

Sanitation paradigm shift with dry toilet solutions at music festivals in Germany

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More than 500¹ music festivals are carried out in Germany per year. These mass events attract about 33 million² people per year, with often more than 10,000 visitors per event. Music festivals frequently take place in remote areas without adequate sanitation infrastructure. Currently, sanitation management at these events is usually based on mobile chemical toilets, which do not always provide a user friendly sanitation solution and frequently lead to dysfunction of small treatment plants of rural communities.

Different types of dry toilets have begun to be seen as an alternative solution – in tune with ecological aspirations of festival visitors – with an increase of festivals offering a small amount of dry toilets alongside chemical toilets. This paper looks into the current situation of dry sanitation at mass events in Germany. The paper further shows the potential of dry toilets at mass events by looking at examples of large scale waterless sanitation infrastructure provided at European festivals and gives an overview of actors in the scene. Additionally the challenges which companies face while establishing a dry sanitation solution for mass events in Germany, especially in terms of the legal framework, are described.

At least four companies are currently providing dry toilets and hand-washing facilities as mobile sanitation solutions for music festivals in Germany. Altogether, they have a capacity of 165 mobile composting toilets. More than 230.000 people have been reached in total in 2014 by implementing dry toilet solutions at mass events in Germany. The companies do not yet have the capacity to serve a complete festival with dry toilets; nonetheless the number of users reached per toilet is growing as well as with the number of toilets available for festival use.

Scaling-up of the German dry toilet scene remains a challenge, which is currently complicated by an unsupportive legal framework. The legal framework for composting and reusing the collected biomass from dry toilets has not been established yet. The legal disposal of the collected biomass is for the young entrepreneurs - instead of being an economic benefit - an expense factor. It remains a challenge to reform relevant regulations towards nutrient recovery from human excreta.

Dry toilet sanitation at music festivals is widely spread in other European countries, the Glastonbury Festival (UK) with approximately 200,000 visitors and more than 1,000 dry toilets and the “BOOM” festival in Portugal with 20,000 people and a complete dry sanitation coverage being prominent examples. These best practices identify dry sanitation as a viable option for mass events and highlight an unused potential for the German providers.

¹ Deutschen Musikinformationszentrums (MIZ), German Music Information Centre

² Statista Dossier: Festival- und Eventbranche (<http://de.statista.com/statistik/studie/id/6508/dokument/festival-und-eventbranche-statista-dossier/>)

The described business activities have the potential to reform the sanitation supply at mass events all over Germany and promote its use in other potential markets, such as public areas and private households. Besides the technical dimension a change towards sustainable sanitation at mass events is an entry point for users to be introduced to the topic of sustainable sanitation. Furthermore it raises awareness and contributes to mainstream acceptance of sustainable dry sanitation technology solutions in the broader public.

Keywords: *Composting toilet, dry toilet, sanitation as a business, legal framework, Germany*

1. Music festivals – hotspots for music, art and sanitation

Music festivals are hotspots in multiple senses. Every year approximately 33 million³ people gather at German mass events like Hurricane Festival, Wacken Open Air or Fusion Festival to spend days of hedonism with music, art, foods and drinks. Over the last 20 years this phenomenon grew constantly to a yearly average of 500 music events⁴ in Germany alone.

Apart from stages, food and drink stalls, toilets are an integral part of the festival infrastructure that need to cater for often more than 10,000 visitors at a single event. While stages, food and drink stalls are components which directly yield a monetary benefit (income through ticket sales or commissions or rents by stall operators), toilets do not produce income, they produce costs and are often treated as unpopular necessity from the perspective of festival operators.

Hence, the sanitation situation at music festivals can often be described as precarious. Apart from the personal, mainly hygienic issues, also ecological problems in relation to the disposal of the generated excreta are to be considered. Mobile eco-toilets can turn this situation into an asset – as festival organisers can prove, that they care about the environment and future generations and visibly underline this by offering eco-toilets to their visitors.

2. Conventional festival sanitation

Music festivals often take place in rural, remote areas where no sanitation infrastructure is available and mobile sanitation solutions are required. Current systems rely on containment. The faecal matter collected in chemical toilets is stored in the toilet cabin itself, whereas in flushing or vacuum toilets it is stored in connected tanks. The tanks are emptied by extraction trucks and then transported via road to the next treatment plant. Being situated in rural areas – same as the festivals itself – these treatment plants are usually designed for smaller communities with population equivalents of 10,000 or less.

Ecological dimension

Having to handle peak loads during events is already a challenge on its own, a study by the BUND⁵ (Friends of the Earth Germany) reveals that the liquid used in chemical toilets contains up to 24 per cent formaldehyde, dye, fragrances and tensides. Formaldehyde is a strong disinfectant reducing the

³ Statista Dossier: Festival- und Eventbranche (<http://de.statista.com/statistik/studie/id/6508/dokument/festival-und-eventbranche-statista-dossier/>)

⁴ Deutschen Musikinformationszentrums (MIZ), German Music Information Centre

⁵ BUND: <http://www.bund-sh.de/uploads/media/Chemietoiletten.pdf>

microbial activity in the tank, which is supposed to reduce the formation of gases and therefore the released odours. Added fragrances support this effect. Additionally dye covers the sight of the content of the tank and serves aesthetic reasons. These ingredients are known to irritate the respiratory tract, cause chemical burns or allergies. Formaldehyde is a suspected human carcinogen, as classified by Annex 6 of Regulation (EC) No 2008/1272/EG of the European Parliament⁶.

The disinfectant effect of the fluid also applies after being disposed of into a sewage treatment plant. It reduces the microbial activity of the biological degradation process and increases the likelihood of malfunction of small treatment plants leading to contamination of receiving water bodies⁷.

Apart from overstressing treatment plants, the traffic generated by tank trucks or slurry tankers in rural communities does further contribute to negative environmental impacts e.g. through fuel consumption, exhaust gases and noise emissions.

The personal dimension

The aspects mentioned below are problems not linked to technical solutions, but to the management of the facilities offered. However they are often valid for the chemical toilets as well as for the toilet containers with flushing- or vacuum toilets found in festivals.

- Access to the toilet
 - The toilets are un-evenly distributed.
 - User to toilet ratio is calculated unrealistically, resulting in the queueing time at peak hours (morning) being long.
 - The toilet unit is dis-functional and damaged by overuse, unsatisfied or intoxicated festival visitors or both.
- Hygienic risk from toilet use
 - Often, heavy use combined with inappropriate cleaning and emptying routines lead to hygienic risk due to faecal matter not disposed of properly. Furthermore, toilets that are already in bad conditions due to previous users are likely to be mistreated by the users that follow as well⁸.
 - Hand washing facilities are not available, therefore toilet users are exposed to pathogens via the „Faecal oral contamination“-route.

⁶ CLP-Regulation (EC) No 1272/2008: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:353:0001:1355:EN:PDF>

⁷ Personal communication with festival managers

⁸ Wilson, James Q; Kelling, George L (Mar 1982), "[Broken Windows: The police and neighborhood safety](#)", *The Atlantic*, retrieved 2007-09-03 ([Broken windows](#) (PDF), Manhattan institute).

3. Request for alternatives

The combination of (1) unsatisfied users, due to precarious hygienic conditions and at the same time a (2) growing awareness for ecological aspects, has paved the way for the development of alternative sanitation solutions for large events. They have emerged only recently, but are already seen as a popular sanitation alternative at such events. Especially composting toilets combined with smart management concepts can address several aspects of the problems stated above – including hygienic and environmental aspects.

Since composting toilets at events are a relatively new concept, especially at German events, first time users have to be convinced of the higher quality and better user experience. The return rate after the first use is high. Users value (1) the advantages of odourless toilets without “splash effects”⁹, (2) a higher level of service quality due to more frequent cleaning routines and (3) the ecological aspects like the potential for nutrient recovery, water savings, and reduced load for treatment plants and protection of surface waters.

Apart from the small challenge of motivating people to understand the difference between a composting toilet and “conventional” mobile chemical toilet, there is the additional task for the entrepreneurs of bringing this sanitation system – especially the final composting of the faeces - in line with existing regulations. The current regulation situation in Germany for instance has no regulation that is explicitly dealing with human faecal compost (wood shavings, toilet paper and faeces/small amounts of urine) and therefore has no waste code number that can be allocated to this type of resource. This waste code number (and related background procedures) is a precondition to enable standard composting plants to accept raw compost from composting toilets. There are different options to approach this problem by taking into consideration what other official policies regulate similar problems. The most interesting regulation in this relation is the German BioAbfV.

In order to assure full hygienisation of the compost, thermophilic composting can be applied. According to the German BioAbfV¹⁰ guideline the composting method assures this by meeting the following criteria:

- 2 weeks and Temperature > 55°C
- 1 week and Temperature > 60°C
- 3 days and Temperature > 65°C

Although applicable to compost that is containing human faeces¹¹, these guidelines are not yet recognised for the hygienisation of this type of compost by all composting plants. The clear recognition of human faecal compost and related procedures in the BioAbfV is therefore an essential step to allow for the integration of composting toilets as large scale alternative for mobile sanitation at festivals and beyond (e.g. households, community gardens, etc.). The WHO guidelines on “excreta and greywater use in agriculture”¹² could serve as a starting point and base for an extension of the BioAbfV in this direction.

⁹ Splash effects can occur, when chemical toilets are used. Since the collection chamber of these toilets is comparably shallow and the content is liquid, dropping faeces lead to splashes that interfere with the personal hygiene of the user.

¹⁰BioAbfV: Regulation on the reclamation of bio waste of agricultural, sivicultural or horticultural soils. Bioabfallverordnung Annex 2 (§ 2 number 2, § 3 paragraph 2 to 7)

¹¹ Compare: Berger, W. (2011). Technology review of composting toilets - Basic overview of composting toilets (with or without urine diversion).

¹² Guidelines for the safe use of wastewater, excreta and greywater. Volume 4: Excreta and greywater use in agriculture

4. Dry toilets as a solution for sanitation supply at festivals

Dry toilets provide a solution to many of the challenges that sanitation services at mass events face. The current dry toilets types that are installed and used at mass events are devices which have either a raised or a levelled toilet cabin, and are built over a storage container that varies in material and volume. Before being used by visitors it is filled with a receiving material that absorbs liquid (sawdust, ash, leaves or other absorbing and easy compostable organic materials). A handful of this material is added after every usage by the user. As the bulking material absorbs the liquid, it prevents the development and emergence of gas and therefore controls odour and maintains the toilet odour free. Hygienic standards for hand washing are met by providing a range of hand washing facilities (tippy tap, pumped hand wash basin or dispensers with hand sanitiser). After the event the collected organic material can be composted, and after a composting time of one to two years (depending on the specific climatic conditions and the composting method applied cf. chapter 3 BioAbfV) the compost can be applied as a fertilizer or soil conditioner for cultivation of non-edible crops.

Altogether dry toilets combined with smart management concepts to solve all the challenges the sanitation supply at mass events face: they are independent from water supply on one hand; on the other hand no sewer connection is required. If correctly used and maintained, dry toilets are odour free, the collected organic material does not affect the local sewage treatment plant and does not, if handled appropriately, represent a danger to the environment, quite the contrary: it has the potential to benefit the soil.

Overview of mobile dry toilet suppliers in Germany

The first mobile dry toilet start-up was established in 2011. Since then two more start-ups have been established and the number of additional small scale projects is growing. The companies, which are presented in this chapter, have different conceptual approaches, but they all try to offer more than a toilet. By using high quality material like massive wood, establishing a creative and fun surrounding with music and games and an appealing interior through different design aspects such as flowers and charts, they try to raise the emotional value of the object to protect it from outside damage, e.g. vandalism.

Short company profiles

Ecotoiletten



Location: Berlin
Region of activity: East Germany
Capacity: 130
Established in: 2013
Concept: Rental of portable toilets to various occasions and events, from music festivals, to construction sites or weddings. Provision of whole service package from delivering, over maintaining and recycling.
Reached users in 2014: 75.000



Image 1: Wooden Ecotoilet cabin, © EcoToiletten

DRY TOILET 2015
5th International Dry Toilet Conference

Goldeimer



Location: Hamburg/Kiel
Region of activity: Germany
Capacity: 62
Established in: 2013
Concept: Composting toilets for events; Social Business

Reached users in 2014: 20.000



Image 2: Metal framed Goldeimer toilet cabins with sawdust container and tippy taps aside, © Goldeimer

Nowato



Location:	Frankfurt am Main
Region of activity:	Greater Frankfurt
Capacity:	30
Established in:	2011
Concept:	Composting toilets and pissoirs for events and long-term rental
Reached users in 2014:	130.000



Image 3: Installation of wooden Nowato toilet cabins and pissoirs at public event, © Nowato

Ökocus

Location:	Leipzig
Region of activity:	Germany with focus on Saxony, Saxony-Anhalt, Thuringia
Capacity:	33
Established in:	2013
Concept:	Composting toilets and pissoirs for short and long-term rental
Reached users in 2014:	8.000



Image 4: wooden Ökocus ecotoilets at a public event, © Ökotoiletten

Experiences with mobile dry toilets at mass events

A total number of more than 220.000 people have been reached in 2014 by dry toilets at mass events in Germany. The yet biggest festival served partly by dry toilets was the Hurricane festival, with 70.000 visitors and 15 mobile dry toilets.

The experiences so far vary from company to company and the event context. In general the reported user feedback was excellent; the approach to raise the value of the object and thereby raise the peoples' acknowledgement has emerged to be successful. Even though free sanitation facilities are offered at the event location, people are willing to pay fees for usage of a comfortable hygienic alternative. Even though vandalism is always a possible issue at mass events, it does not affect the high quality dry toilets as bad as the regular facilities. This is the result of (1) the raised value of the object, and (2) the regular maintenance service.

Different payment models have been tested to develop a profitable and competitive business approach:

Convener based model

Using the convener based model, financial contributions are provided fully or partially by the events convener. The positive aspect of this model is a high financial security for the providing companies, and free toilet use from the user perspective. On the other hand the benefit margin is comparatively low, as the convener has a certain budget frame and usually opts for the cheapest sanitation solution. Therefore, if once convinced to choose the high quality and ecological alternative, the provider has to negotiate the renting conditions with the events convener.

Pay-per-use model

The pay-per-use model covers all the expenses by user fees. User fees may vary from 0,50 EUR to 2,00 EUR per use. A variation of the traditional pay-per-use system is a flat rate model, where the user pays a certain amount once (around 15,00 EUR) and in exchange either gets a certain amount of uses or unlimited use of the toilet. Those users usually are given an identification mark, such as a paper bracelet or a card.

Independent sanitation supply

More and more users, especially at mass events lasting a couple of days, prioritise hygienic sanitation supply and do not only wish for a clean shared toilet, but are willing to rent a toilet cabin for their private use. The direct business between customer and provider, without directly engaging the event convener, has to be agreed with the event convener beforehand and requires a higher amount of decentralised organisation. The toilet cabins are brought to the camping location of the user and stay there for the whole duration of the event. The user is provided with a lock and a key, to guarantee private use only. The highest benefit of this model is gained by the convener, who has delegated the responsibility for the sanitation supply for a number of users and in doing so decreases the amount of people who use the convener provided toilets. Also the user benefits from a private toilet, which he can keep up to his desired hygienic standards. The providing company faces a higher risk when their product is under the sole control of the user for the duration of the event. The decentralisation raises the effort which has to be invested in logistics and lowers the possibility of permanent control of the product. Therefore companies have to pay special attention to regulated responsibilities and insurance coverage beforehand.

5. Challenges

The challenges in implementing dry toilet solutions at mass events in Germany are diverse. They are related to:

- **Typical challenges that start-ups face**
Initial funding for the start-ups was financed with prize money from founding competitions, bank loans and investors. At present the companies rely on in-kind contributions and creative payment concepts, which offer other valuables in exchange to manpower (e.g. free festival ticket for voluntary work at the festival). The establishment of a financially self sustained business still remains a challenge.
- **The labour intensive management model** required for maintenance of the toilet facilities and awareness raising for the eco-technology. As stated above, the majority of the businesses require a high level of in-kind contributions, as the provision of dry toilets due to the high maintenance requirements is a labour intensive task. The challenge here would be to reach a point where a sufficient wage can be paid to all employees.
- **Logistic issues**
The establishment of a large scale smart logistics concept is a long term task which requires a high amount of infield expertise and a trial and error process. The on-site logistic of barrel exchange, storage of collected human waste, process organisation and transportation to the disposal/reuse site remain a challenge. Furthermore the production of an optimised toilet cabin, which is lightweight, easily installed, cleaned and resilient against mechanical and chemical damage and meets the sustainability criteria is a process of constant innovation that has not yet come to an end.
- **Disposal or reuse of the material** collected during a festival in a legally sound manner, which is further discussed in the following section.

Legal reuse of human waste

In general the legal framework for the composting of human biomass differs between the different federal states in Germany. In most settings providers of dry toilet solutions for music festivals in Germany have difficulties to find centralized composting units that are able to accept the material¹³.

At present the providers of public dry toilet solutions have following options to process the human waste:

1. The transportation to a central biogas or wastewater treatment plant, where energy recovery or disposal follows.
2. Onsite treatment: As long as the excreta are not been transported away from the site of collection it is not regarded as a waste in a legal sense, which allows onsite composting. That makes partial reuse as a soil conditioner possible.

The Kreislaufwirtschaftsgesetz §3(1) gives a hierarchy for the avoidance and for the management of waste: the avoidance of waste has priority. If avoidance is not possible, reuse, recycling, energy recovery and disposal follow (ordered by priority). The present legal framework in Germany does not offer any virtual possibility for reuse, e.g. composting of human waste collected at music festivals. This prevents the recovery of resources such as Phosphorous and Nitrogen and prevents a closed nutrient cycle.

¹³ Berger, W. (2015). Kompost-Toiletten für Garten und Freizeit (in German) - Composting toilets for the garden and for recreation. Ökobuch Verlag, Germany, ISBN 978-3-936896-79-4

There are several countries, where the use of dry toilets at mass events is much more common and the legal framework is much more supportive than in Germany. In the United Kingdom companies providing composting toilets for mass events need a special environmental permit in order to treat the solid waste at their depot. In 2011 the UK Environment Agency reacted on the emerging trend of composting toilet solutions at music festivals by publishing a regulatory position statement on the treatment of human waste from composting toilets¹⁴. Since then, there is no longer a need for the special environmental permit for companies that comply with a list of requirements stated in the regulatory position statement. Requirements are of technical nature regarding the design of the toilets and regarding the composting process. The maximum amount of composting material stored at a composting site is limited to 10 tonnes.

In Germany for economic and hygienic reasons a centralized composting of the biomass is the most favourable option. In order to give the mentioned companies a reliable framework for such a system, some legal regulations need to be amended. As the biomass is not of a household origin, no public disposal obligation exists. A modification of the Abfallwirtschaftssatzung¹⁵ is required¹⁶. In addition, regulations have to allow the treatment of human waste as biological waste (modification of the Bioabfallverordnung §2(1), BioAbfV¹⁷). This topic is not covered by the waste management statute. The waste management statute (AWS) differs from one federal state to another.

6. Potential of dry toilets at mass events

The mass event sector is a growing sector, and taking only the ten largest of a total of 500 events in Germany potentially 2,5 million¹⁸ users could be reached, if those events were supplied fully with dry toilets. Taking the total number of visitors at mass events in Germany, which are approximately 32,9 million¹⁹ people per year, the companies only covered 0,7% of the German wide event sanitation supply with dry toilets and therefore missed out a potential of another 32,6 million users in 2014.

Dry toilets have entered mass events all over Europe. Natural Event, the so far biggest company for dry sanitation at mass events, is acting worldwide and implemented dry toilets not only in water scarce areas like Australia, but also in the UK, where dry sanitation at mass events is no longer a side issue. At the Glastonbury Festival, the biggest festival of the world with 200.000 visitors, Natural Event provides 1000 dry toilets for the duration of the festival. Another prominent European example is the BOOM festival in Portugal, which attracted 40.000 visitors in 2014 and fully covered the sanitation supply of the festival with 284 dry toilets.

The BOOM festival has the advantage that the event location is owned by the event conveners and the installed sanitation systems are permanent. It also allows the organisers to compost the organic material directly on their own land, which lowers the legal conflict and also the logistical effort. The BOOM festival can be regarded as the most environmental friendly mass event worldwide. It aims to minimise the impact of the mass event, by recycling, user-consciousness, low water use, use of environmentally friendly material and obviously also by the use of a 100% water-free and nutrient-cycling sanitation system.

¹⁴ Environment Agency (UK): Treating solid waste from composting toilets at the depot from where they have been hired out: RPS 114. MWRP RPS 114 Version:1 Issued: August 2011

(<https://www.gov.uk/government/publications/treating-solid-waste-from-composting-toilets>)

¹⁵ English: *Waste Management Statute*

¹⁶ Unabhängiges Institut für Umweltfragen e.V.: *Abwassermeidung und –Entsorgung in Kleingärten*. Studie. 20.April 2004

¹⁷ Bioabfallverordnung in der Fassung der Bekanntmachung vom 4. April 2013 (BGBl. I S. 658), die zuletzt durch Artikel 5 der Verordnung vom 5. Dezember 2013 (BGBl. I S. 4043) geändert worden ist

¹⁸ <http://www.eventspion.de/news/die-groessten-festivals-in-deutschland/>

¹⁹ Statista Dossier: Festival- und Eventbranche (<http://de.statista.com/statistik/studie/id/6508/dokument/festival-und-eventbranche-statista-dossier/>)

Compared to a maximum of approximately 10.000 people reached during a single mass event in Germany, and regarding the large number of festival visitors, it is apparent that it is possible to cover the market in a larger scale.

Furthermore mass events provide a key entry point to a so far unsensitised target group and have a potential to raise awareness by simply serving an obvious demand. Dry toilets convince in that matter not because they are ecological, but purely because they outperform chemical toilets and water closets with their eco- and user friendliness.

The potential massive outreach and the broad awareness raising opens the door beyond mass events for the usage of dry sanitation in other public areas, such as construction sites, public markets, in private households, and private events.

7. Conclusion

There is a growing market for dry toilets in Germany as well as in other European countries, because of their acceptance and increasing use in large events and festivals. Local infrastructures are commonly not designed for the increased wastewater volumes that accrue from festivals. Festival visitors' awareness of environmental issues is increasing. Although free chemical toilets are available, the amount of festival users that are willing to pay for the use of a dry toilet sanitation solution continue to increase. Currently four companies, mostly active in one specific region with different payment models and different design concepts, provide dry toilet solutions for music festivals in Germany.

Even though dry toilets at music festivals have become more popular in the last few years and visitors' feedback shows signs of the growing potential, the overall coverage in percentage is still low. This is due to a pending up-scaling process, which requires optimisation of financing, human resources and logistics from entrepreneurial side and, most importantly, obliges a supportive legal framework.

There has not yet been a legal reaction on the growing activity in the sector and the current legal framework does not allow central storage and composting of the collected biomass. A comparable situation in the UK was tackled by the Environmental Agency by publishing a regulatory position statement. A similar legal reaction is yet to come in Germany.

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