

# CARBON FOOTPRINT REPORT

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Carbon Footprint report of Graffiti Festival: Step in The Arena 2023

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Author: Luc Hillege  
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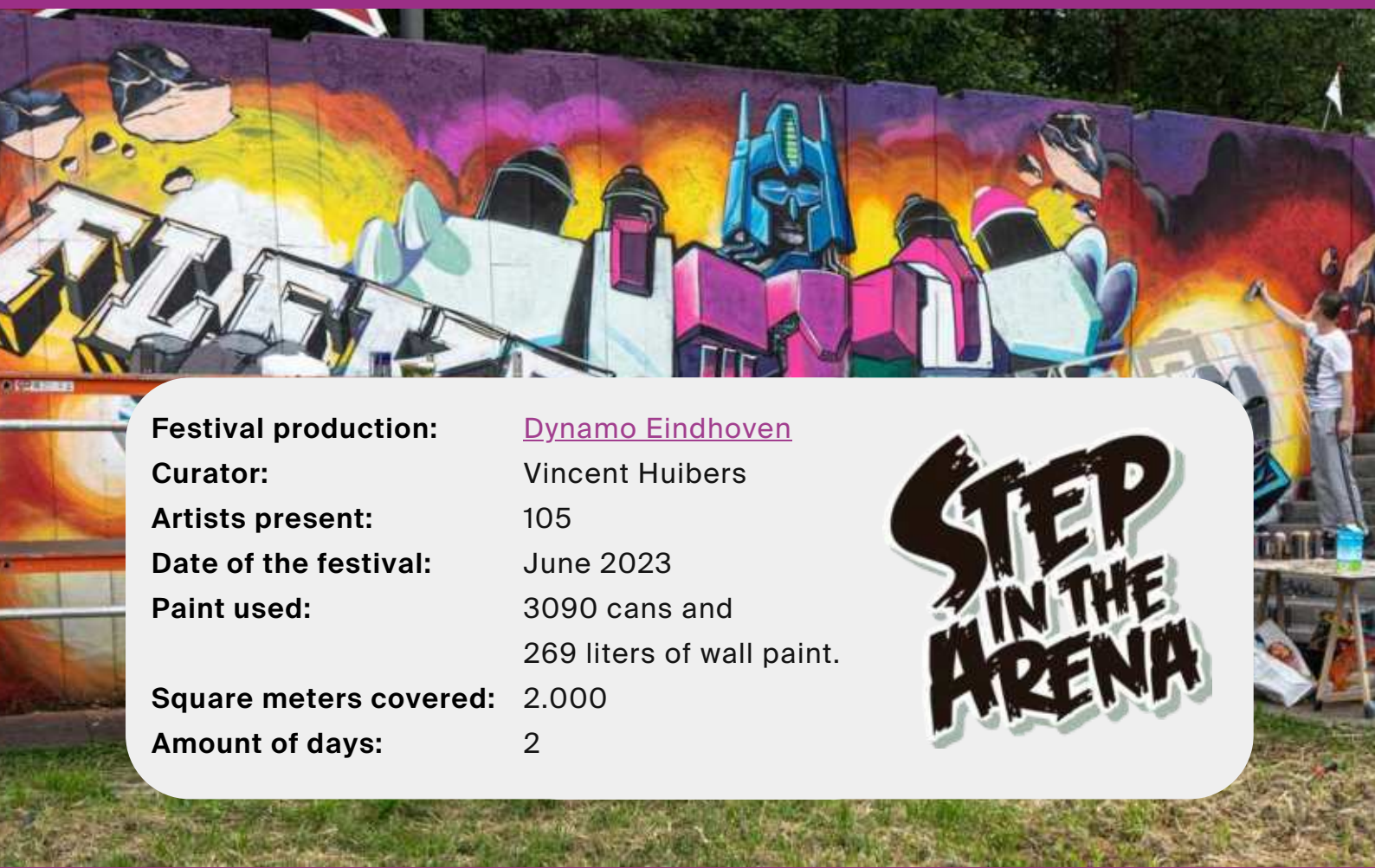
# WORLD PREMIER

This carbon footprint report is an absolute premier as it is the world's first Life Cycle Assessment (LCA) of a graffiti festival.

The carbon footprint of Step in The Arena 2023 was: 20 ton CO<sub>2</sub>-eq.

Our study shows that artists traveling (52%) and paint bought and used (41%) are the highest contributors to climate change. Strategies to reduce the effects on climate change are shared, such as: driving electric, decreasing flights and using public transport. Recycling waste paint is one of the strategies already applied and should be the standard approach for (spray) paint disposal at graffiti, street art and mural festivals.

As a painter, lowering your environmental impact can be achieved by: using water-based paint, using less spray paint cans or choosing wall paint instead.



<b>Festival production:</b>	<a href="#">Dynamo Eindhoven</a>
<b>Curator:</b>	Vincent Huibers
<b>Artists present:</b>	105
<b>Date of the festival:</b>	June 2023
<b>Paint used:</b>	3090 cans and 269 liters of wall paint.
<b>Square meters covered:</b>	2.000
<b>Amount of days:</b>	2

**STEP  
IN THE  
ARENA**

# KEY FINDINGS

Taking into account the several life cycle stages of the graffiti festival, the resulting carbon footprint of Step in The Arena 2023 was:

20.057 kg CO<sub>2</sub>-eq which is 20 ton of CO<sub>2</sub>-eq.

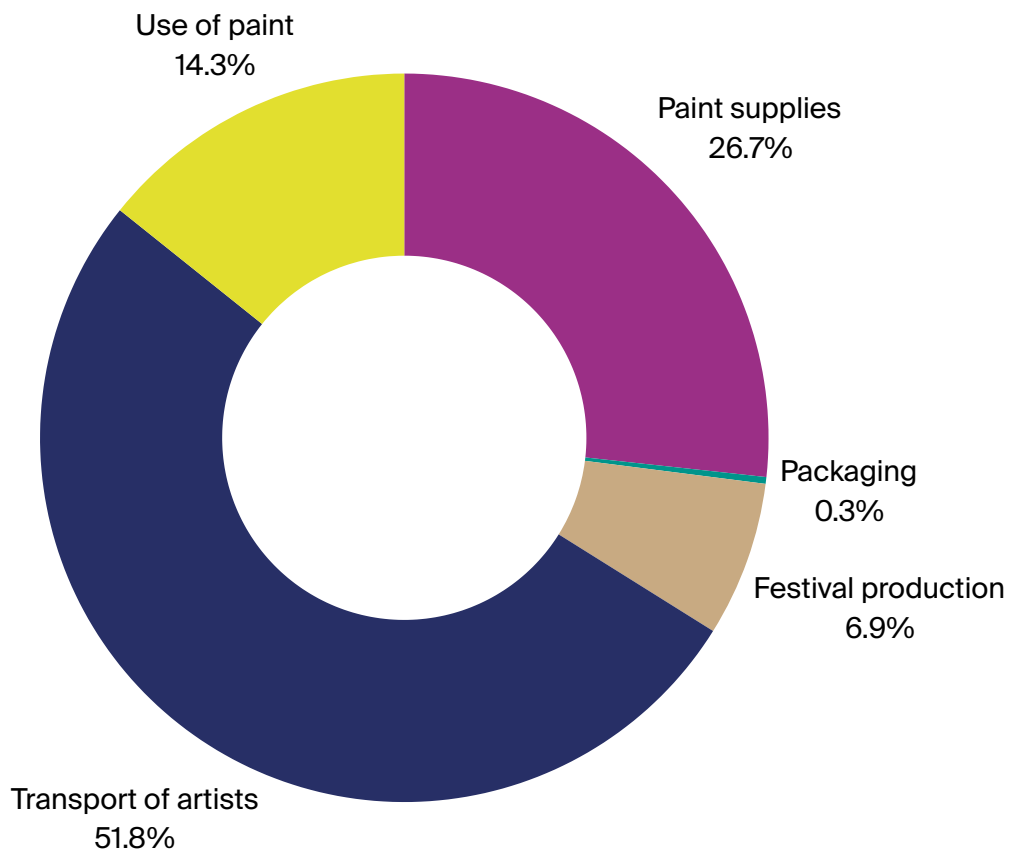
So what does this mean? Is this a lot or a little? Well it is difficult to compare it with other festivals (e.g. a music or food festival) as they serve different purposes. As this is the world's first carbon footprint of a graffiti festival we do not have a reference value. To make the numbers understandable we compared the values to the environmental impact of other products and services. Using the [carbon translator](#) of Ecochain we found that 20 ton of CO<sub>2</sub>-eq translates one of these items:

- 950.000 cups of coffee, or
- 47.000 avocados, or
- 4000 T-shirts, or
- 12 roundtrip flights between New York City and Amsterdam, or
- Driving 1.6 times around the world in a car.



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# KEY FINDINGS



Life cycle stage	Carbon footprint (kg CO <sub>2</sub> -eq)
1. Paint supplies	5.382
2. Packaging	56
3. Festival production	1.382
4. Transport of artists	10.409
5. Food & Beverage	0
6. Use of paint	2.865
7. End-of-life (disposal)	-38
<b>Total footprint</b>	<b>20.057 kg CO<sub>2</sub>-eq</b>

# HOTSPOT #1 TRANSPORT



The main contributor to the carbon footprint of SITA is related to the transport of the artists. Whereby:

- The biggest contributor is car travel (petrol and diesel).
- Next up is transport by airplane.

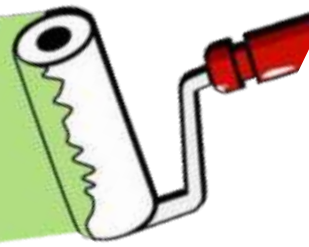
The figures show that curating a festival and focusing on limiting air travel pays off. The burden is shifted towards car travel. Which makes sense as it assumed that 85% of the artists traveling was done by car. Don't let these numbers fool you.



Flying (especially within Europe) remains an impactful way of transportation and should be avoided as much as possible when organizing a graffiti or street art festival. Traveling by train and bike are the most environmentally friendly options available to artists.

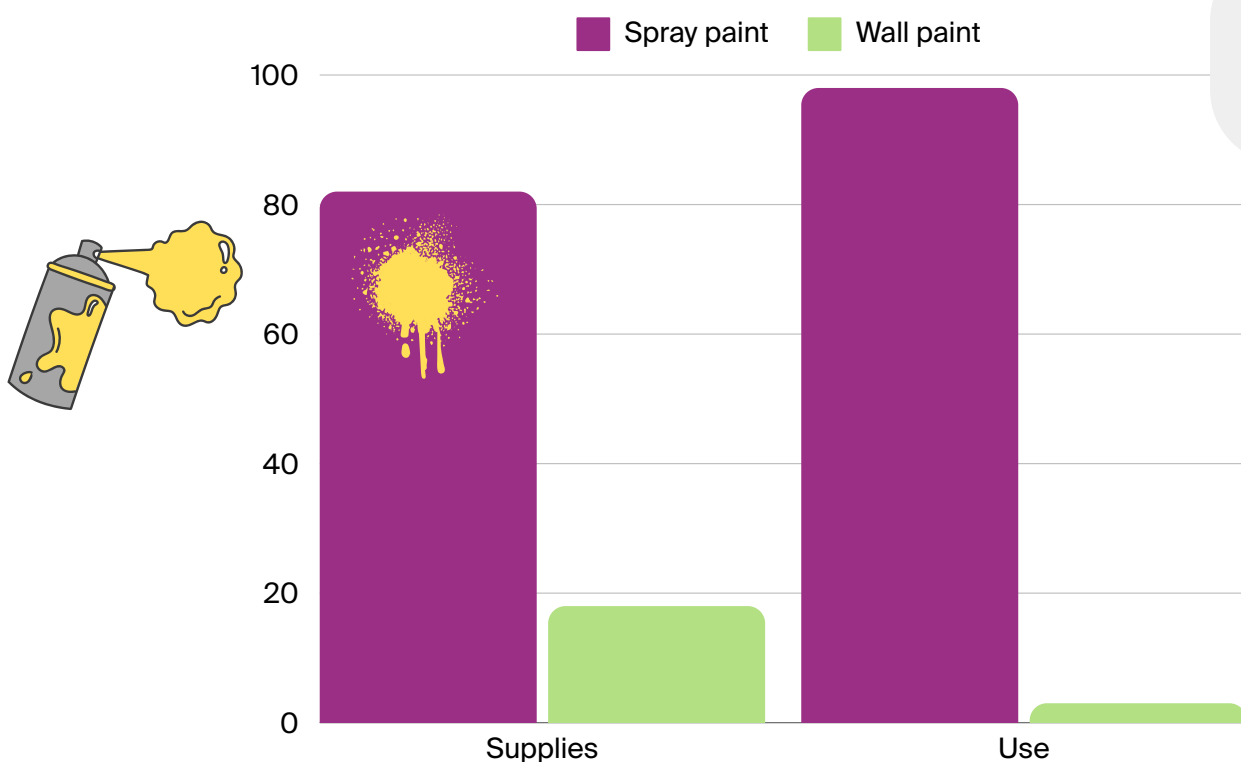
Curators should therefore promote artists to travel as much as possible with public transport, (electric) bike or even walking. Car sharing is another way of mitigating impact related to car travel next to driving with an electrical car.

# SPRAY VS WALL PAINT



Besides artists traveling two other phases contribute significantly to the carbon footprint of SITA. They are: paint supplies and use of paint. Evidently, as it is a graffiti festival the paint used to create art makes up a large share of the impact. The total impact of these phases combined is: 8247 kg CO<sub>2</sub>-eq, which translates into 41,1% of the carbon footprint of SITA.

Let's dive a little bit deeper into the matter and zoom into the distribution in % of CO<sub>2</sub>-footprints related to paint. At the festival two types of paint were used: acrylic spray paint and wall paint.



[Learn more in: 'THE DETAILS' section below!](#)

The first phase (supplies) considers the impact related to the manufacturing of both types of paint. Included here is the 'cradle-to-gate' impact, which means all activities to produce paint are included in the calculation. From raw material extraction to transport of materials to the paint factory.

And of course the actual production processes, like: mixing, filling and pressurizing which are necessary to a final end-product. The second phase - use of paint - considers the emissions related when both paints are applied on a wall.

# FESTIVAL PRODUCTION

For the production of the festival we focused on the equipment used to prepare the walls and power the festival. Mainly a spray paint gun and an aggregate was used. The spray paint gun uses electricity and the aggregate diesel.

The resulting impact is as follows:

- Spray paint gun: 1350 kg CO<sub>2</sub>-eq
- Aggregate: 33 kg CO<sub>2</sub>-eq.



Overall contributing to 6,9% of the total impact of SITA. We know that more inputs such as food stands, food trucks, fences and other materials were used. However, we lacked data to substantiate a carbon footprint for these inputs.



End-of-life disposal refers to waste materials. At the end of the festival all materials used to paint were collected on site at the Berenkuil, Eindhoven. Besides using a designated spray paint container regular large trash bags were used to collect empty spray cans. The remaining wall paint buckets were also collected and disposed of at a local recycling facility.

Recycling spray paint has a beneficial aspect to it as it saves raw materials such as tin-plated steel which can be extracted and remelted. Avoiding the use of primary (virgin) steel in the future. In the impact calculation it results in a negative value (which is a positive thing, just like receiving negative test results at the doctor). Compared to incineration recycling saves roughly 300 kg CO<sub>2</sub>-eq which is roughly 1.5% of the total impact.

# TOGETHER FOR A MORE SUSTAINABLE SPRAY PAINT INDUSTRY



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# SETTING THE SCENE

With: Vincent Huibers, SITA

From the first edition in 2009, the goal of Step in The Arena (SITA) as a graffiti festival was to bring people together, have fun, display our creativity, share knowledge and demonstrate our skills as artists. It evolved to a multiple day event with a global presence of artists. We realized the potential of the festival in a positive way but also considered investigating potential negative sides. For Step in The Arena a carbon footprint report is relevant because it allows us to see which factors are relevant to consider in order to lower our footprint.

Initially, we did not know where to start and which aspect mattered the most. Although some things are obvious to do or not do, like not flying in too many artists, avoiding unnecessary travels, buying things locally, and recycling waste. With the experience of organizing this festival for 15 years now we always tried our best to mitigate impact without knowing the exact numbers. For our future generations it makes sense to deep-dive into the topic and figure out which stones were left unturned.

In my view everyone carries the responsibility within themselves to help limit any negative environmental and health impacts. The world and especially humanity needs accountability and ownership. We hope to set the scene for other graffiti, street- and urban art festivals, by providing inspiration and to enable others to learn for this case study. Become part of this movement, because by working together we can move towards a more sustainable graffiti scene.

# BACKGROUND

Step in the Arena (SITA) is a major graffiti festival that is held in Eindhoven, The Netherlands. Over the past few years, 17.500 spray cans and more than 3.000 liters of latex have been used. Due to its international lineup and relaxed atmosphere, the festival is considered an important event in the graffiti scene. During the festival, you can see all types of graffiti and street art: letters, cartoons, photorealism, and postmodern graffiti. In just under ten years, this festival has grown into a renowned event attracting not only more and more spectators but especially international artists. With the usage of a considerable amount of paint and artists traveling from abroad to showcase their art and skills, understanding the environmental impact of graffiti festivals is crucial for promoting sustainable urban art.

In 2023 the second to last edition of Step in the Arena event was held. For the organizers of the festival sustainability has been a topic of discussion. In previous years they designed, built and implemented a single collection point for cans on site to foster proper recycling of the spray paint can. In 2021 the central theme of their side-event was sustainability and diversity. Focusing on the empowerment of women in the graffiti scene by showcasing the documentary Girl Power about female graffiti writers from 15 different cities. The Aerosol Alliance also gave a presentation regarding the goals of the movement to reduce the impact of spray paint and how all stakeholders should embrace collaboration to work towards a sustainable graffiti scene.

#### References:

[SITA History & Side Events](#)

Local [news article](#) about SITA 2022





# GOAL & METHODOLOGY

The aim of this report is to share information to the public, among others: artists, curators, manufacturers, municipalities, waste treatment facilities and anyone else interested. The goal is providing actionable insights for reducing the environmental impacts associated with graffiti festivals and using graffiti spray paint.

The resulting footprint is based on the established Life Cycle Assessment (LCA) methodology. This means that the assessment covers the entire life cycle of the festival and the used products: from raw material extraction, transport of goods, the usage of paint, up to disposal of the graffiti cans and wall paint buckets. With this report we mainly focus on the impact category called Global Warming Potential (GWP). This is used to quantify the impact on the environmental effect most of you have heard of: climate change.

We calculated the equivalent carbon emissions of Step in The Arena. The carbon footprint is expressed in X kg CO<sub>2</sub>-eq or X ton CO<sub>2</sub>-eq. Whereby: 1 ton = 1000 kg.

For this study we used:

- Environmental database: Ecoinvent 3.8
- LCIA method: Environmental Footprint method 3.0.

Input data is available upon request.

A stylized icon of a CO<sub>2</sub> molecule, consisting of the letters 'CO' in a bold, blue font with a subscript '2' below them, all enclosed within a white, cloud-like shape with a black outline.The Ecochain logo features a green infinity symbol on the left, followed by the word 'Ecochain' in a white, sans-serif font on a dark blue background.

The Aerosol Alliance is a proud partner of Ecochain Technologies. We use their LCA software: [Ecochain Mobius](#). To create LCAs and footprint calculations.

The Aerosol Alliance logo consists of a white circular icon on the left, resembling a stylized 'A' or a drop, followed by the words 'AEROSOL ALLIANCE' in a bold, white, sans-serif font on a dark blue background.

# THE DETAILS



This chapter explains all the detailed information regarding actual Life Cycle Assessment study we performed for Step in The Arena 2023. We describe the life cycle phases, the relevant inputs and key assumptions we made per step. Typically when you do a LCA study - as a product manufacturer - you can use the following five generic life cycle phases of a product.

- Raw Material Extraction
- Manufacturing & Processing
- Transportation
- Usage & Retail
- Waste Disposal

However, we are looking at a graffiti festival which is an entertainment service that uses products. Therefore, we needed to change the life cycle phases to make it better fit for the purpose of studying a graffiti festival. They are defined as follows:

Generic LCA phase	Graffiti festival phases	Description
Raw material extraction	1. Paint supplies 2. Packaging	In this phase the raw materials being sourced are paint supplies including their packaging. The entire life cycle of these products have been taken into account.
Manufacturing & processing	3. Festival production	In this phase we investigate the equipment, energy and other inputs that were required to build or set up the festival. For example the usage of a spray gun and aggregate to prepare the walls.
Transportation	4. Transport of artists	This phase considers all the aspects related to the transport of artists from the start of their journey to the event location.
Retail & usage	5. Food & Beverage 6. Use of paint	This phase shows the effects of consuming products in this case we refer to environmental impacts related to the use of paint supplies. We did not have data available on food and beverage consumption but state it regardless.
Waste disposal	7. End-of-life (disposal)	Here we look at the disposal of waste at the end-of-life of products like spray paint cans and wall paint buckets.

# PAINT SUPPLIES

In total 3090 cans of spray paint were used by all artists that joined the graffiti festival. Resulting into an average spray can usage of 30 cans per artist. Together with the 269 liters of wall paint used to prepare the walls in the Berenkuil. The total paint supplies being used are as follows:

- 3090 cans of graffiti paint;
- 269 liter of latex wall paint;

We included the 'cradle-to-gate' impacts of both paints. Meaning we used a LCA model that resembles the impact of the production of spray paint\*. It contains the raw material extraction, transport of these materials and relevant production processes to manufacture the paint. We also included the well known 6 can packaging made from cardboard. For wall paint we assumed HDPE plastic buckets which are used as packaging containers.

\*The Aerosol Alliance made the first LCA of graffiti paint in 2022. For more detailed information on the 'cradle-to-gate' impact of spray paint:



# TRANSPORT OF ARTISTS

This phase covers the impact of artists traveling. In total 105 artists joined Step in The Arena 2023 and traveled from different places to Eindhoven, The Netherlands to paint. The dominant share (97%) of artists came from European countries. The few exceptions were two artists from Australia and one from Russia, who were already traveling through Europe for holiday purposes. Here follows the distribution of artists by transport method. From the 105 artists 10 flew in via air travel (~10%). The rest of the artists either came by car, train or bike. As mentioned earlier not every method of transport was well documented. We assumed that most artists traveled by car (~85%). In our calculation just a few artists came by train (<5%). However, in practice it is highly likely that more artists used the train as a means of transport.

For determining the transport distance we used the artists' home city and chose a central starting point for their travel. The most logical place was to choose the address of a train station or proximity of a station in their home city. The end stop was Berenkuil, Eindhoven. In addition, 15 artists stayed in a hostel near the event location (3 km) and were picked up daily by a bus to commute, which is also taken into account.

# FESTIVAL PRODUCTION

For the preparation of the walls in total 269 liters of latex wall paint was used from the brand Stezo. We made a generic LCA model of wall paint due to a lack of primary data available from the supplier. The walls were prepared using an electric spray gun that ran on electricity. The power of the spray gun in kilo-watt (kW) is 230 kW. The running time was roughly 8 hours. Resulting in an electricity consumption of 1840 kWh. Next to a spray gun an aggregate was used during the festival that ran on diesel. The total fuel consumption was 10 liters.

Resulting in equipment being used a spray gun & aggregate with the following energy consumption:

- Spray gun - 1840 kWh of electricity.
- Aggregate - 10 liters of diesel.

The impact of equipment like food trucks and vendors selling beverages were not taken into account. In general capital goods and rental equipment can be left out of a footprint calculation as the overall contribution to the footprint is assumed to be neglectable.



# USE OF PAINT

In the 2023 edition of Step in The Arena, 269 liter of wall paint was applied to prepare the walls for the artists. Roughly 3090 spray paint were emptied by the artist to create their artworks. This roughly translates into  $0,400 \text{ ml} * 3090 = 1236 \text{ liter}$  of spray paint. As you could read earlier in both phases spray paint is significantly worse compared to wall paint. You might wonder why?

When acrylic spray paint is applied the paint needs to be propelled out of the canister. By using a propellant the paint is dispersed into aerosol particles and when they hit the wall they need to stick and dry.

Cool! And how does that work? Well, these little processes of paint binding and drying are possible due to the presence of binders and solvents in the paint formula.

In combination: propellants, binders and solvents release Volatile Organic Compounds (VOCs) during the use of spray paint. These are relevant because they contribute to ozone formation. Ozone is a pollutant that forms from other pollutants like Volatile Organic Compounds (which are hydrocarbons) and nitrogen oxides (NOx) that react together in the presence of sunlight.



You might still feel a bit puzzled. Don't worry, we'll get to the point. So VOCs are the bad guys here. And the difference between spray paint and wall paint is that graffiti spray paint contains a much higher amount of VOCs compared to wall paint. Typical VOC content per paint type:

- Spray paint: ~400-500 gram / liter.
- Acrylic wall paint: 50 gram / liter.

# USE OF PAINT



To conclude, when we look at the amount of paint used. Graffiti spray paint is used 4 times more during the festival. In addition, the VOC content is roughly 10 times higher. Resulting that spray paint compared to wall paint is considerably worse for the environment when we look at the contribution to climate change.

To be really blunt: making artwork with wall paint and brushes is way better for the environment. Deviating from spray paint to wall paint is a conscious decision you can make as an artist. Bear in mind we are not saying you can't use spray paint. However, when you want to paint greener: a first step could be to consider using less spray paint and try out how to work more with wall paint.

REDUCE  
REUSE  
RECYCLE



Photo by [Matthew Lejune](#) on [Unsplash](#)

# DISPOSAL

End-of-life is LCA jargon which means that a product reached its end of life and can be disposed of. For spray paint typically three scenarios can occur. Either they are discarded at a recycling facility, they are thrown in the bin or left hanging around on a spot. Step in The Arena always facilitated recycling of empty spray paint cans and brought them to a local waste treatment facility that collects old iron and properly recycles the empty and punctured spray paint cans.

# DON'T FORGET THE DRINKS & SNACKS!

We considered food and beverage consumption. However, no data was available from the suppliers or vendors. We could have estimated the consumption of visitors but also there was a lack of data on the total number of visitors of the festival. Making it hard to make an estimation that made sense. Therefore, we decided to leave this topic out of the carbon footprint calculation. For next graffiti festival footprint calculations we highly advise the curator and festival organizers to gather data related to food and beverage consumption and require vendors to share this information afterwards. We estimate the contribution to the total carbon footprint to be significant enough (>5%) to take into account.



# DON'T FORGET



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# CONCLUDING

Step in the Arena (SITA) has taken important steps to understand and reduce the environmental impact of graffiti festivals. The festival's total carbon footprint is 20,057 kg CO<sub>2</sub>-eq. To put this in perspective, this impact is comparable to 950,000 cups of coffee, 47,000 avocados, 12 round-trip flights between New York City and Amsterdam, or driving 1.6 times around the world by car. The main causes are:

1. The travel of artists;
2. Paint supplies;
3. The use of paint.

Most emissions come from artists traveling by car and airplane. The spray paint used at the festival also has a high impact due to its high VOC content which is released when artists are making graffiti art.

The findings show that promoting more eco-friendly travel options, like trains, electric cars, and bikes, can help reduce the impact. Also, using wall paint instead of spray paint can lower the carbon footprint because wall paint contains fewer VOCs.

Some data gaps remain, particularly regarding food and beverage consumption and the transport of visitors, which were not included in this assessment. Future studies on (graffiti) art festivals should aim to gather more comprehensive data to enhance the accuracy of the environmental footprint calculations.

SITA has already made efforts like collecting and recycling spray cans. The study shows that there's more to be done to make graffiti festivals greener. By encouraging artists, organizers, and everyone involved to care more about the environment. This report gives useful information to help reduce the environmental impact of graffiti and graffiti festivals. As the first detailed study of its kind, it sets a standard for future events and encourages everyone to work together to make graffiti and street art more environmentally friendly.

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