Tampere University of Applied Sciences

Research for Waste Management in Desucon

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ABSTRACT

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Research for Waste Management in Desucon

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Conventions of Asian popular culture have been active and growing over a decade and as the recycling has increased and become more trending the conventions should follow the trend. One of these conventions is called Desucon in Lahti and since it gathers huge number of people in one place for a weekend the amount of waste needs to be regulated. This is done under the Waste Act and legislation of Päijät-Häme.

The purpose of this study was to provide statistical information and possible guidelines for waste management of Desucon. Data were collected via the own feedback form of the convention with combined questions regarding the thesis, where visitors could give their ideas for improvement. Data were also collected from the head organizer and person in charge of volunteer work.

The results shows that Desucon has a functional waste management system, but there still was a chance to improve the waste management and reduction of waste, and the findings indicate the reduction of waste to be a possible but a slow process and is focused more on the individual.

CONTENTS

1 INTRODUCTION 4
2 DESUCON 5
3 WASTE ACT 6
4 WASTE 7
4.1 Mixed Waste 8
4.2 Energy Waste 8
4.3 Recoverable waste 8
5 WASTE MANAGEMENT PLAN IN PUBLIC EVENTS 9
6 WASTE MANAGEMENT IN DESUCON 11
7 METHODS AND MATERIALS 13
8 RESULTS 14
9 CALCULATIONS 17
10 DISCUSSION 21
REFERENCES 23
APPENDICES 25
Appendix 1. Con & Ympäristö 25
Appendix 2. 9 Luku: Roskaantumisen ehkäiseminen 26

1 INTRODUCTION

Conventions for japanese popular culture in Finland have grown bigger and bigger during the decade and since recycling and green lifestyle is currently a trend, it would be good for the organizer to focus more on recycling and increase the awareness of recycling.

The present aims for Desucon was to people clean after themselves and this has been made easier providing bins around the Sibelius Hall and in the future, it tries to provide more suitable recycling and waste collection. This indicates that waste management plan would come in good use.

Waste management in general is regulated by waste act and for every municipality there can be more detailed implementation plans which might variate between municipalities and in this thesis the waste management and municipal solid waste plan of Päijät-Häme was mainly used and compared with other implementation plans. Lahti follows the waste legislation of Päijät-Häme and in waste management legislation chapter 9, section 30 §.

One of the most common waste types in public events and in conventions are solid waste which usually consists of everyday items that are discarded by the public. This contain all sort of waste from organic to non-organic. During the convention recycling is separated in three categories: energy waste, bottles/cans and glass. In the future, this might change for the better.

Scope of this work was to figure out the amount of energy waste in Desucon and possibly provide helpful guidelines for upcoming conventions since waste management was an issue in previous conventions. Data for this thesis was gathered by customer survey and by interviewing volunteers during and after the event itself. The amount of waste is based on the results got from the query and interviewers since Sibelius Hall could not provide information about waste management. Topic was risen through own interest towards the waste management of Desucon and since it doesn’t have official plan or a proper guideline, it inspired to work with this issue. Thesis also take inspiration from the legislation of other municipalities and tries to form a clear guideline for the convention.

2 DESUCON

Desucon is a Finnish convention for the fans of Japanese animation and comics. Held annually since 2009, the event has followed in the footsteps of Frostbite in 2016, restricting the attendance to the convention to people aged 18 and over together with its winter counterpart. Events featured include lectures, workshops, cosplay, maid café, artists' alley, dealers' room, game corner and video screenings. The convention has also hosted numerous japanese guests from voice actors and singers to japanese comic artists, lecturers and directors. (KcS ry n.d.)

Convention gathers in the summer approximately 2900 visitors every year and at the present Desucon doesn’t have any waste management plan other than what is regulated in waste act for recycling or sorting waste although the number of bins and waste management have been improved during the years.

Goals of the Desucon is to evolve and provide as good quality content as possible every year. This also reflects to the environmental aspect where the want to increase the efficiency and awareness of green lifestyle. The convention doesn’t have any formal waste management plan and follows the guidelines of Päijät-Häme municipality.

3 WASTE ACT

The purpose of waste act is to support sustainable development by promoting the rational use of natural resources and preventing and combating the hazard and harm to health and the environment arising from the waste. (Waste Act 1072/1993). For Waste management in public events Waste Act 646/2011 was also applied. (Valvira 2011.)

“This Act shall apply to waste, prevention of its generation and reduction of its hazardous or harmful property, promotion of waste recovery, any other organization of waste management, prevention of littering and cleaning of sites which have become littered”. (Waste Act 1072/1993.)

Each municipal might also have their own legislation for waste management. In this case the legislation for Päijät-Häme is followed next to the waste act.

4 WASTE

The legal definition for waste is described as; “any substance or object which the holder discards or intends, or is required, to discard” (Waste act 1072/1993, 3§). In modern system there are various waste types defined such as municipal waste which consist of household items, commercial waste and demolition waste. The generation of waste is something that cannot be stopped but can be reduced and the goal of recycling is reusing or other way to utilize the waste.

“Primarily, the generation of waste should be avoided, prepared for reuse or re-used. If reuse is not possible waste must be primarily recovered as material and secondarily recovered as energy” (Ministry of the Environment 2018). Easiest way to the sustainable and zero waste living which can be applied everywhere is the 5 R’s rule which PICTURE 1 describes.

PICTURE 1. The 5 R’s rule (Seed! 2019)

By reducing it meant to reduce the usage and helping to lower the consumption of waste-producing goods, but the most effective way is to refuse the product. If products can’t be reduced or refused it’s needs to be recycled or if it’s possible,

reuse. The last one, rot, is specifically for organic waste. For organic waste all possible waste should be composted.

4.1 Mixed Waste

“Mixed waste includes miscellaneous waste when hazardous and all material that can be reused as a raw material has been separated from it” (Helsinki Regional Environment Service Authority HSY 2018) and since non-combustible material cannot be burned or generated to energy it is delivered to waste-to-energy plan where the material is dealt to some extent. Rest of the mixed waste is combusted and turned into energy. (Helsinki Regional Environment Service Authority HSY 2018.)

4.2 Energy Waste

Energy waste is combustible waste which is separated from mixed waste and its combusted in waste-to-energy plans. Most of the plastic can be used as an energy waste excluding PCV-plastic. Marking for plastic qualities can be found example from waste treatment plans website pages.

In Desucon there were three types of energy Waste identified:

- Plastic cups
- Program leaflet
- Plastic bags

4.3 Recoverable waste

Recoverable waste is classified to be waste types which can be reused as it is or as a raw material of different processes. (Napapiirin Residuum Oy 2019.) This includes waste types such as organic waste and cardboard.

Three types of recoverable waste were identified in Desucon:

- Cardboard
- Glass bottles
- Cans

5 WASTE MANAGEMENT PLAN IN PUBLIC EVENTS

Waste management plan is based on the Waste Act 646/2011 and Waste Decree 179/2012. For the plan there is no rigid structure and municipalities may issue general provisions due local circumstances so therefore every municipality have their own waste management plan for public events.

Section 9 in waste management plan of Päijät-Häme states;

“Properties belonging to municipal waste management other than housing accordance with section 8 the resulting waste shall be sorted and collected into its own specific containers as TABLE 1 shows” (Päijät-Hämeen jätelautakunta, 2018.)

TABLE 1. Sorted waste and amounts (Päijät-Hämeen jätelautakunta 2018, modified)

Waste type	**Separate collection**
Mixed waste	All facilities
Energy waste	All facilities
Cardboard	If collected over 20kg/week
Glass	If collected over 20kg/week
Paper	As the sections 49 and 50 of waste acts defines

For example in the guidance related to waste management of Tampere states that when planning a public event, the organizer is responsible for the guidance related to waste management and for the cleaning during and after the convention and the events needs to be planned so that the amount of collected waste

is as less as possible. (Tampereen kaupunki 2017.) And this is applicable to every municipality organizing the public event.

When sorting the waste, it is beneficial to use color coding for collection bins to ease the sorting process. Almost every waste treatment company provides some sort of guides for rightful colors and in TABLE 2 are gathered the ones which might be beneficial for the convention point of view.

TABLE 2. Color coding for waste sorting (Kiertokapula 2020, modified)

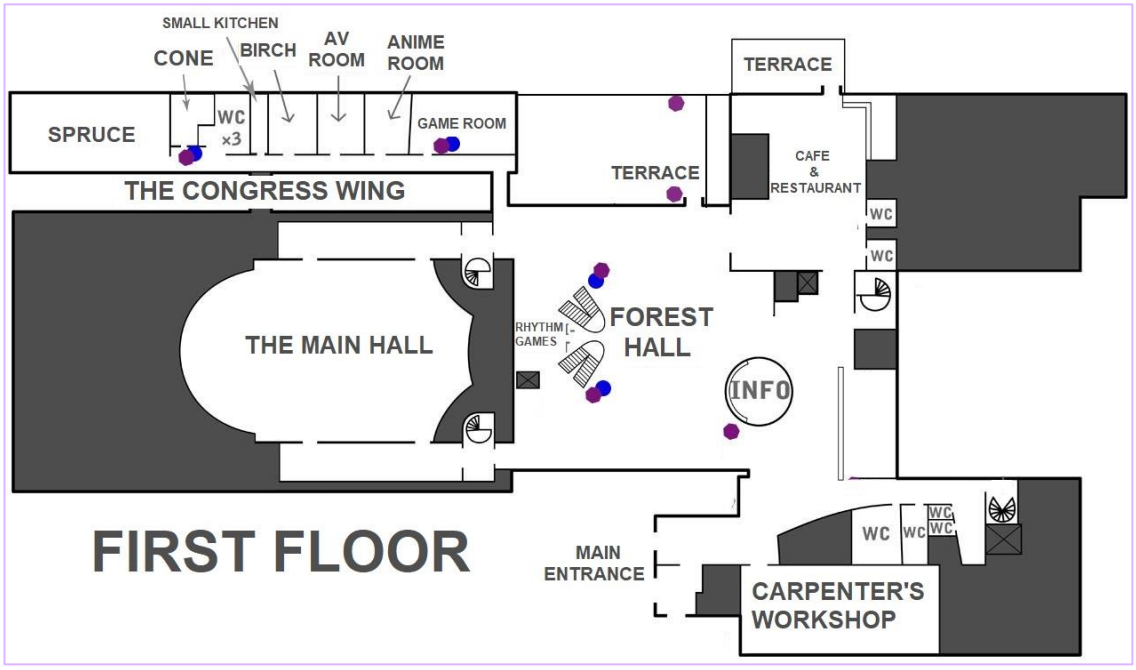
Mixed waste	Glass	Cardboard	Plastic
Grey	White	Blue	Yellow

Since L&T provides the waste management for Sibelius hall it is recommended to follow their guides in sorting.

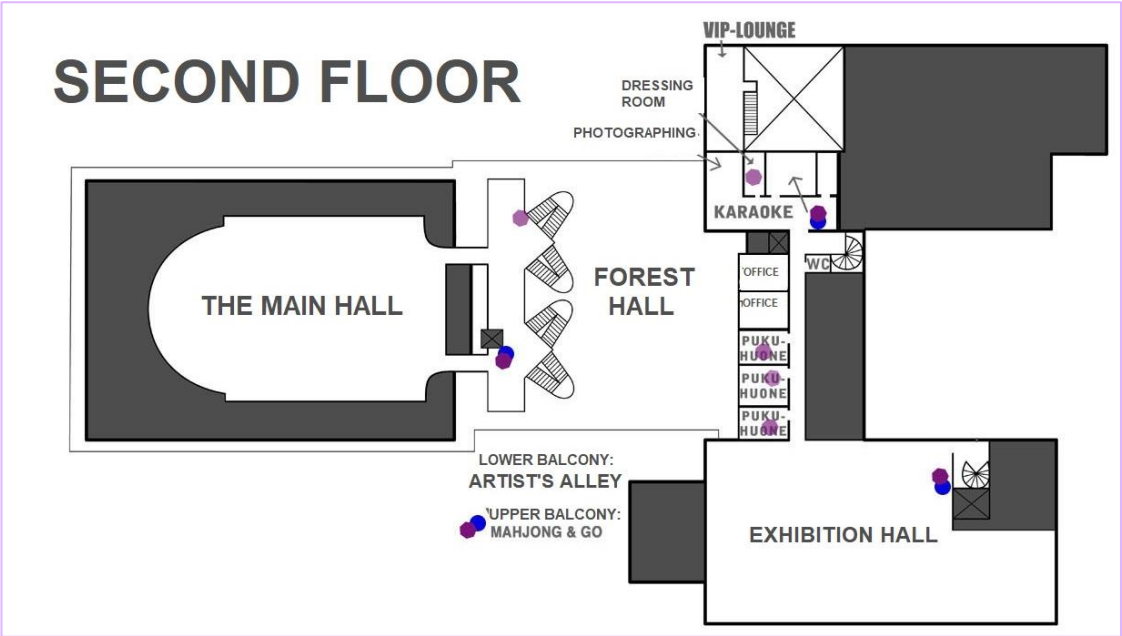
6 WASTE MANAGEMENT IN DESUCON

A few big factors for waste in Desucon was the provided plastic cups and the packaging waste from the exhibition hall, rest of the waste comes from the near grocery store and the restaurant as visitors bring their shopping's to Sibelius Hall. Exhibition hall generated most of the cardboard waste when constructing the convention, but are re-used as well as possible during the convention, but tossed away after. Amounts of leaflets, which contains all vital information about Desucon variates from 3000 to 3500 pieces and plastic cups variates from 10 000 to 15 000 pieces. (Mäkinen J 2019.)

Placing the bins right in public events is crucial. Bins are recommended to be placed in general walkways, easily accessible and next to emergency exits. During the convention the bins were put on marked places which purple dot in PICTURE 2 and 3 indicates. These are located next to the water points and easily accessible places and so that they are not too far away from each other's which follows the idea mentioned before. Glass bottles are also collected to their separate bins and these bins were located next to info desk.



PICTURE 2. Layout for the bins in Sibelius Hall, 1st Floor (Desucon 2019)



PICTURE 3. Layout for the bins in Sibelius Hall, 2nd Floor (Desucon 2019)

For collecting, Desucon have overall 30 bins for mixed waste. 24 pieces of 90 litres, and 6 pieces of 150 litres bins which were labelled usually with white laminated A4 paper as a mixed waste and both bins which were provided by the Sibelius Hall.

Waste from the bins was collected to outdoor collection bins outside of the Sibelius Hall which they had 16 units, and which was labelled as mixed waste and energy waste. These were provided by L&T waste management corporation.

7 METHODS AND MATERIALS

Method used for collecting data was a qualitative research. The results were based on the answers of the visitors of Desucon gave through the open query which was made in Google Docs. Query included questions about recycling habits and thoughts about the present system on. Since answers differed from 150 to 160 answers depending on the question and were put in the perspective of 2900 people, and corresponding figures and tables was made through Excel. Since the amount of people who took the query was quite small compared to the whole convention and were answered after rather than during the convention the margin of error exists so therefore results aren't precise and are just directional.

Query was applied to Desucon's own feedback sheet and the other materials concerning the convention in this thesis were provided by the convention itself such as blueprints and the amounts of bins. Conversion factors regarding public events were gathered from various sources.

Literature review was made to get general information how the waste management is done in public events and if the decrease of the amount of waste could be possible. Since there were no previous studies done it was impossible to do comparison to previous years.

8 RESULTS

Query included questions about recycling and waste management in Desucon. Limit values were set from 1 to 5, where 1 indicated “completely disagree” and 5 “completely agree”. It was important to notice in this case that Desucon had around 2900 visitors and people answered were roughly 150-160 people, so around 20% took the query and in the results the percentage was set in the perspective of 2900 people. As the results were put in the perspective of 2900, results were not accurate but indicative and gave the idea of amounts.

First point was to reflect what visitors thought about recycling and are they willing and aiming to recycle since this was a matter which starts from an individual. As seen in in the FIGURE 1 which is based on the answers of APPENDIX 1 almost three out of four from the ones who participated the query thought recycling was an important matter and aims to recycle. Question was set-up brode on purpose to see if recycling habits have effects in convention.

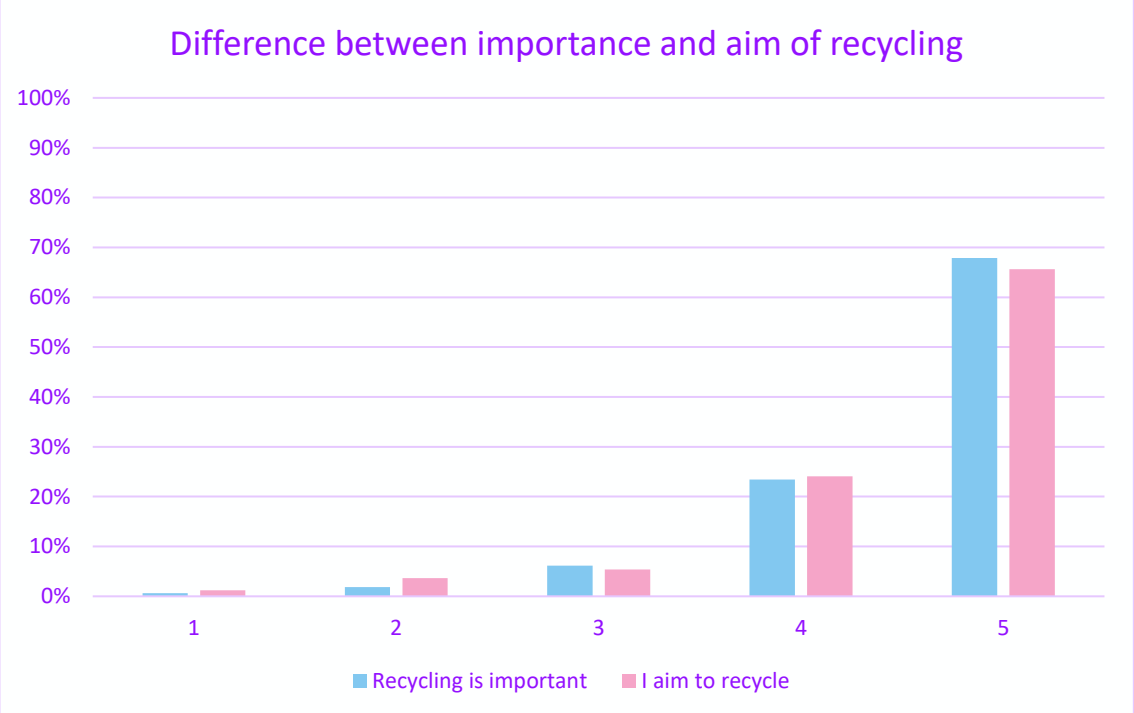


FIGURE 1. Difference between importance and aim of recycling

As it can be seen there was a correlation between people who think recycling is important and tries to recycle and this have some effects on the upcoming results as well.

Next visitors were asked if they thought the amount of waste was a problem inside and outside area the Sibelius Hall during Desucon. These answers were based on APPENDIX 1 and as it can be seen in FIGURE 2, over 60% of the visitors thought that too much waste inside was not a problem during the convention but as it can be seen on the results for the waste amount on the outside variates much more and one possible indicator for this might be the bin on the bus stop next to Sibelius Hall which was usually fully with cardboard waste from near grocery store and a restaurant.

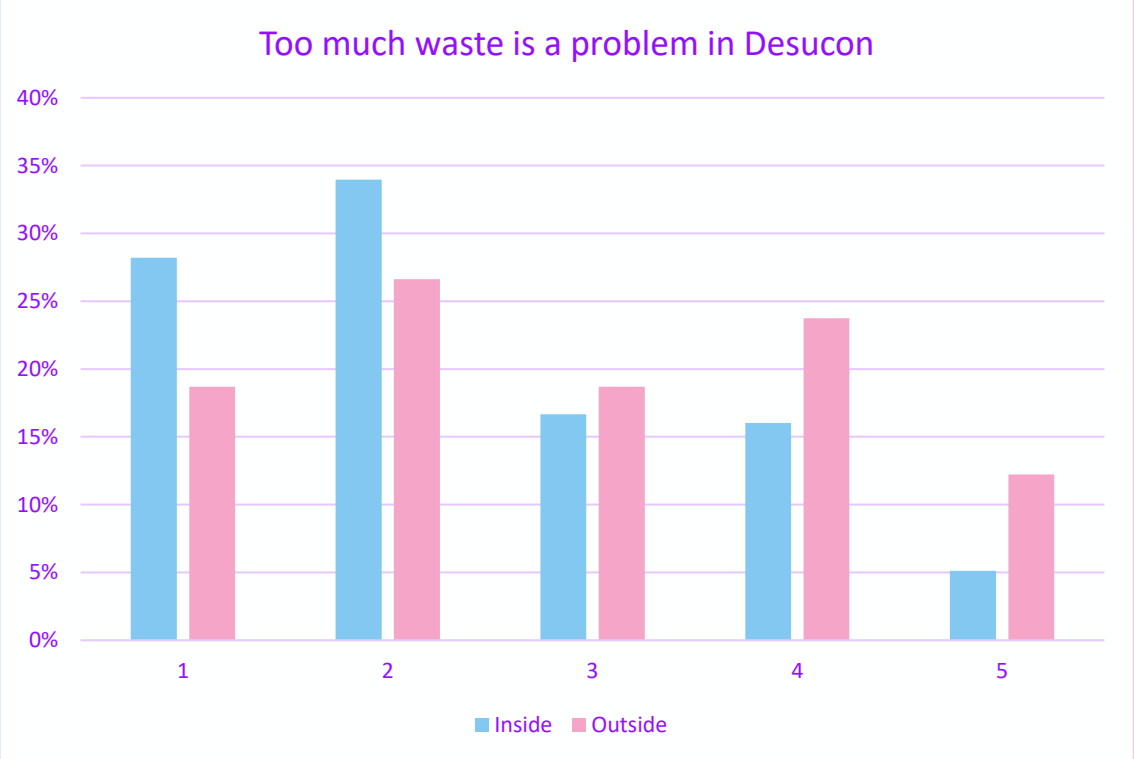


FIGURE 2. Too much waste is a problem in Desucon

This was resolved by putting extra trash bags to collect the extra incoming waste, but as the figure shows it still needs action to work efficiently. Rest of answerers thought there still was some problems with the waste amount inside the Sibelius Hall, where one of the possible indicators might be the doggy bags left on the tables from nearby restaurant or the grocery items bought from the exhibition hall.

Other possible indicator might be the plastic cups since if not crushed properly, the bins seems to be overwhelmed by the cups.

Since one of the factors were the provided plastic cups and how to reduce the use of them it was important to ask whatever the visitor provide their own bottle. This question was added to the query to figure out how many was willing to provide own bottle and FIGURE 3 show that 77%, almost everyone who answered, provide their own bottle.

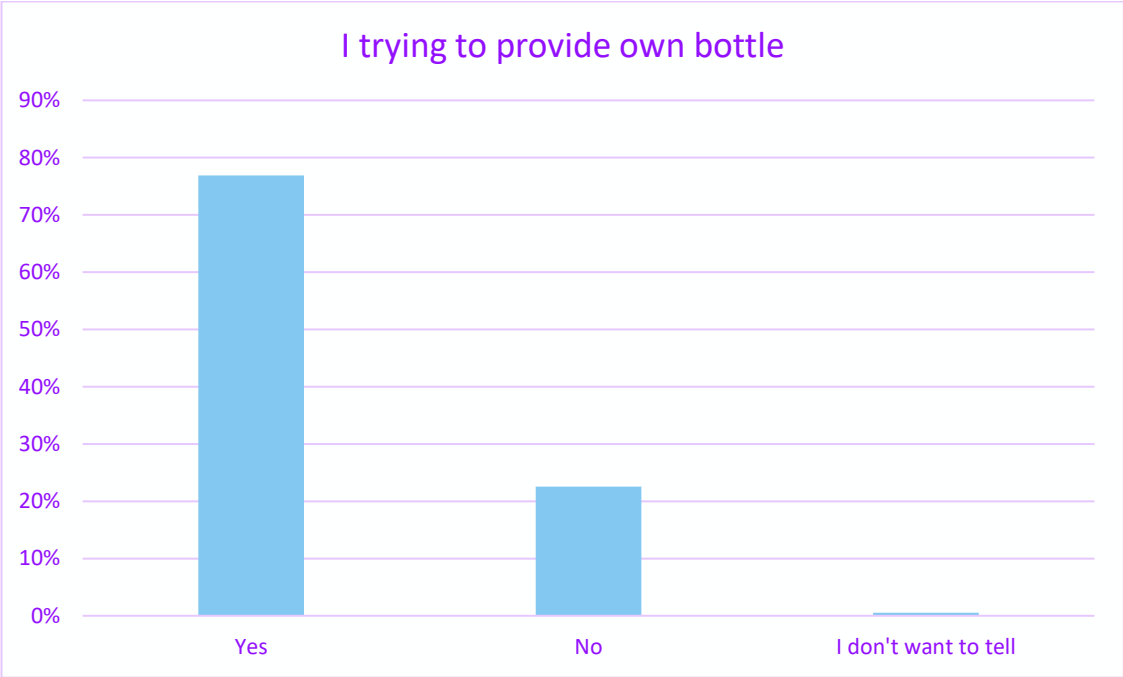


FIGURE 3. I'm trying to provide my own bottle

Rest mentioned they didn't bring own bottle. Since the accuired result were put into perspective of 2900 these result aren't accurate and might be even closer to 50/50 than the results given. Since if this was the case FIGURE 2 might have more answer on the 1-3 axels than what it was now and since providing the cups for visitors has been in the scene all the way from the beginning so not to provide at least some amount of plastic cups might never be archieved but can be set as a reachable goal.

9 CALCULATIONS

Since there was no previous data about waste amount, theoretical values were calculated. Conversion factors used in calculations were provided by Greenlife Industry and U.S Environmental Agency (Greenlife industry 2019; U.S Environmental Protection agency 2016).

According to City of Tampere (2017) a public event where food is offered generates average

$$75\ g/visitor/day$$

and since Desucon lasts roughly 2,5 days the mass of the waste can be calculated.

$$75\ g * 2900\ visitors * 2.5\ days = 543750\ g = 544\ kg$$

Plastic cups with volume 200 ml weights 2 grams (Divi Doo, 2017). Since both the weight and pieces of the cups was known the total mass of the cups is followed.

$$15\ 000\ pcs * 2\ g = 30\ 000\ g = 30\ kg$$

Since the provided Volume-to-Weight didn't match the International System of Units those needed to be converted to match the SI-system.

1 cubic yard (yd^3) of dry waste weights 56 to 73 pounds so therefore if

$$1\ pound = 0{,}45\ kg$$

$$56\ pounds = 56 * 0{,}45\ kg \approx 26\ kg$$

$$73\ pounds = 73 * 0{,}45\ kg \approx 33\ kg$$

1 cubic yard equal to 0,75 m^3 so 1m^3 can be calculated using conversion formula;

$$\frac{1\ yd^3}{0{,}76\ m^3} = \frac{x}{1\ m^3} \rightarrow 0{,}76\ x * m^3 = 1\ yd^3 * m^3 \rightarrow x = \frac{1}{0{,}76\ yd^3} = 1{,}3\ yd^3$$

and to get the conversion factor the result subtracted from the original value;

$$1{,}3\ yd^3 - 1\ yd^3 = 0{,}3$$

therefore, the corresponding factor in SI-system for 56 lbs is;

$$1\ m^3 = 26\ kg * 0{,}3 = 7{,}8\ kg \rightarrow 26\ kg + 7{,}8\ kg \approx 34\ kg$$

$$1\ yd^3/56\ lbs = {}^{1\ m^3}/_{34k\ g}$$

and for the 73 lbs

$$1\ m^3 = 33\ kg * 0{,}3 = 9{,}9k\ g \rightarrow 33\ kg + 9{,}9\ kg \approx 43\ kg$$

$$1\ yd^3/73\ lbs = {}^{1\ m^3}/_{43\ kg}$$

Size of the bins were 90 litres which equals to 0,09 m^3

To calculate the cubic meters of generated waste, must specific be divided by the mass to solve the cubic meter per kilogram;

$$\frac{{}^{1\ m^3}/_{34\ kg}}{34} = {}^{0{,}029\ m^3}/_{kg}$$

$$\frac{{}^{1\ m^3}/_{43\ kg}}{43} = {}^{0{,}023\ m^3}/_{kg}$$

Result is the multiplied by the weight of waste which was 544kg.

$$0{,}029\ m^3/_{kg} * 544\ kg = 16\ m^3$$

$$0{,}023\ \ m^3/_{kg} * 544\ kg = 12{,}5\ m^3 \approx 13\ m^3$$

It can be concluded that average amount of waste generated by visitors during the weekend is average 14,5 m^3.

Since the top and bottom part of the cup are different sizes formula for frustum is used to solve the volume *V*.

$$V = \frac{\pi h}{3}(r_1{}^2 + r_1 r_2 + r_2^2), \qquad (1)$$

where *h* is height, r_1 is the radius of the bottom half and r_2 is the radius of the upper half. For the 200 ml cups the dimensions were 70x82x45 (mm) and the volume can be calculated according to formula (1);

$$V = \frac{\pi * 82\ mm}{3}(22{,}5^2 + 35 * 22{,}5 + 35^2) = 216286\ mm^3 = 0{,}00021\ m^3$$

$$\frac{0{,}00021\ m^3}{0{,}003\ kg} = \frac{x}{1\ kg} \rightarrow 0{,}003\ kg * x = 0{,}0021\ m^3 * kg$$

$$x = \frac{0{,}0021\ m^3 * 1kg}{0{,}003\ kg} = 0{,}7\ m^3/kg.$$

Mass of cups were 30 kg, so total cubic area can be calculated by multiplying specific volume by mass.

$$0{,}7\ m^3/_{kg} * 30\ kg = 21\ m^3$$

TABLE 3. Summary of the masses and volumes

	Kilograms	Cubic meters
Common waste	544	14,5
Cups	30	21

if it assumed that at least 30% brings their own bottle,

$$15\ 000\ pieces * 0{,}3 = 4500\ pieces$$

it means 4500 pieces decrease in cups, which is in amount of waste 4,4 m^3,

$$\frac{15\ 000\ pieces}{14{,}5\ m^3} = \frac{4500\ pieces}{x} \rightarrow 15\ 000\ pieces * x = 14{,}5\ m^3 * 4500\ pieces$$

$$x = \frac{14{,}5\ m^3 * 4500\ pieces}{15\ 000\ pieces} = 4{,}35\ m^3\ \approx 4{,}4\ m^3.$$

10 DISCUSSION

Since the query was answered after the convention it might have an impact for upcoming results. If this query would have done during the convention the reach might have been bigger and answers would have been more precise but even with the result got the overall picture of present waste management system was achieved and in overall Desucon is doing a good work when it comes to waste management nevertheless some things can be improved.

Decreasing the amount of waste in Desucon was more challenging than assumed since so much is based on the actions of visitors and the necessaries provided to get a working convention increases the amount of waste.
To decrease the waste amount starting from the plastic cups visitor would need to be informed beforehand to bring their own bottles. A convention without cups might never be archived but convention with less cups is a reachable goal though it is a slow process. If this seems an impossible thing to do, maybe instead of removing the plastic cups entirely one option could be changing the cups for more environmentally friendly options such as carboard cups where one alternative cup providing company could be Kotkamills. If this is done, then the amount of generated waste stays the same and therefore can’t be decreased.

Even though the amount of paper waste or leaflets wasn’t a problem; it doesn’t hurt to decrease the amount of those as well. By focusing more on virtual leaflets such as a mobile app which contain all the same information as the leaflet and reminds the upcoming programmes and visitor could mark their own interests of programme. But since this might be quite radical thing to do suddenly, the amount of leaflet waste can be decreased yearly little by little to reach the minimum number of leaflets.

If it is not possible to reduce or get rid of the leaflets, it could be a good idea to add a page or a section where is common guidelines for recycling in Desucon. By adding color coding guide and mention this in the opening ceremony is on good choice to increase the awareness and since there official colors for different waste types is already existing those can be easily applied. It is not sure if Sibelius Hall is planning to invest for new recycling bins but at this point by marking bins with a text and color coding could be considerable option. With the combination of color coding and guides and easy start is made for the better.

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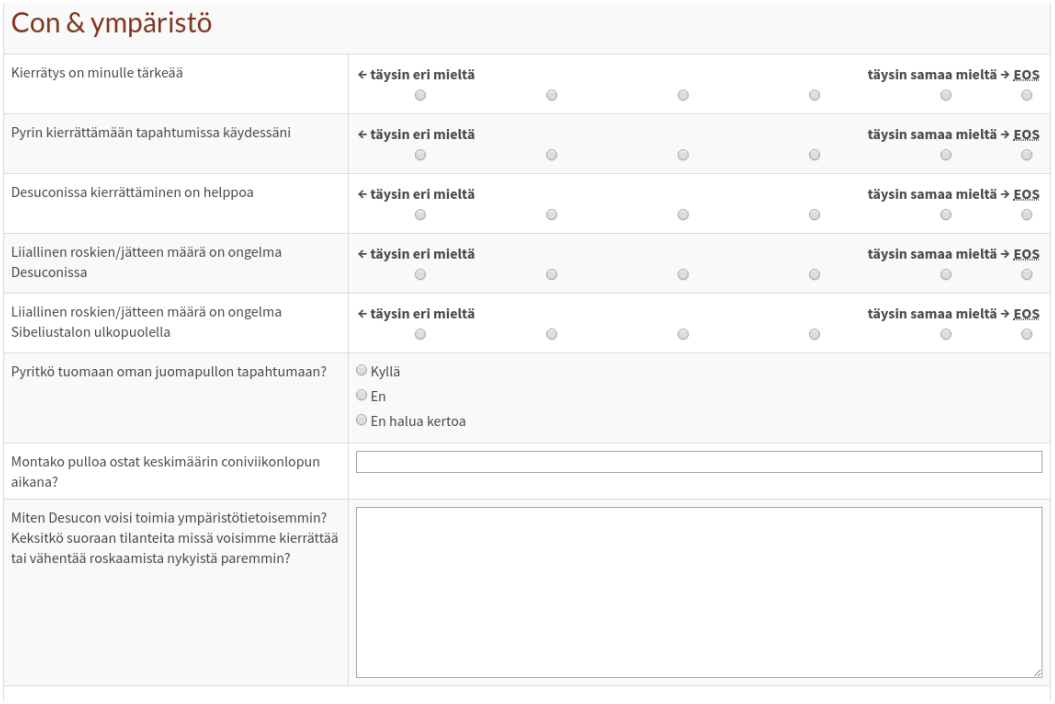
APPENDICES

Appendix 1. Con & Ympäristö



Con & ympäristö

Kierrätys on minulle tärkeää	← täysin eri mieltä				täysin samaa mieltä →	EOS
Pyrin kierrättämään tapahtumissa käydessäni	← täysin eri mieltä				täysin samaa mieltä →	EOS
Desuconissa kierrättäminen on helppoa	← täysin eri mieltä				täysin samaa mieltä →	EOS
Liiallinen roskien/jätteen määrä on ongelma Desuconissa	← täysin eri mieltä				täysin samaa mieltä →	EOS
Liiallinen roskien/jätteen määrä on ongelma Sibeliustalon ulkopuolella	← täysin eri mieltä				täysin samaa mieltä →	EOS

Pyritkö tuomaan oman juomapullon tapahtumaan?

- Kyllä
- En
- En halua kertoa

Montako pulloa ostat keskimäärin coniviikonlopun aikana?

Miten Desucon voisi toimia ympäristötietoisemmin? Keksitkö suoraan tilanteita missä voisimme kierrättää tai vähentää roskaamista nykyistä paremmin?

Appendix 2. 9 Luku: Roskaantumisen ehkäiseminen

30 § Yleisötilaisuuksien jätehuolto

Yleisötilaisuuden järjestäjä vastaa järjestettävän tilaisuuden jätehuollosta. Järjestäjä vastaa myös jätehuoltoon liittyvästä neuvonnasta tilaisuuden aikana sekä jätteiden lajittelusta ja erilliskeräämisestä näiden jätehuoltomääräysten mukaisesti. Hyötyjätteiden erilliskeräys on järjestettävä yleisötilaisuudessa näiden jätehuoltomääräyksien 9 §:n mukaisesti jätteen arvioituun syntymäärään perustuvin edellytyksin. Yleisötilaisuus on suunniteltava siten, että syntyvän jätteen määrä on mahdollisimman vähäinen. Tapahtuma-alueelle on sijoitettava riittävästi ja kattavasti jäteastioita eri jätelajien keräämistä varten. Roskaantuneen alueen toissijaisen siivoamisvastuun osalta järjestäjänä pidetään myös tilaisuuden tai tapahtuman kokoonkutsujaa. Jäteastiat on tyhjennettävä ja alue siivottava välittömästi tilaisuuden päätyttyä sekä tarvittaessa tilaisuuden aikana. Jäteastiat on tyhjennettävä aina niiden täyttyessä. Monipäiväisissä tilaisuuksissa jäteastiat on lähtökohtaisesti tyhjennettävä ja alue siivottava vähintään kerran päivässä. Yli 500 henkilön yleisötilaisuudesta on laadittava jätehuoltosuunnitelma ja esitettävä se kunnan ympäristönsuojeluviranomaiselle viimeistään kaksi viikkoa ennen tapahtumaa.