SHAMBALA FESTIVAL 2012

**CARBON AUDIT**

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*NOTE: The basic results are contained in a 4-page summary. That’s all you need to read. The remainder of the report is for geeks and contains methodology, calculations and further discussion.*

SUMMARY OF PRINCIPAL RESULTS

In Douglas Adams’ masterpiece, *The Hitch-Hiker’s Guide to the Galaxy*, the computer ‘Deep Thought’ is asked to calculate the answer to ‘Life, the Universe, and Everything’. Seven million years later it produces the famous result:

***42***.

Carbon Footprinting usually takes less than seven million years, and can boil a lot of complex data down to a single number. It could even be 42! But what would this number mean?

On its own, the bald footprint score is about as much use as Deep Thought’s 42. To make it useful it has to be finessed with a bit of ‘philosophy’. Fortunately most of this is obvious common sense once you have had a chance to think about it.

The first refinement is to make a distinction between emissions generated by the festival organisation itself in order to deliver the event – the **Operational Footprint** – and emissions generated along the way by the festival’s participants – the **Participant Footprint**. The organisers of an event have a lot of control over their operational emissions, and should really be judged by this standard. They have far less control over the emissions generated by their participants (mostly in travelling to the festival). Because the Participant Footprint is typically two or three times larger than the Operational Footprint, key information is lost if you simply mix the two up.

Figure 1 shows how the two components add together to produce the **Overall Festival Footprint**. The Operational Footprint is 31% of the whole, similar to previous years.

Carbon Footprint (CF) scores are generated from data collected by the organisers. The data come in various forms, and fall rather naturally into four classes:

* Transport
* Energy
* Embodied carbon (this is explained later if you don’t know what it means).
* Waste (and water)

These classes make up proportional patterns that we sometimes call ‘fingerprints’. Fingerprints tell you the relative proportions of the components, and this is handy because there’s not much point busting a gut to reduce a component that is already tiny. Figure 2 is a fingerprint diagram that summarises the results for the festival of 2012. It shows the Operational Footprint (exploded) and the Participant Footprint (not exploded), together giving the Overall Festival Footprint of 411 tCO2e.

Already several general observations can be made.

* Both parts are dominated by transport ( 81% of the whole)
* Energy is the second largest term in the Operational Footprint, but a negligible part of the Participant Footprint.
* Embodied carbon in equipment and materials is a modest part (9.5%) of the whole, but in total more than energy.
* Waste is relatively small.

This pattern is normal and expected. However it does not yet allow us to assess whether this is a good, bad or indifferent result; or allow us to compare it with previous years, or indeed other festivals. The ‘absolute’ results in CO2e units need to be *standardised* to allow for varying number of participants, and the length of the festival. We arrive at ‘Standardised Footprints’ (SFs) by dividing the absolute footprints by a statistic we call the ‘Equivalent Participant Day’ or EPD.

The EPD is a measure of a festival’s product or output; in effect: how many people had a good time for how long. Obviously a festival of 50,000 people is likely to have a bigger footprint than one of 2,000; and (other things being equal) one lasting a week will have a bigger footprint than one lasting two days. The EPD corrects for these differences. There is nothing mysterious about it: it is calculated simply by multiplying the number of participants and the duration of the festival in days, although it does need a little care in defining exactly what is meant by a ‘participant’ or ‘duration’ to make sure the standardised scores really mean something.

Standardised carbon scores can be compared year on year, so we can tell whether there has been any improvement on the year before, or whether there is a problem that needs to be addressed. Figure 3 shows how the SFs have changed in the last four years.

Figure 3 shows steady ‘improvement’ over the years, and this is attributable partly to active carbon-reducing measures, but also partly to economies of scale. The Shambala Festival has grown steadily over the years, and (other things being equal) bigger festivals tend to have lower SFs than smaller ones.

Probably there is limited scope for indefinite expansion of the festival on the same site, and most of the feasible carbon-reduction measures have already been taken. 2012 introduces an important innovation: voluntary offsets for participant car travel.

OFFSETS

Offsets are carbon-saving measures unconnected with the Festival, carried out off the site, and usually paid for either by the organisers or the participants. Offsets are quite controversial, and some people regard them as essentially ‘cheating’. However, in the context of a festival, with a high rate of emissions over a short time in a limited space, there are few alternative avenues for continued reductions. Offsets cover a wide range of measures such as investing in energy efficiency, renewable energy, reforestation, commercial carbon credits and so on.

When festivals start carrying out carbon audits, they quickly discover where there is scope for improvement. They recycle as much waste as they can, replace mineral diesel with biodiesel, and encourage shared travel schemes. Nothing else makes a great deal of difference, and eventually they run out of options. A festival is usually already a low-carbon event and given the prevailing technologies the on-site possibilities are limited.

In 2012 the Festival organisers offered voluntary offsets to those travelling by car, at around £100 per tonne CO2e saved. £4196 were contributed to this fund, resulting in emissions savings of 40.8 tonnes. This is a significant initiative and should be encouraged in future years.

For the Operational Footprint, much effort focuses on energy, but the Shambala 2012 results show that energy was only 17% of the operational and 5% of the Overall footprint. These levels are unlikely to be much reduced by further onsite developments. It would make much more sense to invest Operational funds in serious offsite renewable energy projects at say £50/tonne. At this price the entire operational footprint could be balanced out for about £6400, small in relation to a turnover of £1.6 million. There would be a considerable marketing and ‘feelgood’ payoff in terms of support for the sustainable energy industries.

Perhaps such offsets could be budgeted for and phased in over a number of years. But let’s get back to the festival data.

BASIC STATISTICS FOR 2012:

|  |  |
| --- | --- |
| PARTICIPANTS, number | **11315** |
| CREW, number | **3444** |
| ARTISTS, number | **1970** |
| TRADERS, number | **689** |
| EQUIVALENT PARTICIPANTS, number | **14176** |
| EFFECTIVE FESTIVAL DURATION, DAYS | **3.65** |
| EQUIVALENT PARTICIPANT-DAYS | **51803** |
| OPERATIONAL FOOTPRINT, tCO2e | **128** |
| PARTICIPANT FOOTPRINT, tCO2e | **324** |
| LESS OFFSET OF 41tCO2e | **283** |
| OVERALL FESTIVAL FOOTPRINT, tCO2e | **411** |
| STANDARDISED OPERATIONAL FOOTPRINT kgCO2e/EPD | **2.48** |
| STANDARDISED PARTICIPANT FOOTPRINT, kgCO2e/EPD | **5.48** |
| STANDARDISED OVERALL FOOTPRINT kgCO2e/EPD | **7.96** |

By way of putting this in context, an average UK citizen is responsible for emissions of about 42kgCO2e per day. Of course this includes many factors (such as food, capital, government services etc) not counted in this analysis. Nevertheless, if the Overall Footprint represents the carbon cost of the ‘service’ being bought by participants, including transport, it suggests a remarkable conclusion: that attending the Shambala Festival *actually reduces emissions relative to staying at home*.

If confirmed, this would be an important result for the festival industry as a whole, and deserves further investigation.

METHODOLOGIES AND DISCUSSIONS

*This section is mainly devoted to methodology and ‘philosophy’, leaving the final section to present more detailed calculation steps.*

SOME PRINCIPLES

The creation of Carbon Footprints for an event is not an exact and mechanical process. It depends on a large number of assumptions that are not normally brought into the open. Some of these assumptions are discussed in this section.

DOES A FESTIVAL HAVE A CARBON FOOTPRINT AT ALL?

The UK collects statistics for all the carbon emissions produced on UK territory, as part of its reporting obligations under the Kyoto Protocol. This way of collecting and aggregating data is called a ‘production perspective’. In this accounting system, where would a festival appear? Nearly all the emissions from the festival site, transport to and fro, or that needed to make materials and equipment, turn up in other statistical files such as transport, energy supply, manufacturing and so on. So who would a festival report its Carbon Footprint *to*?

Well, it wouldn’t. Nobody’s really interested. Festivals do audits for themselves to help monitor their performance, to save money, as a marketing tool, and because it does after all make everyone feel better. Festival footprints are slices carved off bigger national accounts and gathered together in a bundle on the principle that “these emissions would not have happened if the festival had not taken place”. That itself is a dubious assumption, but in any case, officially all these slices are already accounted for. *There is no festival footprint*.

Now let’s look at it from a ‘consumption perspective’. In this view emissions are the responsibility of consumers, and are allocated in functional categories such as food, domestic energy, transport, goods and services, imports etc. Responsibility for emissions rests 100% with consumers because in a modern market economy *everything* is done ultimately for the benefit of consumers, and a festival is a service product being consumed by its customers. But once again a festival has no emissions of its own, because it is a provider, not a consumer: emissions are all allocated to participants consuming a service product.

So from both production and consumption perspectives, *the festival footprint does not exist*. Nationally, it is just an exercise in double-counting, slicing and dicing emissions already accounted for elsewhere. But we still want to do it! Well how?

‘GUESSTIMATES’

By now it should be fairly obvious that to get credible and consistent results a large number of assumptions and approximations have to be made, and conventions set up, to allow a consistent methodology from year to year, and so others can check our procedures. As well as having to make ‘best guess’ averaging conventions (for example, emission factors for alcoholic drinks; how much should voluntary workers be considered ‘staff’ and how much as participants?), we sometimes have to estimate actual data. In many parts of the analysis data are poor or missing completely, but where there are clearly expected emissions, it makes more sense to make an informed estimate and say so, than to assume the value is zero, which is manifestly wrong. An example is emissions from energy used for administrative preparation of the festival in the prior year, for which statistics are not collected. Another is the material content of tents. Usually ‘conservative’ assumptions are made that are probably too low, but definitely better than zero. We refer to all these factors as ‘guesstimates’ and we hope that eventually they will be resolved or at least improved by real data or by industry-wide norms.

THE COMMON-SENSE APPROACH

Festival footprinting is a compromise, trying to answer the question “what emissions have occurred, directly and indirectly, as a result of the festival, that might not have occurred otherwise?”. It is full of paradoxes, starting with the apparent fact that the best way to reduce emissions would be *not to have the festival at all*. Or perhaps *keep it small*. At first sight these look logically sound, but in a wider context you have to ask, what might the participants have done instead, with their time and their money? They might have gone to another festival, with worse GHG performance than yours. Or they might have taken a cheap flight to Greece. They might have stayed at home, and you can ask of any of these options, were more GHGs emitted than if they had attended *your* festival? Such questions often produce surprising answers, and are worth asking.

A variety of customs have grown around festival Footprinting, what goes in and what stays out. Nobody has thoroughly thought through the philosophy, so the contents are fairly arbitrary. Probably full consistency is unobtainable. Some festival footprints for example include food, but against this you could argue (as we do) that participants eat roughly the same amount anyway, so the festival has not made any difference. Roughly the same is true for water consumption, for toilet waste, or even household solid waste. OK you can put these into the footprint, but what do the figures mean? They just contribute noise to the signals you are trying to detect in the data.

What *does* change as a result of an outdoor festival is the extra use of camping equipment and other items such as stages, lighting, marquees etc. These all generate extra emissions in manufacture and maintenance, yet these are never included in festival footprints! Except this one.

The approach we have adopted is to deduct most things ‘that would have happened anyway’ and count up the rest. Then we allocate some of it to the festival itself, and some to the participants. Now we’ll talk about how this is done.

ALLOCATION BETWEEN FESTIVAL AND PARTICIPANTS

*A festival should be judged by its ‘core’, ‘production’ or Operational emissions*, i.e., those it generates, or causes to be generated, irrespective of its participants, and over which it is in a position to make choices. This includes transport of equipment, staff travel, fuel consumption, carbon embedded in infrastructure, and ‘commercial waste’. Participants are separately responsible for their own travel, energy, equipment and wastes. The festival has limited control over its clientele.

If this is the case, why measure the participants’ festival-related emissions at all? There are two reasons. One is that within the festival industry, and perhaps beyond it, it is widely (though erroneously) thought that the carbon footprint must include participant travel. There is some demand to see the ‘full monty’ even if it renders comparisons difficult. The other reason is that participant travel is always a very large component, and even small proportional changes might have large absolute effects on total emissions. On reflection, festival organisers *could* have some control over participant travel, and provided it is recorded separately they would have some way to measure the effects of their actions and observe changes year on year. This has particular relevance to 2012, as we shall see.

A further reason to look at the Overall Footprint, especially in its standardised form, is that it gives us some way to compare with other types of holidays, usually showing that from a carbon perspective, Festivals are an extremely sustainable way of having a good time.

Trying to keep the two parts of the festival footprint decently apart generates more philosophical luggage that we shall have to sort through. Not difficult. There is a standard framework of boundary-setting using the notion of ‘scopes’:

Scope 1: All direct emissions arising on-site during the festival (e.g., burning diesel and propane).

Scope 2: Direct and indirect emissions including those generated offsite for the festival’s purposes (all the above plus transport, embodied carbon, waste treatment, strictly for delivering the festival).

Scope 3: Everything else that might be associated with the festival (all the participants’ direct and indirect emissions).

This study analyses data for scopes 2 and 3 separately, and introduces a more precisely-defined terminology.

**OPERATIONAL** emissions are those generated by and on behalf of the festival itself, direct and indirect, in the process of delivering its product, equivalent to Scopes 1 and 2. It is usually between 25-35% of the total.

**PARTICIPANT** emissions are those generated by the festival’s customers in the process of consuming the product, equivalent to Scope 3 minus Scope 1+2.

The **OVERALL FESTIVAL FOOTPRINT** is the sum of Operational and Participant emissions, equivalent to Scope 3.

Where and how do we draw these boundaries? First we require discussion of another aspect any festival: its scale.

HOW ‘BIG’ IS THE FESTIVAL?

Figure 1 gives an important result, but what does it mean? Is it good, bad, middling? The answer depends on the *scale* of the festival. Obviously a festival of 60,000 is likely to have higher emissions than one of 5,000; or a 10-day event is likely to have higher emissions than a one-day event, etc. To correct for these differences some kind of comparative scaling factor or ‘numeraire’ is required. Potentially this could generate a *standardised score* that will allow comparisons across years and different festivals.

The numeraire we use is the ‘**equivalent participant day**’ (EPD). This is used because it is ‘the unit of consumption’, in other words, how many people had a good time for how long. Think about this. It is the essential ‘product’ of a festival.

The EPD is an important statistic, so it is it is worth a moment to explain how it is calculated.

It is the product of two other statistics, one about people, the other about time. To take a simple illustrative case, suppose that 10,000 people came to a festival for three days. You could say that there were 3x10,000 = 30,000 days- worth of ‘festival consumption’. In many standard festival audits this is called ‘Audience Days’ and is a good crude guide to the general scale of a festival.

The EPD is similar, but modified slightly to take account of two factors that particularly apply to Shambala:

1. Not everybody comes for the whole time
2. Many people work part-time for the festival in exchange for free tickets

THE REAL LENGTH OF A FESTIVAL

Let’s take these in turn. For the ‘time’ factor, fortunately the well-organised Shambala ticketing system records who comes and when, so we have a neat table. Here it is for 2012:

|  |  |
| --- | --- |
| OCCUPANCY | **%** |
| Thursday | 70.36% |
| Friday | 95.46% |
| Saturday | 99.61% |
| Sunday | 100.00% |

*Notionally* the festival lasts 4 days, but not all participants are there all the time, so it would obviously be wrong to assume they were. An adjusted festival length can be obtained simply by averaging these occupancies and multiplying by 4, which in this case gives 3.65. This is the time statistic we call the **Effective Festival Duration** or **EFD**. In this case the EFD is not greatly different from the notional length of the festival, but imagine a case where (for various reasons, perhaps bad weather) occupancy on successive days was 25%, 40%, 90%, 100 %: this would give and EFD of 2.55. It is important to try to make this correction to the nominal ‘audience days’.

THE REAL NUMBER OF PARTICIPANTS.

The number of paying ticket-holders is exactly known, and this is usually taken as the only measure of the number of participants. But like many events of its kind, Shambala makes use of a large number of part-time workers who are ‘paid’ in free tickets. So some of the time they would be acting as participants, enjoying themselves and becoming part of the ‘enjoyable days’ tally. But some of the time they are ‘crew’ – part of the festival’s delivery mechanism. We need to calculate a ‘people equivalent’ on the basis of how much time is spent each side of the line.

Here there is no alternative but to make a plausible assumption and create a ‘convention’ that would need to be followed if year-on-year comparisons are to be meaningful. In this case discussion with the organisers suggests a breakdown of 50-50, as this the ‘deal’ offered to volunteer crew. They are expected to work half time for the festival, and are otherwise free. The same is assumed for ‘artists’ who generally stay for the festival as participants. The situation is different for some other parts of the delivery organisation: there are for example traders selling goods and services, and contractors installing and maintaining the infrastructure. Again by discussion with the organisers it is assumed these groups are so occupied with their tasks they only have 20% of time available to ‘enjoy the festival’. The same is deemed true of a small ‘core crew’ who are the principal managers of the event.

So now we have ‘participation rates’ as follows:

Participants 100%

Base crew, contractors and Traders 20%

Main crew and artists 50%

Let us openly acknowledge that these are simply conventions whose purpose is to get closer to some kind of ‘reasonable truth’, and to make the calculations explicit. It would be clearly wrong to assume either that everybody was fully a participant, or that ‘crew’ were not participants at all. At the same time we cannot possibly take into account every individual case, so a ‘one size fits all’ approach is unavoidable. These are the plausible best guesses and are adopted as conventions.

Recorded numbers of people in each of these ‘functional parties’ are multiplied by their assumed participation rates to give a participation equivalent value, which are then added to give the **Participation Equivalent** or **PE**. The 2012 calculations are shown in the table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Absolute number | Assumed  Participation rate, % | Participation Equivalent | Total PE |
| Participants | 11315 | 100 | 11315 | 14176 |
| Crew and Artists | 5408 | 50 | 2702 |
| Third Parties | 827 | 20 | 154 |

THE EPD NUMERAIRE

Multiplied by the EFD of 3.65 the PE gives our key numeraire, the EPD, Equivalent Participant Day, as **51803** for 2012. For comparison the figures for 2010 and 2011 were 41123 and 45979. Now we have all the data to calculate the most important results, the standardised carbon footprints in kgCO2e/EPD. For the Operational Footprint it is 163423/51803 = **2.48**; for the participants it is **5.48**; and for the Overall Festival Footprint **7.96**.

It might be wondered why we would go to such trouble when we could simply have used ‘audience days’, multiplying the paying participants by the notional length of the festival. This would be 11315 x 4 = 45260, about 13% ‘too low’, although admittedly it is reasonable approximation. We prefer to use Shambala’s more sophisticated data collection to generate a more accurate figure that will be accepted as more credible. It requires a little more finesse, but is not difficult.

THE ALLOCATION PROCESS

Having decided on the conventions for participation rates, we can then use them to allocate emissions to Operational and Participant accounts. But there are of course other judgements to be made.

Some of the allocations are obvious and unproblematic. Diesel or biodiesel used to produce electricity belongs to the festival, while ‘Camping Gaz’ used privately by participants belongs to them . Embodied carbon in principal structures and equipment belongs to the festival, while embodied carbon in tents and other camping paraphernalia belongs to participants.

ALLOCATION FOR TRANSPORT

It is a bit more difficult when it comes to transport and waste, and it is hard to avoid some tricky decisions. A truck delivers a generator. Should the transport emissions be counted? Presumably yes, to the Operational account. A trader drives to the festival with stock , should these emissions be counted? Yes again, Operational. An organiser drives to the festival. Is *this* Operational emissions, or merely ‘commuting to work’? How many other commercial bodies would include employees’ commuting in their footprints? But if this is not done, who is responsible for these emissions? Is it the organiser personally? If so, should these emissions be ignored, or added to the Participant account? It would seem odd to ignore them if we are aiming for comprehensive ‘Scope 3’ totals. But clearly organisers are not ‘participants’. Tricky isn’t it?

The convention adopted in this system is to count all transport associated with preparing the festival and delivering materials (and removing them afterwards) *and* travel for staff. It more or less follows that if this convention is adopted, the travel for crew and artists on half-time tickets should be allocated half to the Operational account (like organisers) and half to the Participants account (because most crew are half-time participants). And this is what is done.

WASTE

Waste is also rather difficult within our system. The standard convention is to deduct recyclables from the waste total, call these zero, use a standard emission factor for the rest, and allocate the lot to the Operational Footprint. Easy!

But this is odd, because while participants are at the festival they are certainly generating waste, but at the same time they are *not* generating it at home. Most of the waste is clearly associated with the participants, yet the festival is expected to pick up the whole carbon tab. This seems inconsistent. It’s the *extra* waste that should be the festival’s responsibility. The convention we have adopted is this:

Step 1: deduct the recyclates and deem them zero emissions. (Zero is wrong but this is standard procedure and a small term overall).

Step 2: calculate the amount of waste expected by all bodies on the site, including all crew, using a national average. We use an Open University figure of 1.1kg per person day.

Step 3: deduct this from the total

Step 4: express this as a proportion of the total waste

Step 5: allocate emissions Operational: Participant in this ratio.

This is not entirely consistent, because we have not actually deducted the ‘expected background waste’ from the Participant Footprint. We do it this way because everyone else does, because it is not a very big item, and because organisers can get some credit for encouraging waste minimisation and recycling.

OTHER ITEMS

Clearer logic is adopted for food, drink, water consumption and liquid wastes: what appears at the festival is simultaneously *not* appearing elsewhere, and it seems perverse to stick the emissions onto the festival’s account. For liquid wastes we assume they are much the same as they would have been ‘at home’, except that special arrangements are required to truck the waste to the nearest treatment works. These are measured and allocated, but are very small terms.

For food we assume the quantity consumed is the same, and the composition of different food types similar to each participant’s customary diet. These assumptions might not be quite right, but it would take a great deal of survey effort to test them, and it seems unlikely they are seriously wrong.

Although by convention we exclude food from the analysis, it could become a decarbonisation tool. Consider this: that emissions per head per day from the overall UK food chain are about 5 kgCO2e. This means that we ‘expect’ food-related emissions (indirect of course) during the festival be 5\*EPD = about 260 tonnes, a very large amount. If something like this were accepted as a baseline, the festival could attempt to reduce it by promoting low-carbon foods (mostly having a low content of livestock products). A reduction of 20% could easily be envisaged, and if verifiable, could be accepted as a carbon credit and deducted from the Participant account (in this case of 54 tCO2e, similar to the travel offset). Something to think about.

For alcoholic beverages, the amount consumed is about twice the daily per capita average (strangely abstemious for a festival!) so one half of the calculated emissions are allocated, all to the Participant account. None are allocated to the operational account because (formally anyway) the consumption of alcohol is not an operational requirement of the festival.

DETAILED RESULTS AND CALCULATION STEPS

--AND FURTHER DISCUSSION

*This final section is a ragbag of details for others in the footprinting or festival communities that like to chew the fat and look over our shoulders.*

SUMMARY OF MAJOR TOTALS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | TRANSPORT | ENERGY | EMBODIED | WASTE | TOTALS |
| PARTICIPANTS | 240,510 | 860 | 28,847 | 12,713 | **282,930** |
| OPERATIONAL | 94,151 | 21,456 | 10,056 | 1,900 | **127,563** |
| TOTALS | **334,661** | **22,316** | **38,904** | **14,613** | **410,494** |

TRANSPORT

Travel emissions certainly dominate the footprint. By 2010 the Shambala Festival had developed a sophisticated registration and tracking system for each vehicle entering the site, and post-codes were used as a reasonable proxy for mileage travelled. The vehicles were also classified into different types and users, and this has generated a reliable and fairly accurate data-set. The table here shows the statistics available:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | # of vehicle trips | Type of vehicle | Total distance | Avg distance Rtn | Km conv | Emission factor | Emissions |  |
| **CREW DATA** | | | | |  |  |  |  |
| Red (Staff) Parking | 539 | Car | 115724 | 215 | 186316 | 208 | 38754 |  |
| Build & Break | 106 | Car | 31157 | 294 | 50163 | 208 | 10434 |  |
| Camper Van Field | 141 | Van | 35512 | 252 | 57174 | 252 | 14408 |  |
| Artist Parking | 219 | Car | 53192 | 243 | 85639 | 208 | 17813 |  |
| Artist Camper Van | 110 | Van | 21394 | 194 | 34444 | 252 | 8680 |  |
| Meadow Parking | 80 | Car | 5138 | 64 | 8272 | 208 | 1721 |  |
| On site Pass | 394 | Van | 88055 | 223 | 141768 | 252 | 35726 |  |
| **TOTALS** | **1589** |  | **350171** |  | **563776** |  | **127535** | Alloc 50:50 |
| **CONTRACTOR DATA** | | | | |  |  |  |  |
| 7 tonne | 30 | 7 tonne | 3714.22 | 124 | 5980 | 571 | 3415 |  |
| Car | 23 | Car | 3857.29 | 168 | 6210 | 208 | 1292 |  |
| Articulated | 48 | Artic | 7900.76 | 165 | 12720 | 980 | 12466 |  |
| Transit van | 23 | Transit | 5269.3 | 229 | 8484 | 252 | 2138 |  |
| **TOTALS** | **124** |  | **20741.57** |  | **33394** |  | **19310** | Alloc 80:20 |
| **PUBLIC DATA** |  |  |  |  |  |  |  |  |
| Car Pass | 2522 |  | 450532 | 179 | 725357 | 208 | 150874 |  |
| Live in Vehicle | 509 |  | 96038 | 189 | 154621 | 252 | 38965 |  |
| Motorcycle pass | 10 |  | 1623 | 162 | 2613 | 120 | 314 |  |
| Coach Bristol | 5 |  | 1025 | 205 | 1650 | 822 | 1357 |  |
| Coach London | 3 |  | 520 | 173 | 837 | 822 | 688 |  |
| Manchester | 1 |  | 256 | 256 | 412 | 822 | 339 |  |
| Coach Sheffield | 5 |  | 640 | 128 | 1030 | 822 | 847 |  |
| Coach Birmingham | 2 |  | 176 | 88 | 283 | 822 | 233 |  |
| Coach Brighton | 1 |  | 206 | 206 | 332 | 822 | 273 |  |
| Shuttle bus | 26 |  | 624 | 12 | 1005 | 822 | 826 |  |
| **TOTALS** | **3084** |  | **551016** |  |  |  | **194714** | **341558.53** |

The following table shows the allocations and tallies, including a few guesstimated or pro-rated extras:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | CALCULATED EMISSIONS | ALLOC TO OP | ALLOC TO PART | TOTAL |
| Pre-festival | 3400 | 3400 |  |  |
| Third Parties | 19309 | 15447 | 3863 |  |
| Small vehicle Crew | 127353 | 63677 | 63677 |  |
| Participants | 194714 | 2241 | 192473 |  |
| Bar deliveries | 4064 | 4064 |  |  |
| Train/bus | 26615 | 5323 | 21292 |  |
| Offset |  |  | -40793 |  |
|  | 375455 | 94152 | 240512 | 334664 |

Figure 4 summarise the proportions travelling by various modes, derived directly from the statistics provided by the organisers.

Nearly 80% come by car or van. The average occupancy appears to be quite high, about 3. The Festival also provides a shuttle service from the local railway station, and the number of passengers is logged. This is used to estimate the proportion coming by train and service bus – about 12%, and we assumed these travellers came the same average distance as the private vehicle users.

About 8% of travellers came in hired coaches, and detailed statistics for journeys, occupancy and emission factors are available. Coaches are outstandingly good, generating about 4 kgCO2e per person travelling to the festival, against about 21 kg for those coming by car or van.

The number coming by other modes (walking, cycling) was negligible.

The proportion of ‘crew’ to the whole population is about 20%, and it was assumed they distributed their travel in the same modes. Crew travel is allocated 50-50 to core and periphery according their 50% participation factor.

Pre-festival travel by the organisers is always likely to be a small term, but worth checking. An interview with one of the principal organisers in 2007 revealed the following: 5 directors had 12 meetings alternately in Birmingham and Bristol (140 km), and travelled in typical cars (as we are informed they did: not trains!) with emissions 200 g/km occupancy 2, that’s 831 kg. The extra pre-festival set-up crew of 22 taking two round trips each to the site, 10 from Birmingham and 12 from Bristol with occupancy 4 would clock up 698 kg. Allow a bit for extra wear and tear, say 100 kg. Overall total 1610 kg.

We know this is going to be a small term in the total picture so there is no point trying to refine it further, but presumably larger festivals entail somewhat more organisation, so it is pro-rated 10% a year pending a further investigation. This was estimated at 3400 kgCO2e for 2012, allocated entirely to the Operational account.

An important innovation in 2012 is the offering of voluntary offsets to car-driving participants. The total offsets amounted to 41 tCO2e, and in effect reduced the total Participant Footprint emissions from 281 t to 240 t. Some aspects of this procedure are discussed above.

Of course it is open to the Festival organisers to ‘impose’ obligatory offsets, charging a levy on private vehicles. At typical distance and occupancy it would cost about £6.50 per vehicle.

OPERATIONAL ENERGY

Most of this arises from running the electricity system and clearly belongs in the Operational account. The organisers simply report how much red diesel or similar has been used, and we multiply by emission factors of 2.63 kg/l for red diesel and 0.53 for biodiesel from reprocessed waste oils. So 3250 litres of red diesel generated 8548 kgCO2 and 10977 litres of biodiesel generated 5818 kg.

Many of the traders use propane for cooking and a few other purposes, and the organisers estimate the usage at 2509 kg propane, so 3764 kgCO2 with emission factor of 1.5 kg/litre.

Some emissions must be attributed to office functions in preparing for the festival, but this is difficult to measure because much work is done at home or in shared offices. These are small items, but to guesstimate a modest amount is preferable to assuming zero in this case, so we have assumed 5000 kWh of gas heating and 3000 kWh of electricity, using standard emission factors.

There remains the operational energy we could attribute to participants. This is nearly all small quantities of butane for cooking on camping stoves. Another guesstimate is required here. Observation suggests that during the festival most participants simply ‘eat out’. A minority however might do some cooking in their camping circles. If we assume that a quarter of the quantity of propane gas is burned for this purpose, 2731/4=683 kg, same emission factor. A small term, unimportant if wildly wrong.

The total is 21456 kgCO2 for the core, 860 kg for the peripheral footprint.

The use of reclaimed waste oil biodiesel is widely believed to reduce emissions, and the UK government gives its blessing in the form of a lower ‘official’ emissions factor. We ought to say however, that there is considerable scepticism about this. Since there is only a very limited supply of genuine biodiesel fuel, using it at a festival merely means it is not used somewhere else. It is sometimes argued that the emission factor should be reduced only by the proportion of biodiesel in the whole system, which would make hardly any difference.

Having said this, festivals have become major markets for biodiesel and stimulate production. Using it is a cornerstone of their efforts to reduce emissions, and a badge of their good intentions. For the time being we shall stick with the official factors, but here is another item of ‘philosophy’ where we simply have to take a view and go with it.

EMBODIED CARBON

‘Embodied’ carbon is that which was emitted in the production of goods and materials used for the festival. There is an important distinction between *durable goods* that are re-used frequently, and *consumables* that either disappear in the consumption or end up as waste (discussed further below).

Consumables

The main consumables are food and drink, and a wide variety of other materials that eventually turn up in the waste statistics. The approach adopted here is to ignore consumables that would be the same if participants had not come to the festival. This is assumed to be true of food, but not of drink, consumption of which is assumed to double during the festival.

For alcohol consumption, unfortunately it is very difficult to obtain consistent data about GHG emissions associated with a given quantity. A general guideline seems to be 0.5 kg/litre for beer and cider, and we adjusted wine and spirits to ‘equivalent litres’. The festival itself ran all the bars in 2012 and was able to provide accurate data. The estimate we arrived at was 39396 equivalent litres. On the assumption that alcohol consumption does indeed double, then half can be discounted as ‘background’ consumption that is simply not happening elsewhere.

The emissions of 10098 kgCO2e are allocated to the peripheral footprint.

Durables

Durables include things like structure, tents and equipment that are used repeatedly, not just at the festival. The embodied emissions of a wide range of materials and products over a typical lifecycle, are widely studied, and figures are readily available. The problem is: how much of the total lifecycle can reasonably be attributed to the Shambala Festival? To find the festival’s share of the life-cycle emissions, we have know, or guesstimate, how long each item lasts and how frequently it is used, for how long.

It should be noted that this is an especially weak part of the analysis since the data are hard to collect and we have been forced into heroic guesstimates. We hope to show however that this component is small relative to others, so that even substantial errors would not greatly affect the overall result.

Organisers, participants, and traders all have re-usable equipment of various kinds. Short of very laborious sampling and measurements we try to break down equipment into material components of known carbon-intensity, estimate the total weight, then adjust for the expected number of lifetime uses. Most of the material is in the form of temporary structures made of steel, aluminium and plastic membranes.

For the organisational side, the material is dominated by five large structures estimated to weigh an average of 25 tonnes. Assuming this breaks down approximately as steel 10, plastic 10 and aluminium 5, this gives 18t+25t+46t=89 tonnes CO2e per structure (using the Bath University carbon intensity data). Multiply by 5 = 445 tonnes. Assume they are each used 5 times a year and have a lifetime of 15 years, the embodied emissions attributable to Shambala would be 445/75=5.93 tonnes.

To these should be added a wide range of marquees, large tents and other public structures. There has never been a proper survey or even a reasonable estimate for these structures, but it is unlikely they would exceed the total of the main stages. Let us assume they amount to the same as the principal structures and allocate another 5.93 tonnes. Admittedly this is flagrant guesstimate, but as previously argued such informed estimations are better than zero, which is clearly wrong.

To estimate embodied emissions for participants, we actually asked questions about tents, using an approximate sample of participants. The reason for looking at tents is that camping requires some special equipment, notably tents, which might not have been bought otherwise. We weighed the components of sample types. We also asked about how often the tents were used (on average 4 times a year, suggesting a ‘regular camping’ subgroup of the general population) and assumed a conservative occupancy of two and an equally conservative tent life of two years.

The calculations carried out in 2007showed an average embodied carbon in tents attributable to Shambala Festival: 0.8 kg. To this should be added other camping equipment such as sleeping bags, inflatable mattresses, cooking equipment etc. These were not measured but in toto could well amount to the same quantity of material as the tents. As a rough guide this gives an average value per participant of 1.6 kg. Probably this should be reduced somewhat to allow for background decarbonisation and ‘lightweighting’, and we have guesstimated 10%. This can simply be multiplied by the reported number of participants, which for 2012 is 11315. Participant embodied carbon in materials is therefore estimated at 16294 or about 16 tCO2e .

We can perhaps make some more up-to-date checks on this. Most of the tents are single-season types and rather light, weighting just a few kg. Occupancy is highly erratic but if we suppose 2 kg per person, and that the typical tent is made of polyester with fibreglass poles both with emissions factors of around 2.2 kgCO2e/kg, that gives about 4.4 kg per person. But of course, a tent is not (usually) used only once. How often it is used in its life is a key factor, and we can suppose that this will vary from once only to maybe 20 or more for keen campers who look after their kit. Without some detailed surveys we cannot know the typical pattern for Shambala, but because it is ‘family festival’ we might guess that tents are used five times, and this would give the Shambala share a value of 4.4/5= 0.88. If this is doubled to cover other camping equipment, we have a value close to the original estimate.

Assuming that crew behave broadly like participants with respect to accommodation, some of their personal embodied equipment should be attributed to the Operational account. Crew were 5414 at 50% participation, so 3898kg are allocated equally to Operational and Participant accounts.

For traders we have almost no information, so a further heroic guesstimate is required. Say that on account of necessary equipment etc., their embodied energy is five times that of an ordinary participant, 8 kg per head. How credible is this? Although the total amount of equipment might be considerably more than that brought by the average participant, it is likely to be used much more intensively. The ‘Shambala share’ would therefore be proportionately less. However on the guesstimated basis of 8\*0.9\*689 we have 10163, or about 10 tonnes CO2e.

These guesstimates are admittedly outrageous. The best we can say is that are likely to be in the right ballpark, and we know for sure that the ‘correct’ value is not zero. Embodied carbon makes up about 10% of the total footprint, so it is not trivial. It deserves far more attention, and is an area where some serious data collection must be undertaken.

WASTE

Festival organisers like to receive detailed waste statistics because waste disposal costs money, and they want to know whether and how these costs could be reduced.

But from the carbon perspective it remains problematic what proportion of waste should be attributed to either of the footprint accounts, and if so, how it should be allocated. Our adopted ‘solution’ is to attribute to the Operational account the difference between the amount of waste reported and the ‘expected’ amount had the festival not taken place, after recycled material has been deducted. Then the total remaining mixed waste is given a generic emission factor and attached to the Participants account.

Liquid Wastes

There is a substantial difference between liquid/sewage/toilet wastes and solid wastes. Liquid wastes are usually accumulated in mobile toilet units, collected regularly and tankered off-site for treatment. The calculations are fairly straightforward and the carbon emissions are small. Reduction of the volume is sometimes attempted by using dry toilet systems, but the resulting semi-solid material also has to be transported off the site at equal, or often greater, cost and no measurable improvement in carbon emissions.

For liquid wastes the Operational/Participant partition is fairly easy. We could say that these are wastes that all those attending the festival would have generated anyway, and the treatment process (sewage works) is essentially the same, but that extra tanker trips are required. The trip lengths (35 x 37 miles) and vehicle types were reported by the organisers and generate an emissions value of 2800 kgCO2e, not a large term. Of this 700 kg are allocated to the Operational account.

Possibly the embodied energy in the portable toilets should be considered. Shambala uses about 100 toilets, made of high density polyethylene and weighing about 80 kg each. The embodied carbon of HDPE is 1.6kg/kg, giving a value per toilet of 128 kg. Assuming that such a toilet has a life of 500 usage-days, the total embodied energy attributable to the festival is 128\*100\*3.5/500 = 90 kg, a negligible quantity.

Solid Waste

With respect to solid waste it is difficult for a festival to control the total volume, but it can certainly try to facilitate recycling and composting, and this somewhat reduces the total emissions. There is no standard way of assessing the emissions that should belong to a festival’s Operational footprint. Very commonly it is done by deducting all recycled materials from the total waste tonnage and considering them carbon-neutral. The remainder is then multiplied by a standard coefficient of 0.27 to give the CO2e value, and all this is then attributed to the festival’s Operational account.

The method adopted here assumes, as discussed above, that a certain amount of waste is generated anyway, and if it appears on the Festival site, it fails to appear in Sheffield or Bristol. We use a standard figure of 1.1 kg per day per person to calculate the ‘expected waste’, which we multiply by a statistic called Total Occupant Days (TOD) that includes all bodies on the site, because all are generating personal waste.

|  |  |
| --- | --- |
| Recycled, t | 27.03 |
| General, t | 54.12 |
| Total, t | 81.15 |
| Expected, t | 70.34 |
| Per TOD | 1.269 |
| Deduct expected | 0.169 |
| Ratio | 0.13 |

The ratio of the remainder to the total waste might be considered the ‘extra’ waste, presumably most of it operational waste of one kind or another. This proportion, in 2012 13%, 1900 kg, is allocated to the Operational account. The rest, 12713 kg, goes to the Participant account.

Using these conventions, we derive a total solid waste emission value of 14.6 tonnes for Shambala 2012.

This approach still retains a basic methodological problem: That if we really do treat waste like food and deduct what would have been produced anyway, then most of the waste element disappears. This is logical but contrary to normal practice for event Footprinting, and it would fail to give organisers an incentive to reduce the emissions from waste. This is a matter than needs wider discussion in the carbon auditing community.

It might be asked of this method, what would happen if the waste collected amounted to *less* than the UK average? In our view the festival should then be allowed a carbon credit, to be deducted from the overall core footprint.

SOME FINAL REMARKS

FESTIVALS IN CONTEXT

If the Shambala Festival embraces 14000 people over a period of 3 or 4 days and can be held to emit over 400 tonnes CO2e, can this be judged in any way as a good or bad performance? Consider the statistic of 8kgCO2e/EPD as a holiday benchmark, or more precisely the major component of this, an average of 15kg per attendee for transport for a four-day holiday. In 2007 a sample of 50 Shambala Festival participants was asked what other trips had been taken in the previous year, where to and by what mode. The results are presented in Figure 7, and show many trips with emissions in the thousands of kg. The average holiday trip in the sample gave emissions of 624kg, possibly close to the typical UK holiday. To compare with Shambala, imagine these are 4-day holidays, and emissions per day are half the UK background of 41 kg per person, assuming food, local travel, hotels etc, say 20 kg per day. So the total would be 624+4\*20 = 704 kg. In contrast Shambala ‘costs’ 15 kg for transport and non-transport emissions of 5 kg per day plus food at 5 kg, making a total of 15+4\*10 = 55 kg, **less than 10% of a typical holiday abroad**.



Shambala Festival Average Travel Emissions

Figure 7

In fact the potential carbon effects of festivals go even further, since the average daily tally of a Shambala participant is around 15 kgCO2e, compared with an average daily rate of 41 kg per UK person. It must be said immediately that this latter figure includes all sorts of ‘background’ emissions such as government expenditure, investments, depreciation etc that would continue during a festival, but nevertheless it is possible that festival holidays represent *a reduction from the level participants would have emitted if they had stayed at home*.

Festivals are low-emitting occasions and should be recognised as such. Shambala’s results demonstrate that truly sustainable holidays are both possible and highly enjoyable.