territories.

- More arena level artists are interested in doing residency tours (tours based in a single venue for consecutive dates) at premium venues.

- There is a marginal decrease in clubs hosting live music because profit margins are very tight at this level.

- The number of music festivals is increasing. Festival tours provide a cost effective opportunity for smaller bands to reach new audiences without incurring the high costs and financial risks of touring solo. This is because they do not need to transport production or ensure ticket sales: these are the responsibility of the festival promoter.

- With an increasing number of festivals bands, especially smaller bands, are doing festival only tour circuits

Characteristic practice

Most UK-based artists will tour nationally first so to build up a domestic fan base. International music markets which UK artists are likely to target are the United States, Europe, Japan and Australia/New Zealand. There are some smaller, but growing, markets such as South America, the Russian Federation, Southeast Asia (e.g. China and Malaysia), the Middle East and South Africa. However, touring these regions is higher risk; artists are often less well-known and the audience is not able to pay the ticket prices typical in Europe or the US. Tours in these regions will often necessitate additional sponsorship.

A tour is divided into legs, which are typically defined by the continent they cover. Each leg will usually consist of between 10 and 20 shows routed in a reasonably logical geographic order. For example, an artist will do a UK leg, and/or a European leg with perhaps 15-20 shows across France, Netherlands, Germany, Italy and Spain. Usually within a leg the artist will be performing in the same type of venue, consummating with their popularity and therefore ticket sales.

Planning

Planning involves detailed decision-making happening weeks, months and sometimes even years. There are several key stages of tour planning: booking the routing and venues; designing the show; arranging the logistical arrangements; and rehearsing the performance and show day.

The artist and their team, aside from at club level where it is more likely to be the promoter, are the primary tour decision-makers. And the stronger the ticket sales of the artist the greater their influence is to place demands on their suppliers.

Routing

The routing of the tour is usually the first aspect to be decided and booked. For stadium and arena tours planning will start a year or two in advance. For theatre tours planning will begin months in advance and then for club artists it is likely only to be weeks in advance. When booking a tour, managers, agents and promoters will try to locate venues and dates that reduce travel times, distances between shows and staffing - minimising these factors will keep costs down. However, routing a tour logically can be fraught as venues might not be available, extra dates get scheduled, or the artist has pre-scheduled commitments (recording an album, performing at a festival or receiving an award). Once the routing is secured the production logistics can be organised.

Touring schedules try to conform to the touring cycles of the region. In Europe most venue-based tours take place in winter months and festival tours in the summer. A US tour will be organised similarly to Europe as the festival and venue cycles coincide. In the winter, UK-based artists will tour in the southern hemisphere and Asia, usually January, February and March.

A successful artist can expect to be on the road for one or two years covering these territories. Over this period they are likely to return to the same region if their shows sold well or they have become more successful. The length of time an artist is on the road is influenced by their audience, contract commitments and personal choice.

Before booking a full tour an artist is likely to do a couple of promotional dates which indicate demand. This is especially important for an artist that needs to raise their profile. Being the support act for other more established artists can also be a useful barometer of success and expose the artist to new audiences. Festivals provide valuable exposure, often acting as unofficial 'feasibility' exercises before launching on a venue-based tour. Building up a solid audience base is an intensive process and the timing of launching a touring career is crucial, especially for early career artists.

Furthermore, an artist will usually want to start their tour in smaller cities to ensure the show is well prepared before going to the major hubs where music critics are likely to review the show. In addition artists will want to be at certain venues on certain nights of the week to maximise ticket sales in their key market.

Artists compete for audiences, so a tour schedule is likely to be organised so as not to overlap with their main competitors resulting in lost ticket sales. This rationalisation of tour schedules is supported by record companies which co-ordinate the promotion of all their artists to ensure that clashes are avoided.

Show design

The show design will be decided through discussions between the artist and the lighting designer. The lighting designer will conceive the aesthetic concept and then work with suppliers to create the show. The design has important ramifications for the power demand of the show as well as the travel logistics of the tour. Budget will determine how much can be spent on the design and the logistics of moving the production. The design of the show can be influenced by the equipment available in venues if not taking production on the road.

Production logistics

Production logistics are ultimately limited by the budget and the routing, so the logistical arrangements are set by the transport modes fitting the schedule and fuel costs.

For venue-based touring the artist's team is generally responsible for delivering the production of the show.[1] At the arena and stadium levels artist's team supply most of the production equipment for the show as the venue is rented as empty shells with minimal staging, sound and lighting systems.

Sometimes, for high production shows with consecutive show dates it is more efficient and cheaper to construct multiple stages and production gear as an alternative to setting up, transporting and taking down elaborate productions.

Artists on a theatre tour may also take a substantial amount of equipment with them. This will depend on the availability of equipment, the production budget, and what type of show the artist wants. However, the amount of equipment needing to be transported is decreasing (at least in the UK) as more venues refurbish with high-quality sound and lighting systems.

Artists on club circuits need minimal production: generally there is neither the budget nor the venue space for elaborate shows. Typically, artists are only responsible for their backline (instruments and amplifiers) and depend on the venue to provide most of the lighting and sound.

At the stadium, arena and theatre touring levels specialist logistics companies are used to transport equipment regionally and globally. Articulated trucks are typically used for ground transfers between venues. For continental transfers air freight is more common than sea freight because it is much quicker. However, air freight is expensive so tours will try to keep it to a minimum and aim to pick up most of the equipment in the continent where they are touring. Trucks will be used for the ground transfers of equipment between venues. Club level artists with much smaller amounts of equipment and budgets will often travel by car or use a transit van.

Almost no artists, especially at the theatre and arena level, currently use public transport for their production and/or personnel travel. This is because it is not convenient or cost effective, and, depending on the artist profile, not appropriate.

[1] Promoters are responsible for production at festivals.

Conclusion

- Although there is concern about the environment this is not yet reflected in touring practices (with a small number of exceptions). This is largely because financial decisions and constraints alongside artistic considerations are the main drivers dictating touring practices and therefore will override environmental considerations.

- There is a perception from those interviewed for the study that environmental actions will cost more and therefore may reduce income. However, few people in the industry to date have systematically approached their touring from an environmental perspective and furthermore not all actions will be necessarily be more costly than conventional practices.

- The artist, especially at the large theatre and arena circuit, will have the greatest influence on their supply chain; however, at this scale their schedule is likely to be very busy. Therefore it is incumbent on the artist to allow enough time - both before and during a tour - to embed environmental sustainability into decisions and activities.

- At the club circuit level the promoter will have the greatest influence on the supply chain of the tour. Club artists have very limited control over their touring schedule, but conversely they have limited production (as they will often use in-house venue production) and will usually travel together in a single vehicle so be relatively energy efficient overall.

- To maximise opportunities for reducing GHG emissions requires consideration of the environment at the very early planning stages when the artist, manager, agent and promoter are booking the tour as the decisions taken at this stage will have ramifications for the overall environmental impact of the tour.

- Especially in the UK where there has been substantial consolidation in music clubs and theatres by multinational corporations it is not inconceivable that venues could be refurbished to a level that obviates the need for much of the production gear currently being brought in.

- Movement of production for arena shows is likely to continue; these are highly bespoke shows being performed in multi-purpose venues and it will not make financial sense to re-fit expensive production equipment. GHG emissions reductions of arena shows should focus on show power demand and design to minimise the movement of equipment between arenas.

- Touring is highly fragmented and decisions are all premised on ticket sales so far-sighted planning is difficult and requires considerable co-ordination between different players. As the capacity of the sector to consider the environment increases there is substantial scope for shifts in practice and developing new tour models where the environment is placed centrally, alongside artistic and financial considerations.

- The industry is lacking the capacity, resources and tools for an informed response to reducing GHG emissions, but the will to take action is increasingly evident across the supply chain.

Glossary

Environmental terminology

Adaptation: Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Biofuels: A wide range of fuels derived directly from living matter. The term covers solid biomass, liquid fuels and various biogases. Examples of biofuels are bioethanol, biodiesel and algal fuel (see Hot Topic 5 for more information on biofuels).

Carbon Dioxide (CO_2): A naturally occurring gas, and a by-product of burning fossil fuels and biomass, as well as of land-use changes and of other industrial processes. It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential of 1.

Carbon Dioxide equivalent (CO_2e): The universal unit of measurement used to indicate the global warming potential (GWP) of each of the six Kyoto greenhouse gases. It is used to evaluate the impacts of releasing (or avoiding the release of) different greenhouse gases.

Carbon footprint: The total set of greenhouse gases (GHG) emissions caused by an organisation, event or product. For simplicity of reporting, it is often expressed in terms of the amount of carbon dioxide or its equivalent of other GHGs emitted.

Carbon offsets: A carbon offset is a mechanism that allows a company, organisation or individual to reduce its environmental impact on the atmosphere in one area by investing in projects that reduce greenhouse gas (GHG) emissions in another (see Hot Topic 3 for more information on Carbon offsets).

Carbon valuation: In order to be able to incorporate, in monetary terms, the cost of potential damage to the environment caused by GHG emissions, a consistent carbon pricing or carbon valuation should be applied to public policies and project budget appraisals – this will provide a complete costing of a policy or project which includes the often hidden, but nevertheless real cost of the policy or project, even if that cost is not borne directly by the customer (see information box on internalising the price of pollution by adopting carbon valuation).

Climate: Climate in a narrow sense is usually defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands of years. The classical period is three decades as defined by the World Meteorological Organization (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind.

Climate change: A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere, and which is in addition to natural climate variability over comparable time periods.

Climate change mitigation: Measures or actions to decrease the intensity of radiative forcing in order to reduce global warming. Mitigation is distinguished from adaptation, which involves acting to minimise the effects of global warming. Most often, mitigations involved reductions in the concentrations of greenhouse gases (GHG), either by reducing their sources or by increasing their sinks.

Disclosure: The action of making new or secret information known. In the context of climate change, it refers to the disclosure of direct and indirect emissions produced from buildings, transport, the production and movement of goods and services, etc.

Direct emissions: Emissions that are produced by organisation-owned equipment or emissions from organisation-owned premises, such as carbon dioxide from electricity generators, gas boilers and vehicles, or methane from landfill sites.

Embodied carbon emissions: The term "embodied carbon" refers to carbon dioxide emitted at all stages of a good's manufacturing process, from the mining of raw materials through the distribution process, to the final product provided to the consumer. Depending on the calculation, the term can also be used to include other GHGs.

Emissions: The release of a substance (usually a gas when referring to climate change) into the atmosphere.

Environmental sustainability: Environmental sustainability refers to the ability of natural ecosystems to remain diverse and productive, thus being able to support life over a period of time. All human activity is based on these ecological goods and services. Some human activities, such as the excessive production of GHG emissions (including carbon dioxide), has led to the decline in natural ecosystems and to changes in the balance of natural cycles, thus undermining and degrading the capacity of ecosystems to continue supporting life. Living sustainably, for example, by reducing carbon dioxide and other GHG emissions, will ensure the long-term viability and productivity of these ecosystems, providing both humans and other living systems with the capacity to endure. It is in this context that we create a direct link between GHG emission reductions and environmental impacts.

Global Warming (GW): The continuous gradual rise of the earth's surface temperature thought to be caused by the greenhouse effect and responsible for changes in global climate patterns.

Global Warming Potential (GWP): The GWP is an index that compares the relative potential (to CO_2) of the six greenhouse

gases to contribute to global warming i.e. the additional heat/energy which is retained in the Earth's ecosystem through the release of this gas into the atmosphere. The additional heat/energy impact of all other greenhouse gases are compared with the impacts of carbon dioxide (CO_2) and referred to in terms of a CO_2 equivalent (CO_2e) e.g. Carbon dioxide has been designated a GWP of 1. Methane has a GWP of 21.

Greenhouse effect: Trapping and build- up of heat in the atmosphere (troposphere) near the Earth's surface. Some of the heat flowing back towards space from the Earth's surface is absorbed by water vapour, carbon dioxide, ozone, and several other gases in the atmosphere and then reradiated back toward the Earth's surface. If the atmospheric concentrations of these greenhouse gases rise, the average temperature of the lower atmosphere will gradually increase.

Greenhouse Gases (GHG): The current IPCC inventory includes six major greenhouse gases. These are Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur hexafluoride (SF6).

Indirect emissions: Emissions that are a consequence of the activities of the reporting company but occur from sources owned or controlled by another organisation or individual. They include all outsourced power generation (e.g. electricity, hot water), outsourced services (e.g. waste disposal, business travel, transport of company-owned goods) and outsourced manufacturing processes. Indirect emissions also cover the activities of franchised companies and the emissions associated with downstream and/or upstream manufacture, transport and disposal of products used by the organisation, referred to as product life-cycle emissions.

Light-emitting diode (LED): A light-emitting diode is a semi-conductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting. LEDs present many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved robustness, smaller size, faster switching, and greater durability and reliability.

Sector terminology: Artists and bands

Green rider: An additional provision provided with the live performance contract for an event or festival which stipulates the necessary sustainable requirements of the band or artist. This can include an organic or locally-sourced food and drink section, specific lighting and sound requirements and commitments by the venue / promoter in the sustainability issues surrounding the show including travel/transport by staff and crew, recycling, and more.

Performances away from homebase: Performances that take place in a different location than where the performer(s) is based.

Touring: The movement of product away from homebase.

Touring company/party size: The amount of people travelling from one show location to the next for a given project. In band touring there are three categorised of touring party: Party A refers to the artist and entourage; Party B is production crew; and Party C are additional crew members.

Tour leg: Refers to the regional territory being toured i.e. just UK dates, or just Europe dates, or just US dates etc.

Venue capacities: Is the maximum number of people allowed in the venue. A venue's capacity can change depending on the numbers seated and/or standing.

Abbreviations

CO_2: Carbon Dioxide

CO_2e: Carbon Dioxide Equivalent

Decc: Department of Energy and Climate Change

Defra: Department for Environment, Food and Rural Affairs

EU: European Union

EU ETS: European Union Emissions Trading System

GHG: Greenhouse gases

Kg/kgs: Kilogram/kilograms

Km/kms: Kilometre/kilometres

kWh: Kilowatt-hours

NO_x: Nitric Oxide (NO) and Nitrogen Dioxide (NO_2)

t: Tonnes

UN: United Nations

Units

1000g = 1 kg

1 tonne = 1000 kg

1 mile = 1.61 km

Contributing authors

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Dr Rebecca White has just finished her PhD at the Environmental Change Institute, University of Oxford, which investigated the role of supply-chain based carbon governance in reducing emissions from liquid milk in the UK. This was the culmination of a longer-term interest in climate change and food systems. She is now putting this learning to use further afield, looking at emissions in agricultural sectors in India. This current research is being undertaken in the School of Interdisciplinary Area Studies at Oxford. Contact details: rebecca.white@area.ox.ac.uk

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