Final report

The 2051 Munich Climate Conference

Climate neutral through avoiding, calculating, and compensating greenhouse gas emissions

Lea Klausmann

Sengül Weidacher

FutureCamp Climate GmbH

This document is climate neutral through compensation.

December 2021

Motivation and FutureCamp's role

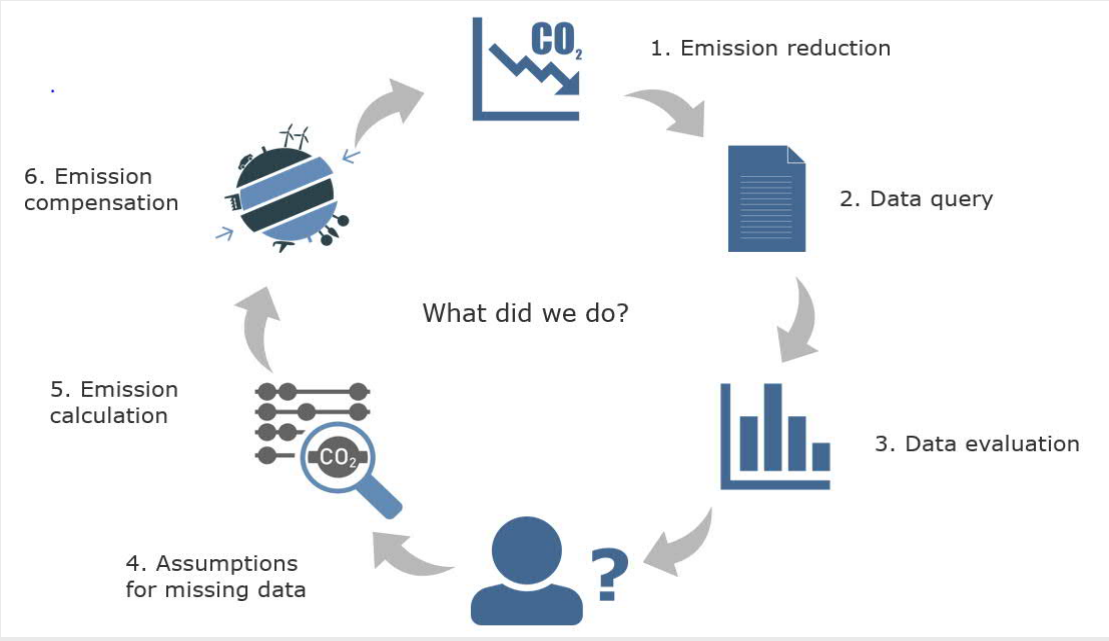
When the artist group Büro Grandezza began to plan the 2051 Munich Climate Conference, they set out to create a sustainable event in line with the goals of the conference. It became clear that they could not accept visitors traveling by plane to a climate conference. Virtual participation had to be equally attractive. Together with design studio Moby Digg and broadcasting experts MediaBox TV, they developed the virtual arm of T2051MCC. In addition, Büro Grandezza partnered with Climate experts from FutureCamp Climate, Rehab Republic's zero waste team, and Omnicert verifiers reduce and compensate carbon emissions, reduce waste and critically review the taken measures.

FutureCamp Climate GmbH is a Munich-based consultancy that advises companies and other institutions on climate strategies, emission trading and sustainability reporting for more than 20 years. As a sponsor of T2051MCC, FutureCamp took on the task of calculating the carbon footprint of the event held on the 18th to 19th of September 2021 at Bellevue di Monaco. This also included advising on and implementing reduction measures beforehand as well as subsequently carrying out the compensation of unavoidable greenhouse gas emissions caused by the two-day conference. This report gives an overview about the approach, calculation methods and reduction measures. The results were also presented in person at the conference.

How did we proceed?

For identifying reduction measures and the calculation of the event footprint, FutureCamp follows the strategic guidelines of the Greenhouse Gas Protocol (https://ghgprotocol.org/) and additional current standards. In addition, the company can look back on many years of experience in carbon footprinting to help make appropriate assumptions and recommendations. Subsequently, the different working steps are briefly described and an overview about the most important results is given.

Overview of the steps to calculate a carbon footprint



Step 1: Identify and address emission reduction potentials

Implementing abatement measures to reduce greenhouse gases generally follows a circular process: Before calculating the carbon footprint, a data query is carried out to collect information. The received input is then evaluated, and assumptions are made in case of missing data. Emission factors need to be researched to carry out the calculation. Lastly, the resulting emissions can be compensated to achieve carbon neutrality. However, the option of compensation should not be taken as a "free pass" to continue business-as-usual without working towards real change to achieve net-zero emissions. On the contrary, compensation should be used as a last resort for emissions that are currently unavoidable. Following this mitigation hierarchy, it means that priority should always be given to emission reduction measures before compensation for a credible approach.

Before the footprint calculation, FutureCamp therefore brainstormed feasible ways to reduce the emissions of T2051MCC as a first step. Together with organizers, four areas of action were identified based on the biggest levers to reduce emissions: Energy, mobility, accommodation, and food. The area of logistics was excluded from the reduction efforts, as no viable alternative to transport by car could be found for the artwork installations and technical equipment. Since this category represents only a small part of emissions, it can be neglected.

Energy

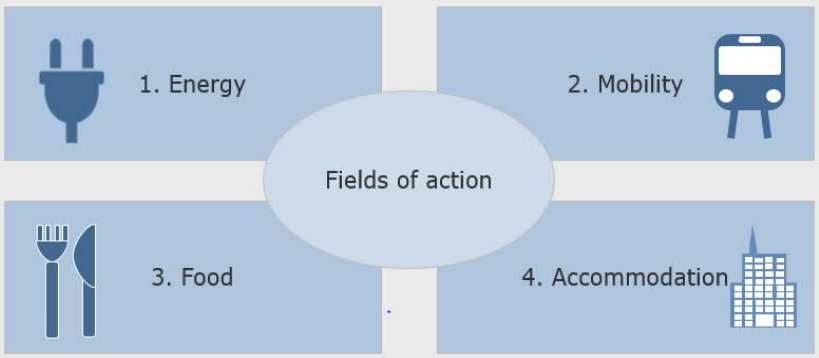
Regarding the heating and electricity used at the event location as well as office spaces, Büro Grandezza has no direct influence on the procurement in place by partners of the event. During the data query prior to the conference, we asked all involved parties for their heat and electricity consumption and whether they use green electricity. This process has served to highlight the climate relevance of their activities and serves as an impulse for the event partners to rethink their status quo.

The switch to green electricity can be an easy and quick way to reduce an organization's emissions immediately, however it permanently increases the costs. To achieve a credible commitment, certain criteria should be considered when choosing a provider: the country of origin, investments into new renewable energy installations (and continued operation or repowering of old EEG-funded installations), as well as no shares or participation in coal or nuclear energy. Green electricity labels like OK-power or TÜV-Süd guarantee the compliance with certain minimum criteria and can help with communication and best-practice advise.

Mobility

The event location Bellevue di Monaco lies centrally in Munich and is therefore easily reachable by eco-friendly travel-options like public transport, by bike, e-scooter or on foot. To reduce emissions caused by mobility to and from the conference place, Büro Grandezza chose not to accept any guests travelling by plane. Thereby, one

Step 1: Identify and address emission reduction potentials



of the largest levers of reducing conference emissions was successfully applied. To nevertheless keep the event accessible for everyone, a hybrid format was put in place, combining the use of the online streaming with an in-person event. Büro Grandezza teamed up with Moby Digg and MediaBox TV to ensure that the online event could take place as an equally attractive opportunity.

Accommodation

For guests that stayed in Munich for the conference, FutureCamp researched eco-friendly accommodations in Munich beforehand to reduce the greenhouse gas emissions caused by hotel stays. We made sure to include different price and comfort levels in our recommendations for guests to accommodate varying preferences. This included the general notice that camping or couch-surfing can be sustainable and budget-friendly alternatives to hotel stays. Criteria for sustainable hotel options were for example:

- Closeness to the event location
- Representation of different budget ranges
- Transparent communication about measures for sustainability and holistic approach (no green-washing)
- Preferred: Calculation and/or compensation of carbon footprint, green electricity, organic and/or plant-based food options

Internet research was combined with direct inquiries to evaluate their sustainability concepts. While it was a challenge to find hotels that combine as many of the desired criteria as possible near the event location, we also found that nowadays a variety of green hotel labels and certifications exist to improve transparency about different sustainability standards. The results of this research can be found in the Annex 1.

Food

Regarding the meals for the participants, a large amount of the reduction potential is already utilized independent of the conference, given that the Café Bellevue di Monaco only serves vegetarian and vegan food and serves fair-trade coffee. This is in accordance with the recommendations of the WWF for a climate friendly diet.

Furthermore, the impact of catering on the planet can be reduced by

- using reusable dishes, no single-use plastic or packaging,
- offering drinks in reusable bottles as well a tab water,
- Sizing portions appropriately (avoid buffets) to minimize food waste.

The latter aspects were covered by the zero-waste concept of Rehab Republic.

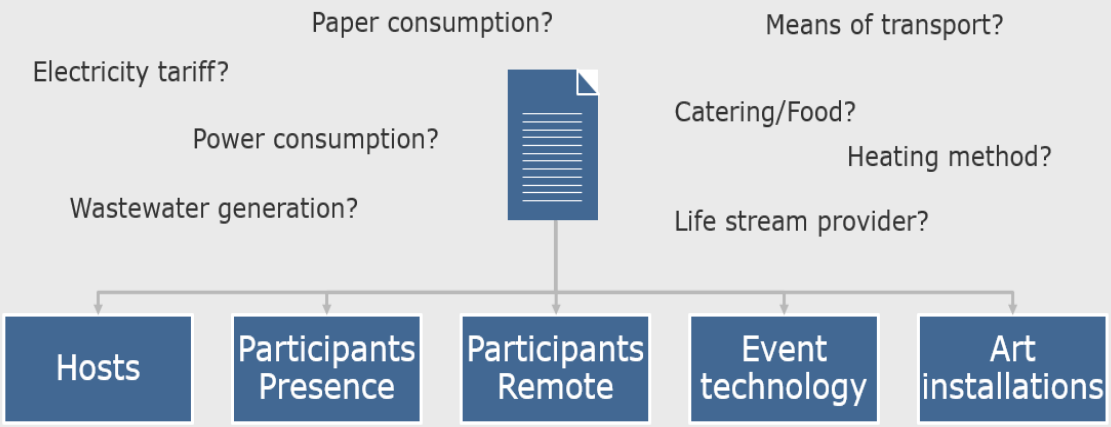
After the emission reduction potential is exhausted and all feasible abatements measures are implemented, the next step to determine the carbon footprint of T2051MCC is to determine the system boundaries for the calculation and perform an initial data query.

Step 2: Determine the system boundaries and perform a data query

To calculate the carbon footprint of the conference, we first needed to evaluate which areas and activities related to the event should be included in the calculation and how they can be accounted for.

Organizational and thematic boundaries can be differentiated. The thematic areas include energy, mobility, catering, accommodation, and logistics. The area of waste could be excluded due to the zero-waste concept implemented by Rehab Republic. The organizational units include the organizers/hosts, in-person and remote participants, as well as the providers of the event technology and art installations. Therefore, the contact persons of these different groups of participants were asked to provide information on their energy consumption, means of transport, and use of other relevant resources in relation to the event like end devices in the form of very detailed questionnaires. This makes it easier for the participants, some of which might be unfamiliar with the topic of carbon footprinting, to reply to the collected questions at once, and accelerates the evaluation afterwards.

Step 2: Determine the system boundaries and perform a data query



Step 3: Evaluate the received data

Once the questionnaires are returned, it is time to evaluate the data. Not all participants were able to answer the questions to the desirable degree of detail. Overall, the number of replies was lower than expected. For future events, it could be useful to investigate obstacles as well as explore possible incentives to receive better data. The given responses were also checked for plausibility to make sure no mistakes will distort the calculation.

Step 4: Make assumptions for missing data

Wherever questions could not be answered conclusively, for example because key figures are unknown, assumptions needed to be made to replace real data in the calculation. Also some groups of participants could not be questioned (completely) prior to the event. For example, the organizers did not know exactly how many participants would show up in-person before the conference, as spontaneous walk-ins were accepted without registering in advance. Therefore, an estimate of 150 in-person participants was used, and 400 remote participants. An additional factor in this case was that the collaborating cultural and not-for-profit organizations did not have comprehensive monitoring

Step 3: Evaluate the received data

Step 4: Make assumptions for missing data

practices in place regarding their energy consumption. Therefore, assumptions needed to be made for some aspects.

Step 5: Provide emission factors

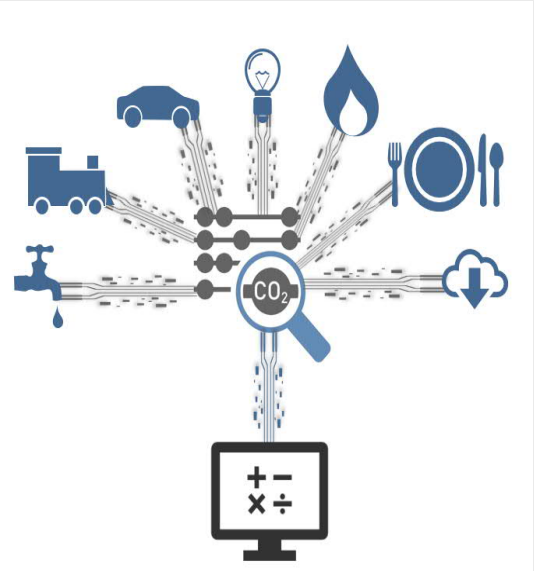
The next step is to match the provided data with emission factors. An emission factor is a coefficient which aims to represent the amount of carbon dioxide or carbon dioxide equivalents released into the atmosphere by a certain activity (e.g. driving a car for a certain amount of kilometres). In most cases, these emission factors can be looked up in data bases or lists like the list of greenhouse gas reporting conversion factors that are updated each year by the UK government. In case of the Munich Climate Conference, a special aspect was the remote participation of people via the online video streaming services Youtube and Mozilla Hubs.

Exkursus: Streaming emissions

When looking for data on emission factors of online video streaming, we found that relatively little publicly available research has been done in the past. Despite the fact, that video streams make up the majority of the global data streams on the internet and are consumed daily by many people, large uncertainties still remain regarding its climate impact on the global scale. Only in recent years some studies have tried to estimate it, with one controversially discussed study by the French think-tank "The Shift Project" placing their estimate at the high end in 2019, stating that global video streaming is comparable to the emissions of the country of Spain. Though some have criticized the study's assumptions, claiming it overestimates the streaming footprint, it's clear that with yearly increasing data flows, it's climate impact can no longer be neglected. The following information can be found in more detail and with additional sources in the Annex 2.

From the end user perspective, there are three sources of emissions that need to be considered when determining an emission factor. First, emissions originate from the electricity consumption and temperature regulation of servers of the streaming providers, where the data is stored. However, the streaming providers Youtube and Mozilla Hubs used for the Munich Climate Conference do not publish information on the location and energy consumption of their servers in the world, leaving the climate impact uncertain. Secondly, the data transmission from the server requires energy and an infrastructure, which also results in greenhouse gas emissions. They vary depending on the technology used for data transmission. Usually, data transfer is more environmentally friendly over

Step 5: Provide emission factors



WIFI than on mobile data. Also, the longer a video and the higher the resolution, the more data it consists of and the transfer requires more energy. Lastly, the electricity of the end device of remote participants factors into the carbon footprint.

This was identified as the most relevant and easily influenceable source of emissions in connection with online participation.. FutureCamp therefore made own measurements. The focus of the measurements was on the additional power consumption of the end devices caused by participation via Mozilla Hubs (or Youtube).

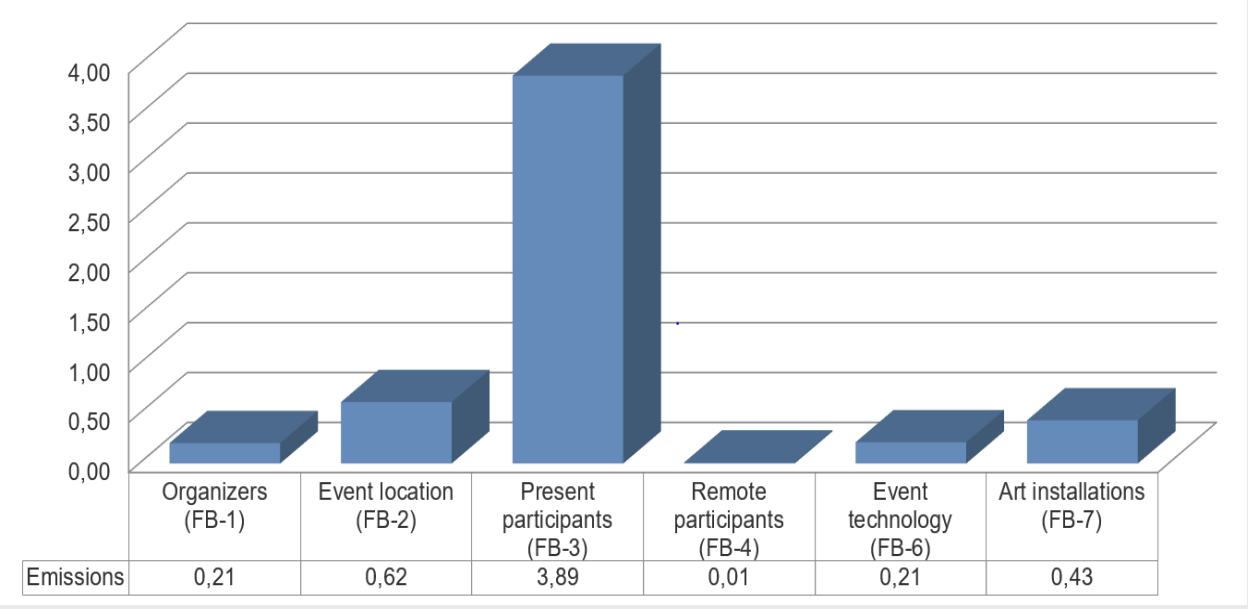
Measurements were taken on an ordinary laptop, as this is most likely to represent the cross-section of participants. Various tools were used to measure the power consumption over time. A clear difference between background noise and the energy consumption during the use of Mozilla Hubs (or Youtube) could be determined, especially for the processor (CPU) and the graphics card (GPU). The GPU was not active during normal use. Only when a demanding application was started (e.g. Mozilla Hubs), power was consumed by the GPU. The 3D modelling of Mozilla Hubs required continuous calculations, which leads to higher power consumption of the CPU and GPU. Youtube, on the other hand, downloads individual video segments at periodic intervals. In addition, videos on Youtube are mostly in 2D only. This led to a significantly lower and more irregular power consumption.

Based on these measurements comprehensible calculations regarding the emissions caused could be made. However, it should be mentioned that much more power-hungry components, such as a large 4k monitor, a faster processor or an extra graphics card with high computing power, have an immense impact on the total power consumption of the end device. Nevertheless, the collected measured values offer a good orientation, but should not automatically be transferred to every individual.

Step 6: Calculate unavoidable emissions - Results

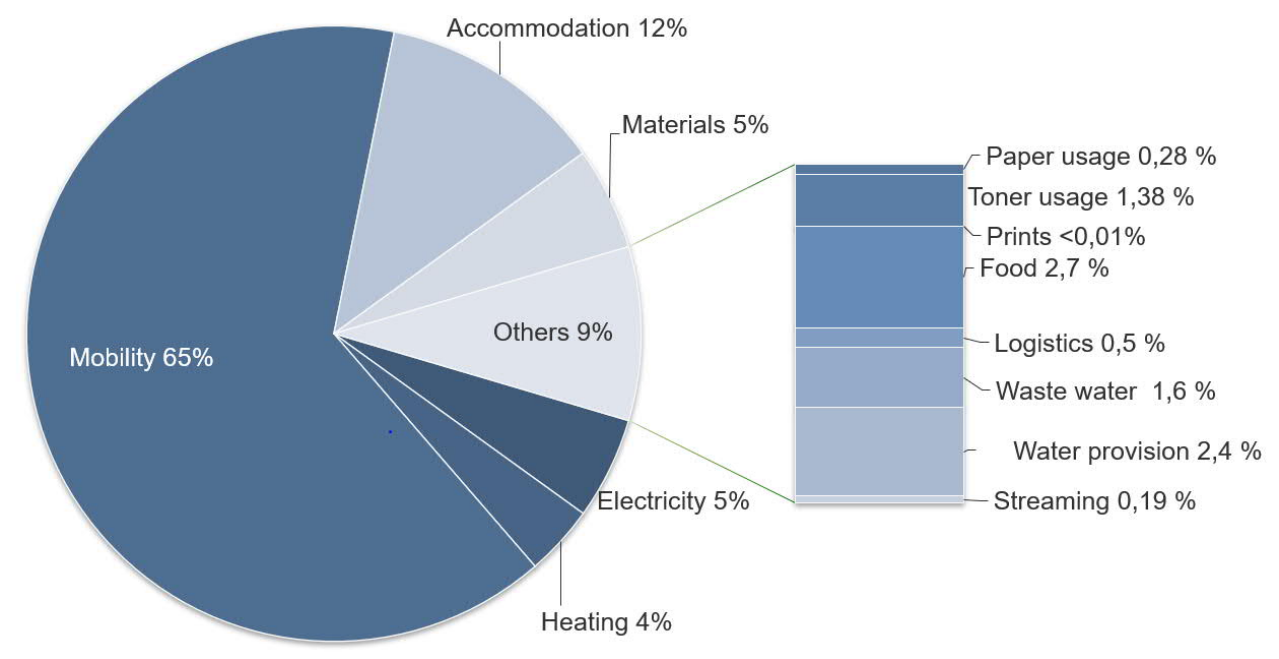
As a last step before compensation, all the previously collected information is used to calculate the final carbon footprint of the unavoidable emissions caused by the conference. The footprint of the Munich Climate Conference amounts to 5,37 tonnes of carbon dioxide equivalents. The largest contributor to this result is the area of mobility. Even though no flights were accepted as mode of transport, the participants' journeys by car and public transport still have the largest impact. For comparison, even if only one person had travelled by plane from Texas to Munich and back for the event, those two flights alone would have cause 3 tonnes of

Results I: Emissions allocated to different event spheres (t CO_2e)



	Organizers (FB-1)	Event location (FB-2)	Present participants (FB-3)	Remote participants (FB-4)	Event technology (FB-6)	Art installations (FB-7)
Emissions	0,21	0,62	3,89	0,01	0,21	0,43

Results II: Emissions allocated to sources (t CO_2e)



carbon dioxide equivalents and drastically increased the footprint of the conference. The second largest emitting area were the activities at the conference location, originating from the energy consumption, food provision, water consumption and logistics. The art installations, created from materials such as glas, PVC, steel, wood, paper and others also contributed significantly to the emission. The streaming emissions from the remote participants only make up a very small part of the conference emissions, especially in comparison to the in-person participants. This shows the enormous reduction potential that a hybrid event with online participation offers.

In general, the footprint of T2051MCC of 5,36 tonnes of carbon dioxide is very low. For comparison: On average, the yearly carbon footprint of a German is 11 tonnes of carbon dioxide (cf. https://uba.co2-rechner.de/de_DE/). In 2019, the political scientist Sebastian Jäckle compared the travel emissions of six scientific conferences of the European Consortium for Political Research and calculated that every visitor causes on average 0,5 to 1,5 tonnes of CO_2 per 3-day conference, with seven percent of participants with very long journeys making up over 50 percent of the emissions. Each participant of the T2051MCC only produced around 0,001 tonnes during the 2-day-event. In Annex 3 you can find the calculation results in detail.

Step 7: Compensate emissions

After verification of the carbon footprint by Omnicert GmbH, FutureCamp compensates the resulting emissions by retiring carbon credits. For this purpose, the equivalent amount of credits will be purchased from the climate and forest protection project REDD++ Jacundà in Brazil. The project takes place in the nature conservation area Rio Preto-Jacundà in the federal state Rondônia in the north-west of Brazil. It aims to reduce the illegal logging and forest destruction in the area as well as generating alternative sources of income for the local community. The project is certified under the Verified Carbon Standard and the Climate, Community and Biodiversity Standard. More information can be found under https://www.die-klimamanufaktur.de/projekte/waldschutzprojekt-redd-jacunda.

Additionally, 6 tonnes of CO_2 were reduced within reforestation projects of the “Menschen für Menschen”-foundation in Ethiopia (https://www.menschenfuermenschen.de/co2). Menschen für Menschen aims to enable people in rural Ethiopia to improve their livelihoods by providing aid to self-help at eye level. One aspect of the foundation’s work is integrated reforestation, which creates alternative sources of income and enriches ecosystems.

Quelle: Stiftung Menschen für Menschen

Conclusion

In conclusion, the reduction measures to decrease the carbon footprint of the Munich Climate Conference have been successful. Excluding flights as a mode of transport and focusing on a hybrid event form was the biggest lever to reduce greenhouse gas emissions. In addition, a significant amount of emissions was avoided in other areas like for example through catering plant-based food. This example shows that it can be productive to investigate all reduction options for holding a more sustainable event. The overall footprint of the Climate Conference is therefore very low for an international scientific conference.

Another takeaway from the project has been that while all event partners were willing and interested to cooperate to determine their emissions related to the conference, the knowledge and capacities to report the required data was sometimes lacking in the cultural field. Therefore, the calculation needed to be based on many assumptions, as partners were not able to provide us with real data on their energy and resource consumption.

For future events, this could be improved by raising awareness beforehand and encouraging more comprehensive monitoring from all involved parties. Besides documenting purposes, this report also aims to guide other event managers in the cultural field interested in holding a sustainable event. What was a learning experience for us might help others as a starting point or blueprint to avoid mistakes and kick-start their own emission and waste reduction measures. We hope you can take inspiration and motivation from our report to take on the challenge.

Annex

Annex 1: Slides “Sustainable Stays in Munich”

:FutureCamp

Sustainable Stays in Munich

FutureCamp, 16.07.2021

:FutureCamp

On the following pages you will find suggestions and ideas for a climate-friendly stay in Munich. They do not represent a conclusive research. We are looking forward to your tips.

General tips for hotel guests to protect the environment

- Short distance to event location (if possible)
- Travel with public transport:
  - **Tickets & Day Tickets:** https://www.mvv-muenchen.de/en/tickets-and-fares/tickets-daytickets/index.html
  - **Tourist information flyer:** https://www.mvg.de/dam/mvg-en/downloads/mvg-tourist-information-flyer.pdf
  - **MVV journey planner:** https://efa.mvv-muenchen.de/index.html#trip@enquiry
- Reuse towels
- Do not request room service / daily cleaning
- Close all windows and turn off lights and devices when leaving the room
- Take hygiene product samples home and use them up
- Order plant-based, regional, and seasonal dishes
- Reduce your water usage

Websites to search for sustainable hotels:

- Search portal for green accommodations
  - Allows to filter search for certain criteria (carbon footpring, bike-friendly, etc.)
  - https://www.viabono.de/hotels-unterkuenfte.html
- Certified „Bio-Hotels“ in Germany
  - https://www.biohotels.info/
- Munich:
  - https://my-greenstyle.com/eco-hotels-in-muenchen-city-guide/
  - https://greentraveltheworld.com/5-top-biohotels-in-muenchen-und-umgebung/
- Selection of recommended hotels – for details please see following pages:
  - DERAG Living Hotels, Cocoon Hotels
  - Guest house Il Plonner, Bader Hotel, Hotel Alter Wirt

1

https://www.skyscanner.de/nachrichten/inspiration/umweltfreundlicher-urlaub-tipps-um-nachhaltiger-zu-reisen

DERAG Living Hotels

- All DERAG Living Hotels:
  - 100 % green electricity („Öko-Strom")
  - Carbon footprint calculation and compensation for business trips and district heating
  - Recycling paper
  - No single-use coffee cups or plastic cups
  - No palmoil in the food (except breakfast bakery products)
  - Green Globe certified
- https://www.living-hotels.com/umweltschutz-und-nachhaltigkeit/
- DERAG Living Hotel at Viktualienmarkt (pictures on the right)
  - 300 m/ 4 min. walk from Bellevue di Monaco, from 150 Euros per night
  - Vegetarian and vegan cuisine
- DERAG Living Hotel Prinzessin Elisabeth
  - 2 km/ 20 min. walk from Bellevue di Monaco, from 100 Euros per night
  - Free charging station for electric cars
- DERAG Living Hotel at Deutsches Museum
  - 2 km/ 20 min. walk from Bellevue di Monaco, from 80 Euros per night
  - Free charging station for electric cars
- DERAG Living Hotel SOULMADE
  - Munich Garching
  - About 25 min. with U6 to Marienplatz, from 80 Euros per night
  - Wooden building with own solar panels on the roof and e-car charging station
  - Plants a tree for each guest

2

Cocoon Hotels

- 3 Hotels in Munich:
  - Am Stachus
  - Am Hauptbahnhof
  - Am Sendlinger Tor
- From 80 Euros per night
- Green electricity (Stadtwerke München)
- Plant-for-the-Planet-Partner
- Green Rate (10 % discount for renouncing daily room service and towel change)
- Rental bikes for guests
- Honeybee colony on the rooftop (Sendlinger Tor)
- E-car charging station (Hauptbahnhof)
- https://cocoon-hotels.de/de/home.html

Guest house Il Plonner

- Wessling-Oberpfaffenhofen
- Distance to event location:
  - Location of hotel is about 20 min. to walk from railway station
  - S8 takes 40 min to Marienplatz (6,80 € one way)
- From 80 Euros per night
- „Biohotel"
- Climate-neutral hotel (carbon footprint of 32 kg/CO2 per night compensated)
- Family owned
- https://www.ilplonner.de/

3

Bader Hotel

- München Parsdorf
- Distance to event location:
  - About 40 min. with bus and S-Bahn to Marienplatz
- From 130 Euros per night
- Wooden construction
- Cooling system with rain water
- Saisonal, mostly regional kitchen
- E-car charging station

- https://www.dasbaderhotel.com/de/das-bader-hotel/

Hotel Alter Wirt

- Grünwald
- Distance to event location:
  - About 30 min. with Tramway and Subway
- From 90 Euro per night
- „Biohotel"
- Climate-neutral hotel (carbon footprint of 16 kg/CO2 per night compensated)
- E-car charging station
- Family owned
- PV-Anlage

https://www.alterwirt.de/

4

Camping and couchsurfing is a sustainable and budget-friendly alternative to hotel stays.

Camping in Munich

- **Campinggground München Thalkirchen** near the Isar http://campingplatz-thalkirchen.de/
- Subway connection to city centre (line U3, 15 min. until stop Marienplatz)
- 10-15 Euros per person per night

- **Campinggground Nord-West** https://campingplatz-nord-west.de/

- **Campinggground München-Obermenzing** https://www.campingplatz-muenchen.de/

Couchsurfing

- Couchsurfing: https://www.couchsurfing.com/
- Registration and a personal account required
- 56 000 hosts in Munich
- free

- Couchsurfing-groups for cities on Facebook or other social media platforms

5

Guest apartments

- One of the few opportunities to stay overnight in Munich at a lower price is offered by the housing cooperatives, which also provide apartments for guests that can be rented by non-members as well.
- The links to the individual projects, which are managed by volunteers, can be found on the homepages of the housing cooperatives:
  - WOGENO
    - https://www.wogeno.de/wohnen/gaesteappartements.html
  - WAGNIS eG
    - https://ackermannbogen-ev.de/gemeinschaftsraeume/gaesteapartments/

6

Contact

Your contact for further questions

Sengül Weidacher
Head of Carbon Footprinting Services

+49 (172) 865 90 16
senguel.weidacher@future-camp.de

FutureCamp Climate GmbH

Aschauer Str. 30
81549 Munich, Germany

www.future-camp.de
www.carbon-footprinting.de

7

Annex 2: Slides Streaming services – climate impact and options for emission reductions

:FutureCamp

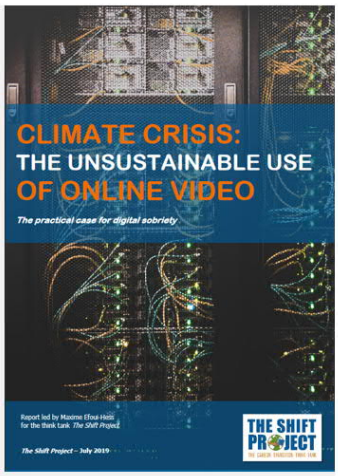
Streaming services – Climate impact and options for emission reduction

FutureCamp, 19.07.2021

:FutureCamp

The Shift Project (2019) I

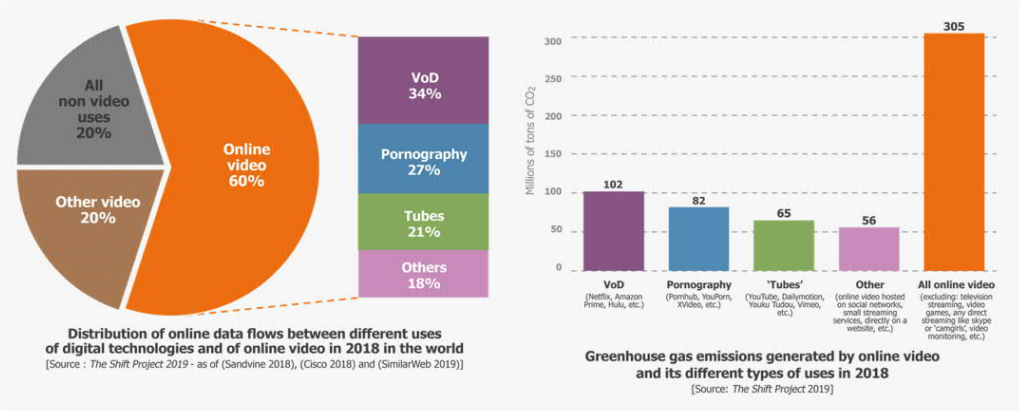
- Study of a French think-tank
- estimated the global climate impact of streaming services similar to the yearly emissions of the country of Spain
  - estimate based on the world-wide emission factor of electricity and the average data transmission, end device etc.
- Criticism:
  - Rough overestimation based on incorrect general assumptions
  - Little accuracy in regards to actual emissions of certain platforms, people etc.



https://theshiftproject.org/wp-content/uploads/2019/07/2019-02.pdf

14

The Shift Project (2019) II



Bitkom-Study (2020)

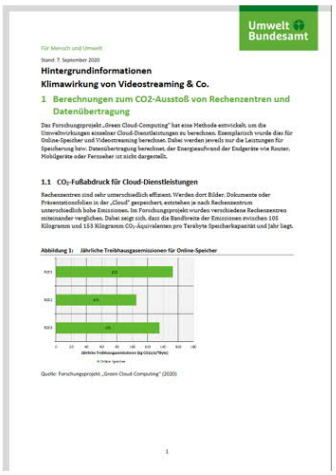
- Study comissioned by the National Association for Information, Telecommunication and New Media
- Video-streaming in HD-quality over WIFI causes around 100 to 200 g CO2/hour (=1km car ride)
- This climate footprint has stayed rather constant over the years, even though the amount of transmitted data for video streaming in Germany rose by 26 % yearly
  - This is due to increasing efficiency of data transmission and the increasing percentage of renewable energy in the electricity mix

https://www.bitkom.org/sites/default/files/2020-06/200618_lf_nachhaltigkeit-von-streaming.pdf
Hintergrund zu Methodik: https://www.borderstep.de/wp-content/uploads/2020/06/Videostreaming-2020.pdf

Federal Environment Agency (2020) I

- Different sources of emissions from video streaming:
  - Data center
  - Network / transmission
  - (end device – not considered)
- Reduction options for consumers
  - Reduce data quantity by using lower resolution
  - Use ad-blockers to avoid advertisement videos, pop-ups and other unwanted content
  - Deactivate autoplay
  - Use of WIFI instead of mobile data transmission
  - Use energy saving or efficient end devices

https://www.umweltbundesamt.de/sites/default/files/medien/2546/dokumente/factsheet_klimawirkung_video-streaming.pdf
Ausführlicher:
https://www.umweltbundesamt.de/sites/default/files/medien/376/publikationen/politische-handlungsempfehlungen-green-cloud-computing_2020_09_07.pdf


Umwelt Bundesamt

Hintergrundinformationen
Klimawirkung von Videostreaming & Co.

1 Berechnungen zum CO2-Ausstoß von Rechenzentren und Datenübertragung

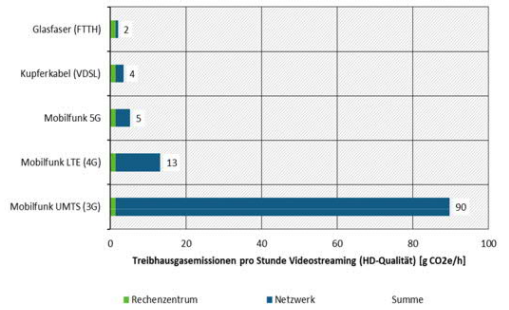
1.1 CO_2-Fußabdruck für Cloud-Dienstleistungen

Abbildung 1: Jährliche Treibhausgasemissionen für Online-Speicher

17

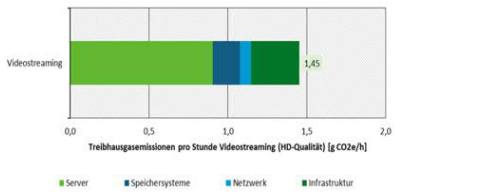
Federal Environment Agency (2020) II

Abbildung 3: Treibhausgasemissionen im Rechenzentrum und im Netzwerk pro Stunde Videostreaming (HD-Qualität)



Quelle: Forschungsprojekt „Green Cloud-Computing" (2020)

Abbildung 2: Treibhausgasemissionen im Rechenzentrum pro Stunde Videostreaming



Quelle: Forschungsprojekt „Green Cloud-Computing" (2020)

18

NRDC / WSP (2012)

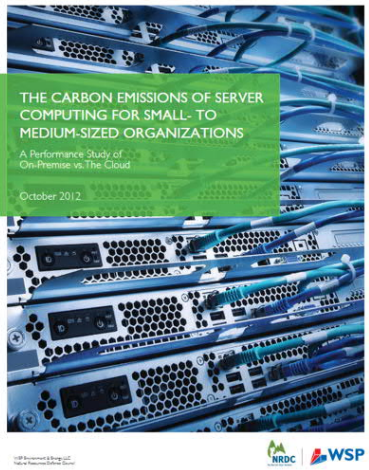
- Natural Resources Defence Council (NGO) & WSP Global company

3 key variables can significantly improve the greenhouse gas footpring of data centers:

- Maximize server load (therefore cloud services can be more efficient than on-premise)
- Optimize emission factor of the electricity (purchase green electricity or own production of renewable energy)
- Improve energy efficiency of the server room (electricity usage, cooling etc.)

https://www.nrdc.org/sites/default/files/NRDC_WSP_Cloud_Computing_White_Paper.pdf

- Text hinzu



21

Greenpeace (2017) I

- Since 2009 Greenpeace has been benchmarking companies of the IT sector for their energy performance to improve transparency and competitiveness
- Greenpeace rates companies for factors like electricity mix, energy efficiency and transparency

https://www.greenpeace.de/sites/www.greenpeace.de/files/publications/20170110_greenpeace_clicking_clean.pdf

- Text hinzufüger

22

Greenpeace (2017) II

- „Google took several significant steps forward since our last report toward a renewably powered Google Cloud, building on it's strength of advocacy and renewable procurement, but also improving its renewable energy deployment in new markets to keep pace with its rapid growth."
- „Google still has significant room to improve in regards to data transparency, however, lagging behind Apple, Facebook and Switch in providing facility level energy demand data."

Video Streaming

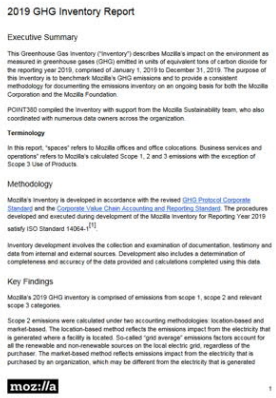
	Final Grade	Clean Energy Index	Natural Gas	Coal	Nuclear	Energy Transparency	Renewable Energy Commitment & Siting Policy	Energy Efficiency & Mitigation	Renewable Procurement	Advocacy
YouTube	A	56%	15%	14%	10%	B	A	A	A	A

23

Mozilla Hubs (2020) I

- Mozilla first published their corporate carbon footprint in 2020 (of the year 2019 as a „baseline" for future reductions)
- Emissions in 2019: about 800 000 t CO2e
  - About 2% caused by „business services and operations" (Scope 1 and 2)
  - About 98% caused by the use of products (Scope 3), estimated based on the average end device etc.

https://blog.mozilla.org/wp-content/blogs.dir/278/files/2021/02/Mozillas-2019-Greenhouse-Gas-emissions-baseline_2020-11-18.pdf



2019 GHG Inventory Report

Executive Summary

This Greenhouse Gas Inventory ("inventory") describes Mozilla's impact on the environment as measured in greenhouse gases (GHG) emitted in units of equivalent tons of carbon dioxide for the reporting year 2019, comprised of January 1, 2019 to December 31, 2019. The purpose of this inventory is to benchmark Mozilla's GHG emissions and to provide a consistent methodology for documenting the emissions inventory on an ongoing basis for both the Mozilla Corporation and the Mozilla Foundation.

POINT360 compiled the inventory with support from the Mozilla Sustainability team, who also coordinated with numerous data owners across the organization.

Terminology

In this report, "spaces" refers to Mozilla offices and office colocations. Business services and operations" refers to Mozilla's calculated Scope 1, 2 and 3 emissions with the exception of Scope 3 Use of Products.

Methodology

Mozilla's inventory is developed in accordance with the revised GHG Protocol Corporate Standard and the Corporate Value Chain Accounting and Reporting Standard. The procedures developed and executed during development of the Mozilla Inventory for Reporting Year 2019 satisfy ISO Standard 14064-[1].

Inventory development involves the collection and examination of documentation, testimony and data from internal and external sources. Development also includes a determination of completeness and accuracy of the data provided and calculations completed using this data.

Key Findings

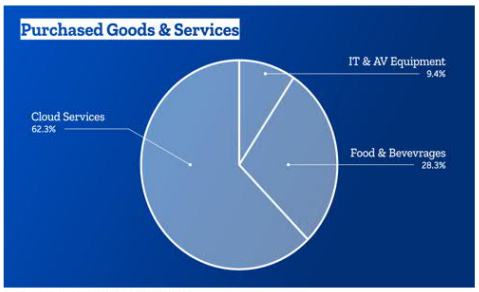
Mozilla's 2019 GHG inventory is comprised of emissions from scope 1, scope 2 and relevant scope 3 categories.

Scope 2 emissions were calculated under two accounting methodologies: location-based and market-based. The location-based method reflects the emissions impact from the electricity that is generated where a facility is located. So-called "grid average" emissions factors account for all the renewable and non-renewable sources on the local electric grid, regardless of the purchaser. The market-based method reflects emissions impact from the electricity that is purchased by an organization, which may be different from the electricity that is generated

moz://a

24

Mozilla Hubs (2020) II



- Business Services and Operations: 14,222 mtCO2e
  - Purchased goods and services: 8,654 mtCO2e
  - Business travel: 2,657 mtCO2e
  - Events: 1,199 mtCO2e
  - Offices and co-locations: 1,195 mtCO2e
  - Remotees: 194 mtCO2e
  - Commute: 147 mtCO2e
- Product use: 785,474 mtCO2e

Table 13: Purchased Goods & Services

Emissions Scope	Scope 3, Category 1
Activity Data	Values reported by data managers via Mozilla GHG Inventory Data Request collection template. Includes PG&S reported by Mozilla spaces and other non-event expenses, such as professional services, electronic equipment and cloud services.
Key Assumptions	Assumptions were made to facilitate mapping of Mozilla-defined category-level and supplier-level spend to DEFRA emissions factor categories. For cloud services, key assumptions include: • Annual server energy consumption: 1760.3 kWh/year • Server lifecycle emissions: 160 $kgCO_2e$/year • Cloud utilization: 50% improvement over on-site servers • Server allocation per $ spend: 0.001 server / $ spend • Emissions factor: 0.0004 $mtCO_2e$/kWh (based on global average Firefox emissions / kWh consumed)

25

Tab. 13 continued

Estimation Parameters	Estimation parameters for cloud services described above and applied consistently across vendors (expect direct vendor emissions reporting)
Emissions Factor Source(s)	*DEFRA, Department for Environment, Food and Rural Affairs (Defra)*, DEFRA 2012 Guidelines to Defra/DECC's GHG Conversion Factors for Company Reporting, Version 1.0, updated May 28, 2012. This is the most up-to-date version available.
Calculation Details	Sum of office-specific annual purchased goods and services in $USD, categorized by DEFRA emissions category, multiplied by appropriate emissions factor to calculate total GHG emissions for organization-wide purchased goods and services in $mtCO_2e$. Example: • $100,000 x 0.0007595 $mtCO_2e$/$USD of spend on food and drink = 75 $mtCO_2e$ • $600,000 x 1760.3 kWh/yr x 0.0001 server/$ x 50% improvement = 530 MWh x 0.0004 $mtCO_2e$/kWh = 212.3 mtCO2e
Additional Details	All factors and calculations for this category are an estimate of cradle-to-grave lifecycle emissions (i.e. material extraction, processing & manufacturing, product use, disposal & end of life). This is the only emissions category reporting lifecycle emissions.

Mozilla Inventory Data Management Recommendations Tab. 21

Purchased Goods & Services: Cloud Services	Direct reporting from only the two main vendors. All other vendor emissions estimated based on emissions / $ spend.	Refine estimate of emissions per dollar $. Consider collecting vendor data on where the service is hosted.

Conclusion:

- Mozilla uses mostly cloud services provided by suppliers and only estimates emissions
- Report contains no information regarding the location of those servers

26

Annex 3: Results of calculating the carbon footprint of T2051MCC

Berechnung der Emissionen										
										Gesamt (tCO2e)
Organisatoren										**0,205602352**
Strom	Stromherkunft	Verbrauch [kWh]	Fläche [qm]	EF [aus Rechnung]	Vorbereitungszeit					0,077150685
	Deutschland (m²)		16		110					0,077150685
Wärme	Brennstoff	Verbrauch [kWh]	Fläche [qm]							0,005257
	Holzpellets	100								0,005257
Mobilität	Fahrzeug	Strecke [km]								0,034310733
	PkW - Benzin	100								0,022316
	ÖPNV	100								0,006442333
	Taxi	30								0,0055524
Papierverbrauch	Papierart	Format	Anzahl Blatt	Gewicht [t]						0,014787926
	Recycling	A4	4000	0,02	Annahme: A4 mit 80 g/m²					0,014787926
Tonerverbrauch	Tonerart	Anzahl								0,07406
	Toner Farbe	5								0,07406
	Toner Schwarz-weiß									0
Druck	Druckart	Gewicht [t]								0,000036008
	Druck Farbe	0,02								0,000036008
	Druck Schwarz-weiß									0
Veranstaltungs-ort										**0,616420193**
Strom	Stromherkunft	Verbrauch [kWh]	Fläche [qm]	EF [aus Rechnung]	Anzahl Tage					0,110444274
	Deutschland (m²)		359,93		7					0,110444274
Wärme	Brennstoff	Verbrauch [kWh]	Fläche [qm]	Anzahl Tage						0,167689111
	Fernwärme (m²)		359,93	7						0,167689111
Verpflegung	Gerichte veget.	Gerichte vegan								0,14739726
	80									0,099360731
		40								0,04803653
Logistik	Fahrzeug	Strecke [km]								0,002048048
	Van - Benzin	7,6								0,002048048
Abwasser	Menge [m³]	Anzahl Personen	Anzahl Tage							0,076305424
		150	2							0,076305424
Wasserbereitstellu	Menge [m³]	Anzahl Personen	Anzahl Tage							0,112536076
		150	2							0,112536076
Papierverbrauch	Papierart	Format	Anzahl Blatt	Gewicht [t]						0
				0	Annahme: A4 mit 80 g/m²					
Teilnehmende Präsenz										**3,8878927**
Mobilität	Fahrzeug	Strecke [km]								3,2503927
	Bahn Fernverkehr	38000								1,102
	Bahn Regional	1000								0,055
	PKW - Diesel	9800								2,052806
	ÖPNV	630								0,0405867
Übernachtung	Anzahl Nächte									0,6375
	37,5									0,6375
Teilnehmende Remote										**0,010257691**
Streaming	Land	Anzahl TN	Endgerät	Plattform	Dauer [h]	Leistung [kW]	Ökostrom			0,010257691
	Welt	200	PC&Laptop	YouTube	4	0,007026	Nein			0,00428384
	Welt	100	PC&Laptop	Mozilla Hub	4	0,022003	Nein			0,004772211
	Welt	80	Smartphone & Tablet	YouTube	4	0,001479	Nein			0,000934196
	Welt	20	Smartphone&Tablet	Mozilla Hub	4	0,002444	Nein			0,000267444
Veranstaltungs-technik										**0,213284423**
Strom	Stromherkunft	Verbrauch [kWh]	EF [aus Rechnur	Fläche [qm]	Anzahl Tage					0,013150685
	Deutschland (m²)			100	3					0,013150685
Wärme	Brennstoff	Verbrauch [kWh]	Fläche [qm]	Anzahl Tage						0,022276938
	Erdgas (m²)		100	3						0,022276938
Mobilität	Fahrzeug	Strecke [km]	Kraftstoff	Verbrauch [l]	Anzahl Fahrten	Durchschnittl. km				0,1778568
	Van - Benzin	660	Benzin		8	35				0,1778568
Papier-verbrauch	Papierart	Format	Anzahl Blatt	Gewicht [t]						0
				0	Annahme: A4 mit 80 g/m²					

Kunstinstal-lationen						0,433761987
Strom	Stromherkunft	Verbrauch [kWh]	Fläche [qm]	Anzahl Tage		0,087671233
	Deutschland (m²)		50	40		0,087671233
Wärme	Brennstoff	Verbrauch [kWh]	Fläche [qm]	Anzahl Tage		0,003712823
	Erdgas (m²)		50	40		0,003712823
Logistik	Fahrzeug	Strecke [km]	Anzahl Fahrten			0,0267792
	PkW - Benzin	10	12			0,0267792
Verwendete Materialien	Materialart	Gewicht [kg]				0,290419864
	Glas	10				0,014027667
	PVC	1				0,003413084
	Stahl	25				0,07751591
	Papier	5				0,000106468
	Pulyurethan	15				0,0775545
	Stoff	5				0,11155
	Holz	20				0,006252236
Abwasser	Menge [m³]	Anzahl Personen	Anzahl Tage			0,010174057
		1	40			0,010174057
Wasser-bereitstellung	Menge [m³]	Anzahl Personen	Anzahl Tage			0,01500481
		1	40			0,01500481
Summe						5,367219346