Reusable tableware at festivals

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LAB vlieland
Circular Festivals
Ministerie van Infrastructuur en Waterstaat

Transition program from single-use to reuse

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Background

Mission Reuse is a program designed to drive the transition from single-use to reusables in the Dutch market. The program, created by Enviu, Recycling Netwerk Benelux, and Natuur & Milieu, tests new reusable business models in different situations to identify conditions and challenges for implementing them on a larger scale. This research supports innovation but also gives insights into our recommendations for supporting policy to implement reusables successfully in the Dutch market. We share our knowledge widely and support the changing narrative from single-use to reuse with our communication strategy. For more information www.missionreuse.com

During 2022 we researched a broad pilot on reusable tableware at festivals, initiated by Lab Vlieland and the Green Deal Circular Festivals. The pilot included three festivals: DGTL, Castlefest, and Into The Great Wide Open. The case study of the Gentse Feesten was added later. This white paper shares the outcomes and recommendations. Paardekooper provided the reusable tableware. For DGTL and Castlefest they used the packaging of Goodless. For ITGWO SwapBox also provided reusable tableware.

In this report, for context, we also explain the existing cup systems at the various festivals.

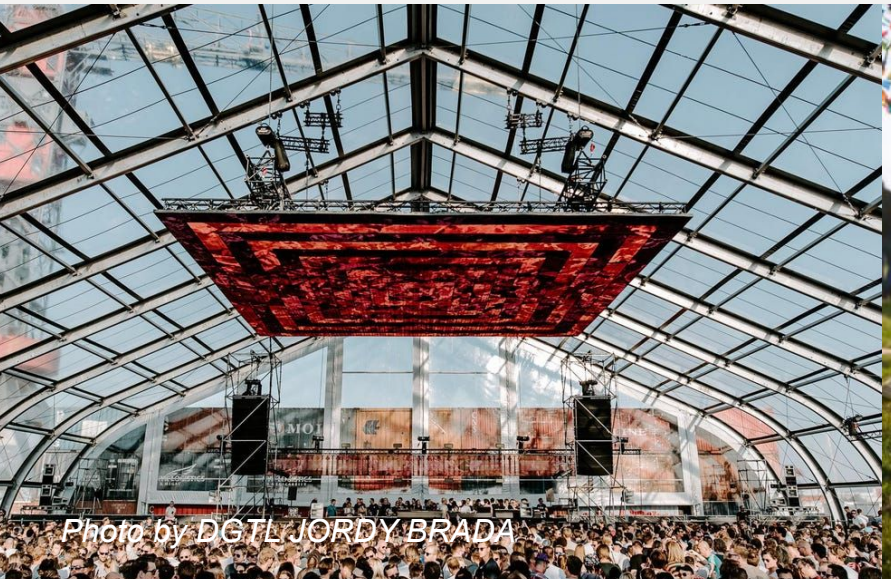

Photo by DGTL JORDY BRADA

Photo by Castlefest

Photo by ITGWO

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PILOTS IN THE NETHERLANDS

DGTL

SITUATION

Reuse system (scope)

Visitors: 48.000 over three days
Incentive for reusable tableware: no
Duration reusables: few hours on 1 day
Location reusables: food vendors at the food square
Meals served with reusables**:** burgers, pancakes, toasties
Disposables used: greaseproof paper (wax paper) and napkins, disposable plates and bowls after the pilot

Reusable plates: 350
Caterers participating: 5 of 9

On the 17th of April 2022, during the day, the festival used 350 reusable meal containers after which they switched back to disposables.

Setting

DGTL is a multi-day festival with approximately 48.000 visitors in Amsterdam (NL). There is no campsite or overnight stay offered. Also, there are no trash bins across the festival site except, only in the designated recycling station and a few collectors for cigarette buds. Food stalls are located at a designated food court. This area is not closed but is clearly separated from the music stages. Visitors, therefore, only eat in this area. Food is not the main focus of this festival though.

There is a recycling station where crew collect different waste streams. This is also the station where reusable plates and containers were collected. The food court offers only vegan and sustainable options.

SITUATION - cups

Cup system

This report focuses on tableware but we briefly explain the reusable cup system, only on this slide, as different systems were implemented for cups and tableware.

A different system was used for drinks, which was also used earlier at the festival. Cups and cans were sold with an additional €1.5 deposit. In addition to the recycling hub (see page 11), cups could also be handed in to crew from the festival who walk around collecting cups.

When the cups are handed in, visitors receive a plastic cup coin or they can also swap a used cup for a new one at the next consumption. This facilitated a cashless operation throughout the entire festival. At the end of the festival you lose the deposit for each cup or coin as it **cannot be exchanged for a monetary value** such as cash back. This provides **an extra source of income** for the festival, but **additional costs for visitors**

SITUATION - tableware

Packaging

The intention was to use two types of reusables a black plate and a black container, both made of plastic (PP). Eventually the containers were not actually used.

Challenges:

- **The look and feel of the tableware:** the most common argument for the food vendors not to use the containers was that they couldn't create the desired food experience using the offered black plate and container. Arguments ranged from purely aesthetic, regarding food styling, to practical like being too small for the desired portion size. Food items that were listed as unfit for these recipients were hotdogs, spring rolls, fries, and fresh fruits.
- **Heat proof:** the plastic material wasn't heat proof and therefore couldn't be used for the vegan kebab 'kapsalon' as they would melt in the grill.
- **Scratches:** the plates and containers both had scratches that were already there, before the start of the festival.
- **Branding:** food vendors wanted branding with their products, for which they used disposable napkins with their name and/or logo, leading to extra use of products.

Conclusion: a wider range of reusable tableware could facilitate the acceptance by food vendors and cater for more types of food. However, in the end the willingness from the food vendor is key as other large scale festivals used these containers for all food items. Implementation can be facilitated by aligning on a uniform reuse system and the type of tableware with the food vendors.

SITUATION - tableware

Communication

Employees were informed about the reusable tableware by the general food stall manager.

Visitors were informed about the pilot by posters and by the employees at the food stalls.

Practical challenges:

- **Explanation at food stalls**: the visitors indicated that they were insufficiently informed about the concept by the employees at the food stalls.
- **Clarity**: the alternation between reuse and disposable may have caused confusion as many visitors attend the festival for several days and this was the last day of the festival.
- **Type of system**: the system for handing out and getting back tableware differed from the known system which has been used for cups (see following slides). Visitors were used to the deposit system and found it confusing that tableware had to be handed in in a different way.

Non-Dutch-speaking visitors indicated that it is nice that the signing was in English.

RETURN LOGISTICS

Collection of reusable plates

The festival had five recycling stations, where mostly cups could be handed in. The reusable packaging - and other recycling items - could be returned to the main recycling station, which was manned by three crew members and located in the food area where the reusable tableware was used. The crew at this recycle station facilitated the system. Besides bins for separating waste streams, i.e. to facilitate recycling, the main recycling station also included 2 bins for returning reusable tableware. This concept of a mixed recycling and reuse station was unclear to some visitors, who tried to return the packaging to the food vendors themselves. The lack of communication, e.g. when purchasing food, played a major role here. By installing a separate waste bin alongside the reuse bins, visitors were incentivised to clean off the tableware better.

There was no tableware seen on the ground and most visitors brought the tableware to the recycling station themselves. Only a few plates were left on the tables. In short, the recycling station was well frequented and because of the lack of waste bins it was clear that people had to pass by the station to hand in materials.

When applying reuse, ‘recycling station’ does not seem to be an appropriate name. After all, recycling implies that everything will be reduced to raw materials and not that items such as the cups (and now also tableware) are reused as products. **A product reuse station or circular point are some suggestions for more appropriate communication.** Clarifying the valuable reuse stream could reduce careless behaviour like sticking chewing gum on plates, which causes permanent damages, and thus impedes reuse.

RETURN LOGISTICS

Return rate

The return percentage of the reusable packaging, without incentives (such as deposits) within a closed food court environment was:

Containers: only few containers were used by the vendors, therefore there is no data available.

Plates: 340/350 (97%) of which 4 (1%) were rejected due to chewing gum/damage.
With a dropout of 14 items and thus 336 items that can be reused (350-14), the number of rotations the reusable plates could make in this context is on average 25 (350/14).

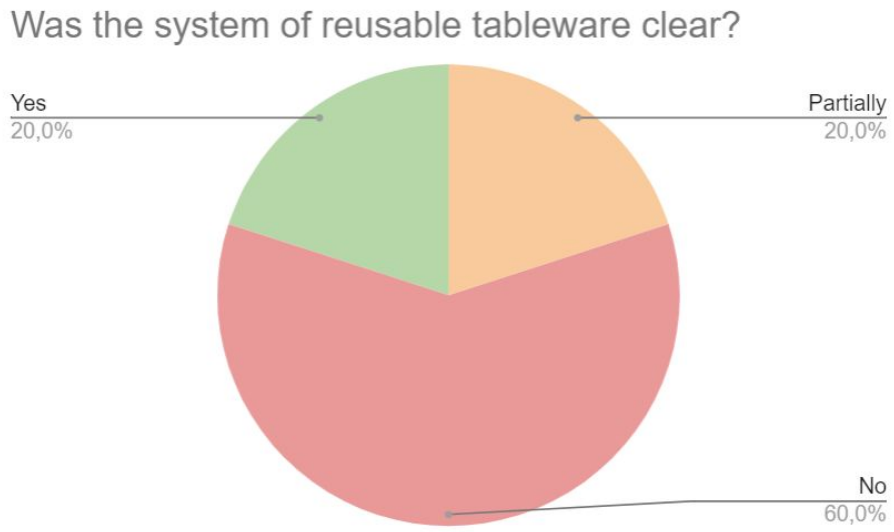
EXPERIENCE

The Mission Reuse team collected input about reusable tableware from 25 visitors and 4 employees during the festival itself.

Visitors

The interviewees had an average age of 27 years and are average in terms of sustainable living. Only five (20%) indicated that the reuse system was clear. They attributed this mainly due to the lack of explanation at the food vendors and the assumption that they can also return the packaging there. The cup system is better known.

Most interviewees found it relatively clear that the tableware was reusable, and thus not disposable (1.9 on a scale of 1 as very clear and 5 extremely unclear).



EXPERIENCE

Visitors

The majority (76%) is open to a deposit system and indicated an average deposit price of €1.5. The preferred way of returning the deposit varied between pin back (33,33%), a coin similar or identical to the cup coin (26,7%) and cash (20%).

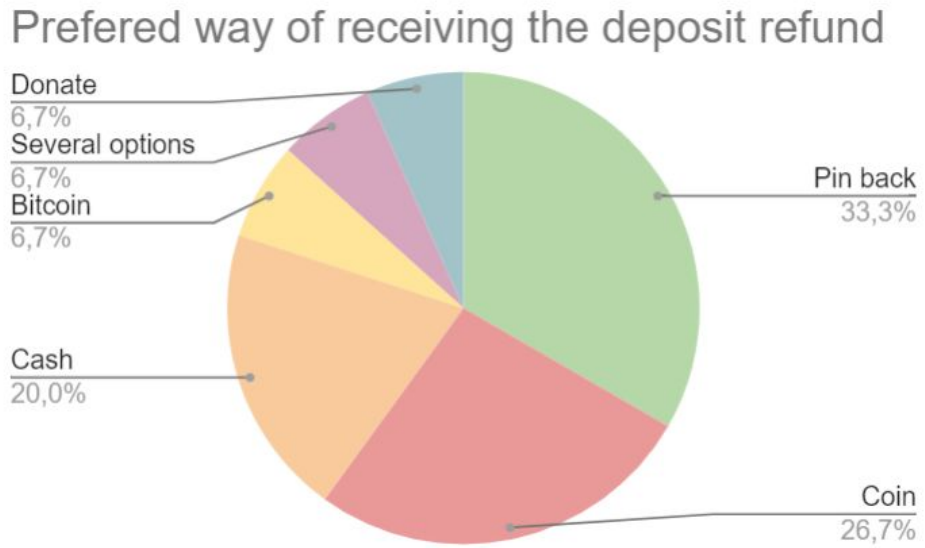
Regardless of the unclarity, visitors indicated that they liked the overall experience rating it 4,4 out of 5. For the next edition 95,7% would recommend it. The majority (90%) found the location of the recycle hubs a good spot to return the tableware.
Visitors stated the following benefits:

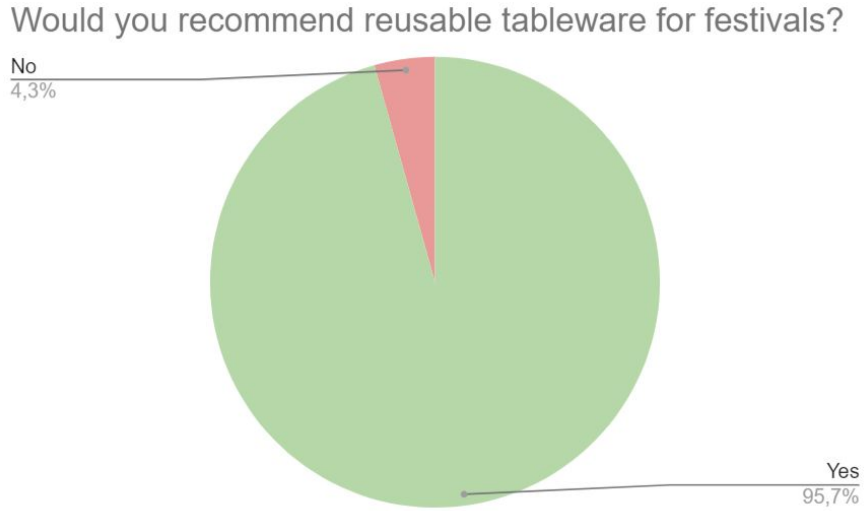
+ Less waste
+ More sustainable
+ Better dining experience
+ Feels more luxurious and better quality
+ Sturdier than disposable and therefore easier to walk around with and eat from
+ Simple
+ Easy to use

Visitors stated the following disadvantages:

- No explanation at the food stall
- Too little information about the sustainability impact

The following **recommendations** were also made: make it obligatory and visitors will follow, mention on the tableware that it's reusable, avoid branding to prevent visitors taking them home as collectors items and apply clear communication.





EXPERIENCE

Foodtrucks - staff

Staff stated the following benefits:

+ The black color gave an **aesthetic** advantage over the white paper plates for some dishes, e.g. the powdered sugar of the poffertjes was more visible
+ **Less (disposable) packaging** has to be purchased
+ **Less waste** and the **festival site is cleaner**
+ Advantage if a **system is offered by the festival**, to reduce purchasing costs and a uniform system can be applied and communicated throughout the festival

Staff stated the following disadvantages:

- Took up much **more space**: where 100 disposable containers used to fit, now only 25 reusable ones fit. Fortunately, they indicated that lack of space was no issue here.
- Downside of the containers is **visibility** - other visitors cannot easily see the food - because that reduces sales, which resulted in a preference for the plates over the containers
- The plastic packaging should not be stored or used in or around an **oven or grill**
- **Dirty plates were returned at the food vendors**, e.g. customers taking their sandwich off the plate and returning it immediately while food vendors didn't have containers to collect them
- Suboptimal **aesthetics** and **dining experience**, e.g. the burger fell apart on the plate

EXPERIENCE

Foodtrucks - staff

Reasons not to apply reuse

- **Lack of willingness** to change business as usual
- Not possible due to the **melting of the packaging** with use for dishes such as loaded fries that go under the **grill** after preparation
- Packaging did not match the **envisioned food experience:** Food vendors are used to a wide assortment of disposable packaging and optimised their meals accordingly. This created the request for different packaging formats, colours, and shapes and required some adaptation with the two types of reusable tableware available.
- **Adapting portion size** to the two types of reusable tableware was especially tricky due to practical reasons (e.g. optimised spoons) and the linked cost calculations within the food vendors' business model.
- Fries **cool down** too quickly on a plate
- No container, or **separation for sauces**

CONCLUSION - DGTL

The food court setting lends itself well for a system with only reusables: the area is enclosed and there is enough staff at the recycle station to control the return logistics. This makes a fully reusable system feasible. A deposit is potentially not necessary because it is a closed environment.

It is important that there will be a more diverse range of types of tableware, or an option is selected that fits a wider variety of food. Most food vendors didn't find the food containers usable for their products. It would be optimal to involve food vendors from the start and include their requirements for selecting a festival wide reusable tableware system.

There was a need for branding and to avoid realizing this via additional disposable items - such as napkins - other branding opportunities could be explored such as on reuse packaging. Although in doing so you sacrifice uniformity and consumer recognition which was appreciated by the visitors.

It remains to be explored how such a system would work in a festival setting with a campsite and the complexity of spreading the food across a festival location.


MISSION REUSE

CASTLEFEST


Where fantasy becomes your reality
CASTLEFEST

SITUATION

Reuse system (scope)

Visitors: 45.000 over four days
Incentive for reusable tableware: no
Duration reusables: 3 of the 4 days
Location reusables: 2 food vendors on one festival square
Meals served with reusables: BBQ and vegan rice dishes
Disposables used: greaseproof paper and napkins, coffee cups, cutlery

Reusable plates: 9000
Caterers participating: 2 of 40

Setting

Castlefest is a multi-day festival with 45,000 visitors at Lisse (NL), which has a camping site. Various food stalls are spread across the festival squares. Food is part of the festival experience with dishes and drinks that fit the scenery. The food stalls are located next to the stages and visitors mostly consume their food near the food stalls.

At one of the festival squares, two different food vendors used reusable plates for all their meals. One served vegan rice dishes and the other BBQ dishes. At this and other squares food was also served on disposable napkins and greaseproof paper,e.g. bread, and in the reusable drinking cups, e.g. fresh fruit salad.

SITUATION - cups

Cup system

This report focuses on tableware but we briefly explain the reusable cup system, only on this slide, as different systems were implemented for cups and tableware.

The reusable cup system differed from the reusable tableware. Drinks have been served in reusable ceramic cups since the first edition of the festival in 2005. These cups were sold for a two coin deposit (€2.80). Cups could be returned to the bars. The Castlefest organization has deliberately chosen to make a cup with a different color for every edition. The cups are regularly taken home by visitors as a collector's item and therefor they don't stay within the pooling system of the festival to be reused at the next edition.

When the cups are returned, visitors get their two coins back, or they can also turn in a used cup for a new one at the next consumption. The entire festival is cashless. At the end of the festival you **can exchange your coins for a monetary value** such as cash back (via card).

<u>Practical challenges:</u>

- **Branding** per edition creates a collector's item and prevents use at other festivals

SITUATION - tableware

Packaging

Black plastic (PP) plates were used. The plates were well received at both locations. By using one type of plate for all meals, the uniformity of the plates created recognition at the different food stands. The stackability facilitated optimal space usage at the food trucks and for collecting the used items.

The reusable plates were provided without a deposit or any other incentive system, this resulted in no additional work for the food trucks.

Practical challenges:

- **Adding disposables**: one of the vendors added disposable packaging for a salad that was served with the dishes.

SITUATION - tableware

Communication

Employees were informed by the food stall manager.

Visitors were informed about the pilot by posters that were placed on the food stalls and by the employees of the food stalls. The signs at the food stalls stated that the plates would be washed and - next year - reused. That was clearer than at DGTL, where it looked like the plates would be recycled. However, the signs was too small and inconspicuous, so most people did not notice them.

Visitors who did not speak Dutch indicated that it is nice that the signing was also provided in English.

<u>Practical challenges:</u>

- **Informing of visitors:** visitors indicated a lack of info about the concept, they were generally not informed by employees at the food stalls even though that was the intention. However, with the high volume of meals that is served this costs a significant amount of time, especially with the first order. They described the signing at the food stalls as unnoticeable, too small and unclear.
- **Clarity:** the combination of reusable and disposable packaging added confusion.
- **Combination of systems:** moreover, the system for the plates is different from that which has been used for cups for some time (see below).

RETURN LOGISTICS

Collection of reusable plates

The reusable plates were provided without a deposit or any other incentive system. They could be returned at **1-3 drop-off points**. Initially one was set-up, we added two later on. These unmanned stations consisted of four collection crates on a stack of pallets. Signs on a pole and at the stations informed visitors that they could hand in their plates there.

To **encourage emptying the plates** of food scraps, napkins and other waste we adapted the drop-off points by adding one of the bins - a low, open wastebasket - for other waste. By placing a separate waste bin in addition to the collection bins for reusable plates, the waste was largely separated from the plates. A single disposable cup or tray, disposable cutlery, napkin or other piece of waste ended up in the collection crates.

The collection points were too **limited and not visible** when it got dark or crowded. Resulting in some visitors that were not aware of the presence of the drop-off points. The lack of visibility was not compensated by the food vendors: they were supposed to inform their customers about the drop-off points but didn't manage to do so.

Alongside the many plates collected at the drop-off points, this resulted in plates left behind, dumped in the bin for other waste or brought back to the vendor. The standard bins for other waste were well known as they were used throughout the festival terrain. Their wide opening facilitated that the reusable plates were also disposed of in these bins rather than the collection point for reusables.

Therefor we installed two additional drop-off points, close to where people were waiting in line to order food at the two locations that used the plates, which resulted in better visibility.

RETURN LOGISTICS

Return rate

The return rate of the reusable plates, without incentives (such as deposits) within a fairly open food court environment was:

Plates: 8074/9000 (90%) returned, of which 404 (5%) were rejected due to chewing gum/damage.
With a dropout of 1330 items and thus 7670 items that can be reused (9000-1330), the number of rotations the reusable plates could make in this context is on average 7 (9000/1330).

Practical challenges:

- **Collection crates overflowing** due to lack of emptying and managing of the drop-off stations
- **Drop-off stations were too limited and not visible enough**: placing them next to the line where visitors queue up to order food proved to be a successful strategy as customers already notice the bins while they are waiting

Conclusion: Placing sufficient collection points, making them visible, clearly communicating about them and repeatedly emptying them are key for facilitating a good return. Additionally, other waste bins should be designed so the reusables cannot be misplaced there. With large reusable items like the plates that would be fairly easy by selecting a lid that selects on size so you can only throw in trash that is smaller than the plates.

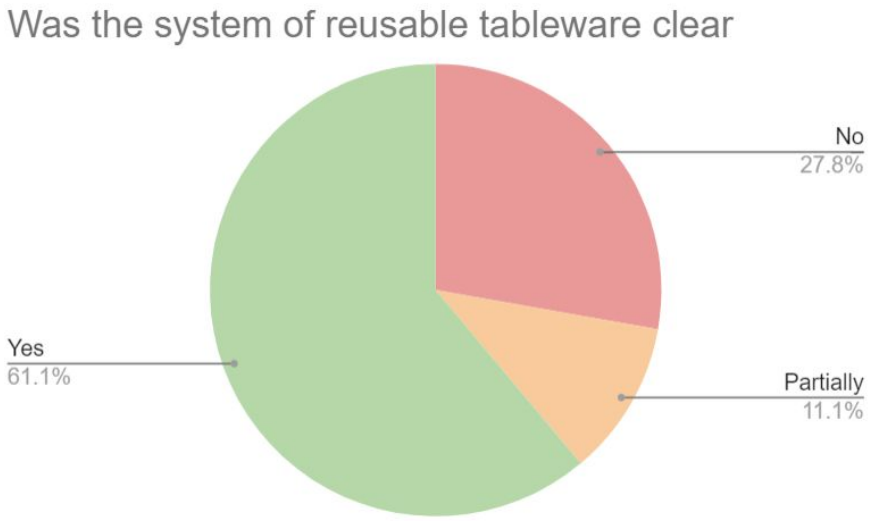
EXPERIENCE

The Mission Reuse team gathered input from 25 visitors and a few employees.

Visitors

The interviewed visitors had an average age of 38 years and estimated themselves average in terms of sustainable living. Some of them indicated that sustainability values fits the approach and atmosphere of the festival.
Most (61%) interviewees indicated that the reusable tableware system was clear but this was mainly because they coincidentally had seen the drop-off points themselves or had seen the announcement beforehand on social media. Only 21% of the visitors were informed by the employees of the food stalls. One visitor indicated, they fished the plate out of the garbage again. They would rate the reusable system 4,9 out of 5.

Most interviewees found it very clear that the **tableware was reusable** (1,94 on a scale of 1 as very clear and 5 extremely unclear). They recommended to add a logo that indicates reuse on the tableware but to avoid festival or too beautiful branding to avoid collector's items, although that is the case with the cups at Castlefest.



Cups are produced per edition with the festival logo, year, edition umber and a specific colour. Photo by Castlefest

EXPERIENCE

Visitors

The vast majority (84%) is open to a deposit system. On average, they are willing to pay a coin (€1.40) and are happy to receive their deposit back as a coin. A few indicated that they would like to follow along with whatever system would be the easiest for the organization. Several visitors indicated that they were not prepared to stand in line again to get the deposit refunded.

Half of them (50%) found the drop-off points well located. Most indicated the request to improve communication and signs as well as having more bins especially near the food vendors, which were relocated halfway the festival.

Except for the visibility of the drop-off points, the reactions were unanimously very enthusiastic. The following benefits were named:

+ Better eating experience
+ Sturdier
+ Feels more luxurious/quality
+ Less waste
+ Less littering
+ Sustainability
+ More in harmony with nature

A number of visitors requested reusables for cutlery and coffee cups.

The cup system is established and well known to visitors. A number of visitors indicated that that a uniform system for cups and tableware would be convenient.

Adding the other waste bin next to the drop-off point increased cleanliness of the collected plates

EXPERIENCE

Foodtrucks - staff

Challenges

- Unclear where visitors should hand in plates: plates were returned to the vendors
- Plate is not deep so overflows quickly
- No solution available for some dishes like, chia pudding.

Advantages

+ Sturdy plates
+ Do not heat up as quickly as many disposable products
+ Costs no extra handling
+ Nice to have less waste and the festival site is cleaner

One of the vendors still used disposables with each dish, to serve salad and already portion it beforehand.

EXPERIENCE

Waste coordinator - staff

Challenges

The waste coordinator (who empties the collection crates at the drop-off points) received the instruction to start monitoring the crates with reusable plates only in the afternoon of the third festival day. Thus the first days of the festival the crates were overflowing.

After being informed they listed some challenges:

- Takes more time
- Unhygienic to dive into the waste bins of residual waste and take out plates
- Didn't get clear instructions so didn't know where to find empty crates and where to put the full ones

Behaviour was clearly copied, one plate in the other waste bin, automatically attracted more, because people then assumed that was the way to handle it.

CONCLUSION - CASTLEFEST

Castlefest is a festival where food vendors are spread across the festival terrain. For this pilot, two food stalls, fairly close to each other, switched to the deposit free reusable system. As the reusables were only tested at one of the food squares, that sometimes caused confusion among visitors but that was compensated by the uniformity of the one reusable plate that was used. Visitors are very caring and involved in helping with the organisation's sustainability efforts by e.g. looking for waste bins themselves. Both visitors and staff reacted enthusiastically about creating less waste and enjoyed the cleaner festival area.

Expanding the reusable plates to the whole festival area might be useful to reduce the use of napkins and greaseproof paper where possible in order to create a more uniform experience. By doing so visitors develop the custom to look for a drop-off point after eating rather than looking for just a bin. For this one type of plates could be selected that caters to as many dishes as possible. A uniform system and clear festival wide communication could also greatly reduce the need for oral explanation by the food vendors themselves, who were too busy due to the high turnover of meals. In addition, pictograms next to or instead of text on signs would be helpful for non-Dutch speaking visitors.

It is key for an optimal reuse system, that the organisation also integrates the reusables in their crew briefings. They should appoint one responsible and contact person for the reusable tableware. Also the emptying of the return points should be optimised. Clear communication is key and the return points should be placed near the food vendors and it offers a nice opportunity to create a visual set-up in fantasy theme, fit with the festival atmosphere e.g.following the example of dragon shaped ashtrays.

INTO THE GREAT WIDE OPEN

INTO THE GREAT WIDE OPEN

SITUATION

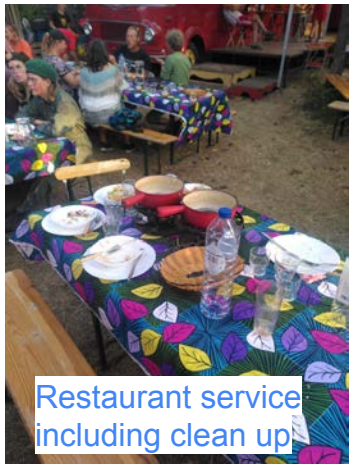
Reuse system (scope)

Visitors: 32.000 over four days
Meals served: 85.000
Incentive for reusable tableware: no
Caterers participating: 35 of 35
Duration reusables: all 4 days
Location reusables: all food vendors on all festival squares
Meals served with reusables**:** burger, pizza, fries, rice dishes, samosa, taco, pancakes, falafel, salad, fine dining
Disposables used: greaseproof paper and napkins, cups sold at a coffee corner from the supermarket near the campsite

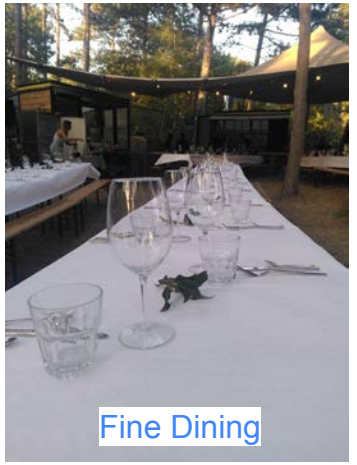
Setting

ITGWO is a multi day festival in the beginning of September at the island of Vlieland (NL) with a camping adjacent to the festival locations. The festival has a strong ambition for sustainability. 35 food vendors are spread throughout the festival squares and are integrated with the stages. Food is presented as a culinary experience and ranges from food truck snacks to restaurant-like haute cuisine. In the latter setting customers were asked to leave the reusables on the table.

To accommodate for these different food experiences some vendors chose their own reusable tableware. This pilot also introduced a shared pool system with reusable tableware offered throughout the festival terrain.



Restaurant service including clean up



Fine Dining

Plastic reusables from the shared system

SITUATION - cups

Cup system

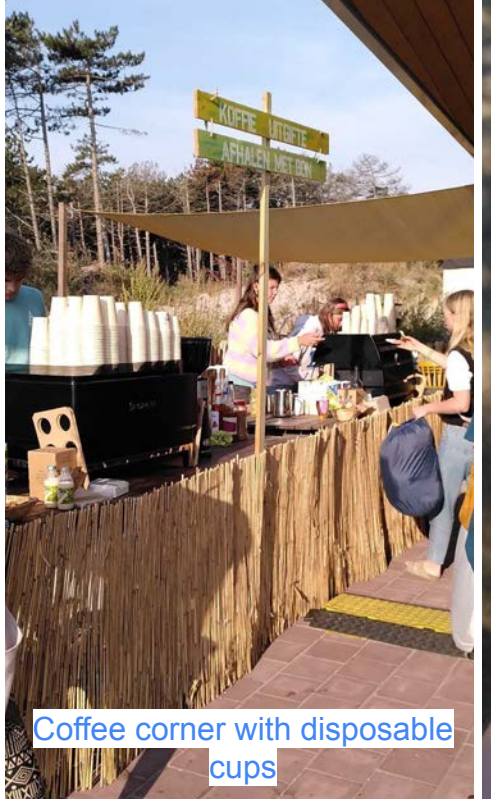
This report focuses on tableware but we briefly explain the reusable cup system, only on this slide, as different systems were implemented for cups and tableware.

A different system was used for drinks. It has been in place since 2010 for cold drinks and was updated every now and then. This year reusable cups for warm drinks were introduced, for example. A deposit system was used with cup coins.

All visitors receive a cup coin upon check-in and can exchange it for cups at the bar or get the coin back when they return the cup. When ordering a drink without handing in a used cup or a cup coin you pay 1.5 euro extra. This money is not refunded at the end of the festival.

<u>Practical challenges:</u>

- The **disposable coffee cups** sold by the supermarket coffee store were very **similar** to the reusables in look and feel. This created confusion for customers and staff.
- The **cups and coins** cannot be redeemed for cash in the end, and thus l**ose their value** then.



Coffee corner with disposable cups

SITUATION - tableware

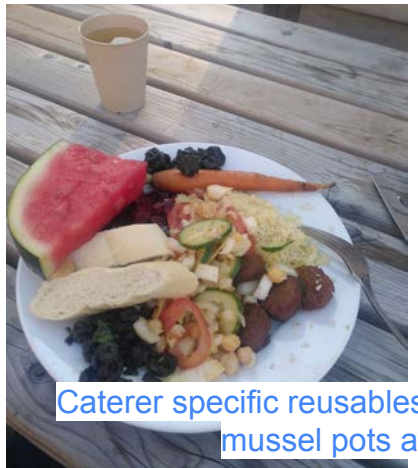
Packaging

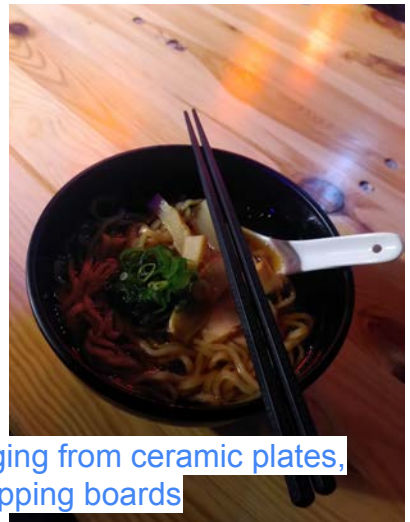
Types: Nine different reusable items were used within the festival wide shared system including six types of plates and bowls and three types of cutlery. The items are all made of PP and some have a minor addition of minerals including micronized talc, a mineral that increases the hardness and resistance of the PP. Alongside, a wide variety of reusables were provided by the food stalls themselves, including among others ceramic plates, mussel pots and ramen bowls.
The food vendors liked the wide variety of packaging that was available so they could keep the culinary experience they envisioned.

Next to the shared system for visitors, for the crew catering there were ceramic plates, reusable plastic bowls with a lid and metal cutlery. For crew that couldn't eat in the canteen reusable boxes with a lid were used.

Plastic reusables for crew on site

Plastic reusables, shared system





Caterer specific reusables provided by the food stalls ranging from ceramic plates, mussel pots and, ramen bowls to wooden chopping boards

SITUATION - tableware

Packaging

Practical challenges:

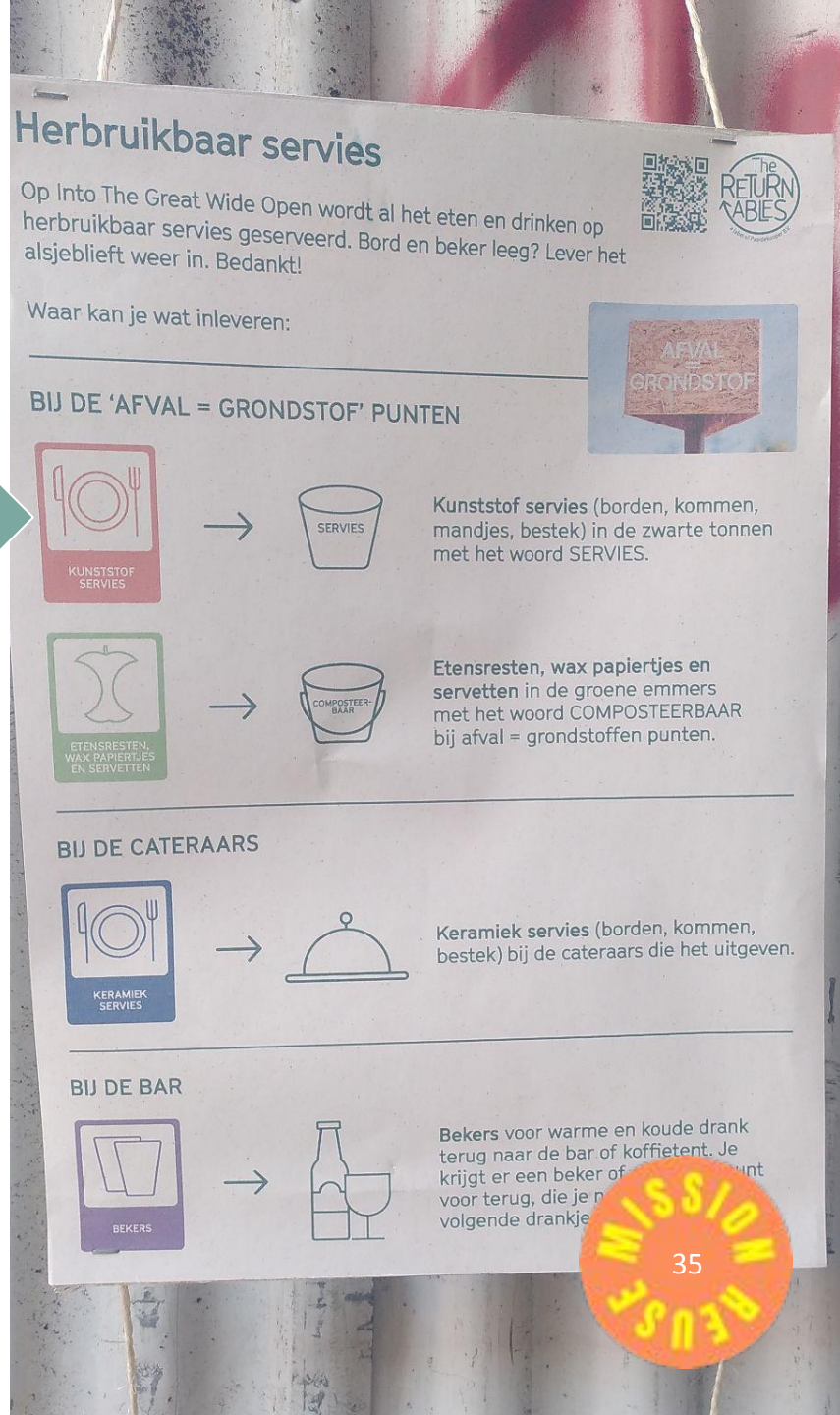
- The plates and bowls were **stackable**, which was convenient behind the counter. **Cutlery** however was delivered loose in a big box, which was less hygienic, unpractical and inconvenient as they got tangled up. Some vendors solved this by wrapping cutlery sets (knife/spoon/fork) in a disposable napkin. Most vendors solved this by offering cutlery in tins at the counter so customers could take what they needed.
- Replacing the disposable tableware with reusables in the food trucks worked out. Especially as most vendors had a spacious area to move around and adjust the set-up. It would be an added benefit if the tableware and secondary packaging they get delivered in are an **(international) standard size** so especially small food trucks can optimise for one set-up
- **Adding disposables**: Several vendors added disposables like napkins around cutlery sets, small sauce containers and paper to the baskets
- Due to **limited availability**, some vendors didn't have the type of containers they wanted, or washing on site was needed to maintain enough clean items
- Cutlery was not that sturdy and the reusability was questioned by the visitors, we found several **bended forks** in the trash

SITUATION - tableware

Communication

Employees were informed by the food truck managers.

Communication towards **visitors** was in Dutch and minimal. Some small posters hung at the food stalls, which only one of the visitors we spoke to noticed. The poster explained where plates and cups could be returned and mentioned that they were reusable. The resource points indicated in which bin tableware was collected. There was also a “circular and climate positive” tour where the reusables and other sustainability measures were shown to the public.



Practical challenges:

- Visitors indicated **a lack of information** about the concept, and the different set-ups and tableware.
- The **combination of systems** confused the visitors. Sometimes they were expected to clean up after themselves and other times not. Some plates had to be returned at the vendor and others at the resource points.
- **English signing** was absent, but the festival has almost no non-Dutch speaking visitors.

RETURN LOGISTICS AVAILABLE TO VISITORS

Resource point


Bin meant for tableware

Signing at the resource point indicating compostables in green bin, tableware in black bin and residual waste in red bin

Bin meant for other waste

RETURN LOGISTICS

Collection of reusable plates

Return streams:

- cups at the bar or resource collection point at the exit of the terrain
- reusable plates from the shared system at the resource points
- reusable plates from the shared system at the vendor's collection stations
- reusable plates from the vendor at the vendor's
- restaurant-like dining: no return needed as tables were cleared by staff (there was no incentive for reusable tableware)

The unmanned resource points were recognisable and present on all squares. Signs on a pole at the location informed visitors to put plates in the black tableware bin.

<u>Practical challenge:</u>

- **Confusion** was allround for visitors with so many different streams and set ups and little communication. If visitors realised that they were required to clean up the tableware, they would often easily find the recognisable resource point. At the resource point however they often looked around confused about which bin to put the reusable tableware in, which led to copying the behaviour of others. With ceramic plates being available several visitors thought that the plastic plates, especially the black ones, were disposable and thus left them in the other waste bins.
- **Uniformity** is key, black bins sometimes mentioned organics while they collected tableware
- Some vendors created additional points near their location and didn't follow the **color scheme**.

Alongside the many plates collected at the resource points, the confusion resulted in

Collection point created by one of the vendors that uses different colours then the festival wide color scheme resulting in mixed streams

RETURN LOGISTICS

Return rate Overview of the reusable tableware within the festival wide system:

Reusable PP (diameter or volume)	Used	Return rate	Rejection rate	Total fall-out	Number of rotations
Large plates (Ø27cm)	2,700	85.5%	89.0%	2,446	1.1
Medium plates (Ø20cm)	12,600	97.5%	15.0%	2,158	5.8
Small deep plates - Bowl (Ø17cm)	6,000	97.8%	11.0%	777	7.7
Baskets	840	99.4%	5.0%	47	18.0
Large soup cups (1017ml)	1,960	99.2%	3.0%	74	26.5
Medium soup cups (598ml)	850	98.7%	59.0%	506	1.7
Knives	12,500	94.4%	1.0%	818	15.3
Forks	24,000	89.7%	17.0%	6,132	3.9
Spoons	13,000	98.9%	2.0%	400	32.5
Total / Average	74,450	94.4%	12.7%	13,095	5.7

Used = items of tableware that were unpacked and returned after the festival

Return rate = number returned / number used

Rejection rate = number rejected / number returned

Total fall-out = (number used - number returned) + number rejected

rotations = Used / total fall-out

The **number of rotations** expresses how many times, on average, a reusable item can be used before it needs to be replaced

Comments and explanation of the data on page 41.

RETURN LOGISTICS - crew catering

Return rate

Overview of the reusable tableware at site of the crew catering

Reusable	Used	Return rate	Rejection rate	Total fall-out	Number of rotations
Bowls with lid	4300	96.9%	%		

The reusables in the crew catering had a slightly higher return rate. This can largely be explained by the closed environment the crew operates in. They for example didn't need to return these bowls through the resource point but the empty bowls were picked up after the meal. It could be surprising that some were lost but these bowls with lids were specifically used for the remote locations. Meals were prepared in the bowls and delivered tor crew members that could not eat at the canteen, where ceramics were used. The locations where crew meals were delivered were spread out, e.g. the information desk on the other side of the festival.

The rest of the report does not include crew catering items.

Used = items of tableware that returned after the festival as used

Return rate = number returned / number used

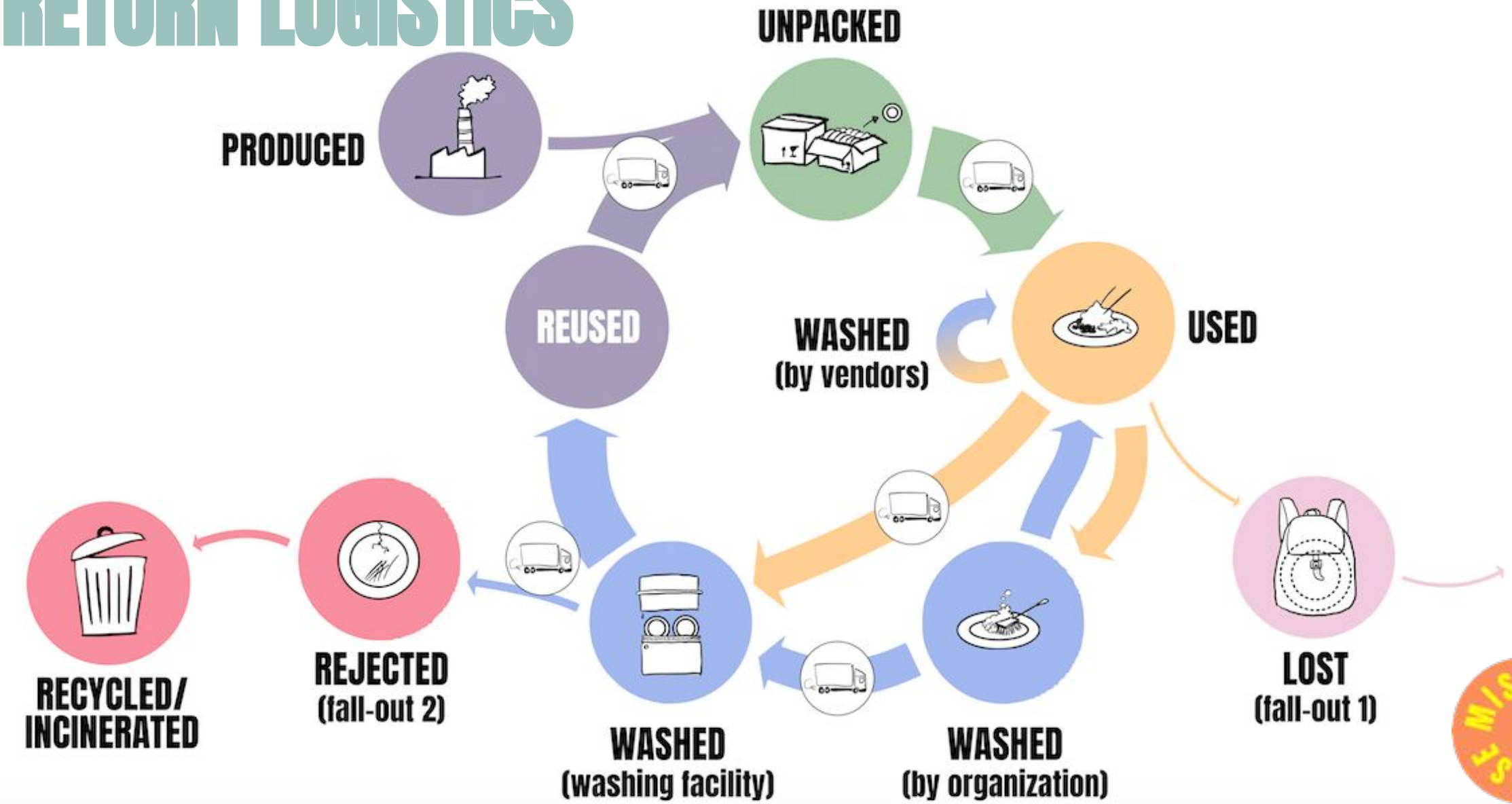
Rejection rate = number rejected / number returned

Total fall-out = (number used - number returned) + number rejected

rotations = Used / total fall-out

The **number of rotations** expresses how many times, on average, a reusable item can be used before it needs to be replaced

RETURN LOGISTICS



RETURN LOGISTICS

Return rate

Note the following characteristics of the data:

- Overestimation of uses: data includes products in crates that were opened, but not used - specifically for cutlery a cluttered delivery lead to caterers bringing more crates with cutlery to their stalls than needed
- Underestimation of uses: because the food vendors and ITGWO washed on site
- Through extensive post sorting of waste streams the reusables got picked out manually
- Rejection of the large plates was because of scratchings through a suspected pizza knife All plates had similar damage, and couldn't be reused because of the unhygienic cuts. The rejection percentage was not 100% due to unused plates in open crates
- The longer the reusables are not washed, the higher the chance of unremovable mold growth. This was the case for some of the rejected products, which were washed weeks after the festival and remained stained after several washes and special treatments.

<u>Practical challenges:</u>

- The customer confusion resulted in **unclarity** about whether and when to clean the table themselves and sorting. This resulted in reusables left behind at tables, where this was not intended, and reusables ending up in the waste streams (plastics, other waste and organics) instead of the reusable one.
- The transfer of the small bins at the resource hubs into the large waste bins, and then onto the sorting trays is sometimes rough resulting in broken ceramics and thus **caution** is needed for the crew handling the stream
- Post sorting is **time intensive**

Conclusion: having a reusable system and plenty similar resource points throughout the festival terrain helps for recognition. A more uniform system and clear communication to the visitors can reduce confusion and additional time post sorting. Poor pre-sorting also contributed to how dirty the plates were and waiting too long to wash them can cause plates to become unusable.

RETURN LOGISTICS

Sorting

Crew members did regular rounds and dumped the content of the bins at the resource points in large waste containers on wheels. At some locations like the exit/entry of the festival terrain there were large containers with logos that indicated the content. At the containers for cups a crew member would return the deposit through a coin.

The containers were directly brought to the sorting center, located near the main stage. Larger distances, from the further terrains and staff kitchen, were covered using a small electric vehicle.

At the sorting centre, crew members would sort out the bins. For the tableware stream that would mean removing clear impurities and sorting them per type. For the organics and other waste they perform manual post-separation on site. Here the reusable tableware was also filtered out. Afterwards, the waste processing centre performs an additional post-separation step.

Staff requirements

For **sorting** at previous ITGWO-festivals there were three people per shift. This edition an additional two shifts with three crew members each was added to sort the waste streams.

For **distribution** of the packaging an additional tableware manager and two crew members were added.

Conclusion: the advantage of having this post-sorting is higher return rates because reusables are recovered from other waste streams. The disadvantage is the higher staff costs, which was compensated at ITGWO by implementing volunteers. Also the collected reusables were a lot dirtier than at the previous pilots as they were

Sorting the different reusables form the joint system and from vendors

RETURN LOGISTICS - SORTING

Electric transport

Waste bins for local transport

On site washing hub by ITGWO

Overview of the sorting centre backstage
Still of video by Ole Zumpolle for ITGWO

EXPERIENCE

Did you notice ITGWO introduced reusables for all food and drinks? What did you think of it? —————>

Visitors - ITGWO

Into The Great Wide Open did a survey which was filled in by 755 visitors, which included one question about noticing and the experience with the reusable tableware. Of the responders 95,5% indicated that they noticed and liked the reusable tableware.

Visitors - Mission Reuse

The Mission Reuse team collected additional input with an extensive questionnaire about reusable tableware from 50 visitors and 20 employees during the festival itself. The interviewees were between 30 and 60 years old and had a varied interest in sustainability.

Of the interviewees, 66% indicated that the reusable tableware **system was clear**. Especially the resource points were perceived as clear and visible by 80%, as they were uniform throughout all terrains and quite abundant. Some indicated the request to have even more bins especially near the food vendors.

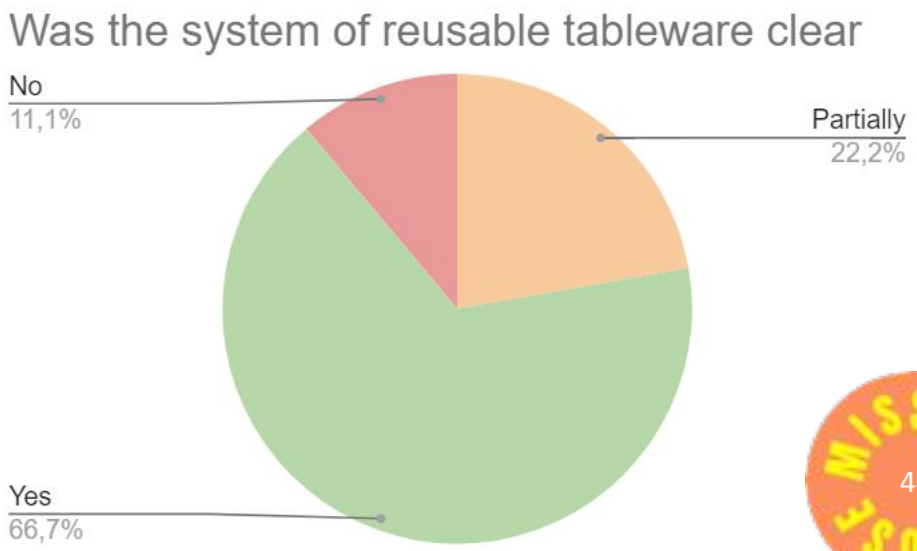
The perception of the system being clear thus differed with the actions visitors took. As indicated, because of the combination of the different settings and tableware some visitors thought they could leave the tableware and it would be cleaned up. This was sometimes the case but not always thus giving the visitor the impression it is clear but them not implementing the desired behaviour.

‘’really good”

‘’no opinion”

‘’didn’t notice”

‘’didn’t like it”



EXPERIENCE

Visitors

Most interviewees found it very clear that the **tableware was reusable** (1,66 on a scale of 1 as very clear and 5 extremely unclear). They indicated confusion overall but especially about the reusability of:

- cutlery: due to the poor quality and unclarity if cutlery is seen as tableware (servies) which was indicated on the resource points and collection bins
- black plastic items: due to the comparison with white plastics and ceramic plates

The confusion was also evident in practice as the reusable tableware items, were often disposed in the other waste and organics bin.

Some indicated that they might take the reusables to the camping and home.

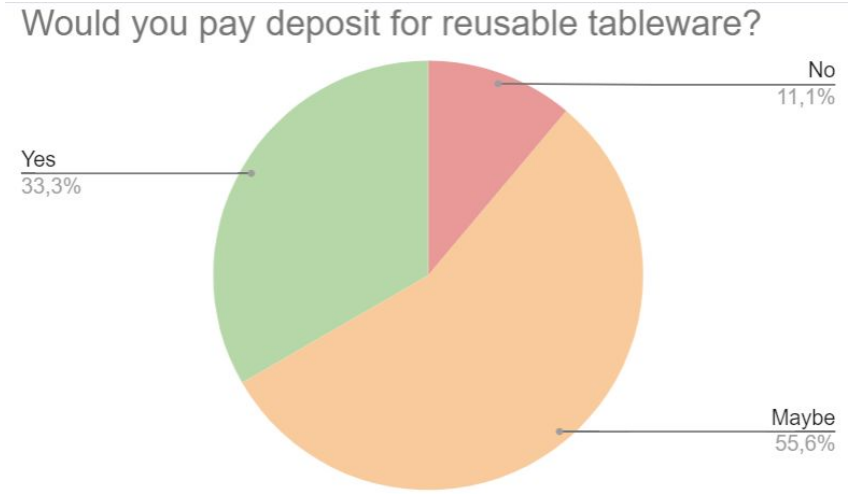
Asking for improvements they indicated more communication and clearer signing. Only one interviewee noticed the posters on reusables and two interviewees got an explanation by the food vendors staff. They also requested to completely switch to reusables, even though the majority of food and drinks were already served in reusables there was a request to ban disposables completely. Having a more uniform system of tableware was proposed to increase the clarity of the system.

EXPERIENCE

Visitors

Only 33,3% of the visitors were open for a deposit system on tableware, they raised a lot of concerns regarding waiting lines when handing back tableware and they are concerned about not getting their deposit fee back after the final use. If there would be a deposit introduced they would like to have a uniform coin system for cups and plates and one that can be refunded. Especially as they indicated, compared to cups, they would not want to walk around with dirty tableware.

Someone indicated that the reusable cup system inspired them to also implement it for events they organised themselves.



Overall, visitors were **unanimously enthusiastic** about the reusable tableware rating it 4,9 out of 5 stating the following advantages:

+ Better eating experience, firmer than disposable
+ Less waste
+ Less littering
+ Sustainability
+ Feels good to do a collective sustainable contribution

They indicated that cigarettes and disposable food wrappers were now the most disturbing litter. Some indicated the preference for a non fossil fuel based resource for the reusable plates as well.

Disposable food wrappers and cigarette buds, the most common litter

EXPERIENCE

Foodtrucks - staff

Challenges

- Unclarity if and how they can order more plates and unused items can be returned
- More staff needed for washing (this restaurant performed washing themselves)
- Several questions from visitors that were confused where to return the tableware
- Requires adaptation in the work flow and serving from you usual disposable packaging
- Cutlery was not study enough to cut through some of the dishes like grilled eggplant
- Still made from plastic

Advantages

+ No coins for tableware, avoids possibly forgetting to charge the cups as vendors indicated that sometimes happened during peak hour
+ Does not cost extra time
+ Easy to handle
+ Better culinary experience
+ Wide variety of tableware to adapt to their concept
+ Less waste creation and littering
+ Coincidence that the secondary packaging fit under their counter
+ Sturdy tableware, also allows to do more food prep as it doesn't get moist

Most staff found the system very clear (1,62 on a scale of 1 as very clear and 5 extremely unclear). All indicated that they did not explain anything about the reusable tableware/system to customers.

Experience for the food vendors improves by having one clear contact person they can reach out to for questions regarding the reusable system, ordering more items etc..

EXPERIENCE

ITGWO employees and volunteers - staff

Challenges

- Drunk people do not clean up their waste or do not sort properly
- Safety: some ceramic plates got mixed up in the reusable stream, even though they should have been handed back to the vendors directly and due to the quite rough return process, some plates got shattered which posed safety problems at the manual post-sorting process
- Costs extra time to clean tables and reusables that get left across the terrain
- The abundance of reuse streams increased the time and space needed for post-sorting
- Risks in the business model when festival organisers and/or restaurants start to wash tableware themselves

Advantages

+ Handling coins and reusables is nicer work than picking up litter
+ Festival terrain is noticeable cleaner than before

Post-sorting

CONCLUSION - ITGWO

Into The Great Wide Open is a festival with food vendors across the terrain, who all used reusable tableware except for some disposable napkins and greaseproof paper.
Some vendors used their own reusable tableware, and 35 vendors used the shared system. All of the items were handed out without a deposit fee. Customers were confused by the variety of tableware, and the different return handling required from them (leaving tableware on the table, returning it at a specific food vendor or deposit it at the box for dishes at the resource hub). The resource hubs were visible and recognisable. Regardless of the indication of the basket for reusable tableware, many visitors were confused. Especially the black reusable items were not seen as reusable tableware. Clear communication and uniformity, at least in colours, could reduce confusion. It stood out that visitors mainly followed the sorting behaviour or lack thereof of others so having a visual example of the tableware that belongs in a certain stream can possibly helped. Due to extensive post sorting, reusables that ended up in other or organic waste got picked out.

It was very helpful for food vendors to have a clear contact person, who managed the tableware. The crew that performed the sorting also contributes to the success of the 95,4% return rate on average. However, the post sorting can be hard to set-up and costly. The plastic reusables provided safer alternative during post collection sorting than the breakable ceramics. This can be compensated by creating cleaner streams from the get go, by having a staff member at a centralised resource hub or clearer instructions towards visitors. As visitors really favoured reusables and were willing to sort them well and would be able to do so with some added info.

EXAMPLE ABROAD: GENTSE FEESTEN

GHENT - Gentse Feesten

Reuse system (scope)

Visitors: 1.600.000
Meals served in reusables: 25.750
Incentive for reusable tableware:: yes
Caterers participating: 12
Deposit return: cash
Duration reusables: all 10 days
Location reusables: mainly concentrated at two festival areas
Meals served with reusables**:** burger, pizza, fries, rice dishes, dumplings, taco, pancakes, falafel, salad, fine dining, ice cream
Disposables used: the food stalls auctioned by the city could only use paper napkin, edible packaging, and wooden fork or toothpick. The other food stalls could use disposable paper and cardboard packaging. The existing restaurants issued all type of disposables.

The Gentse Feesten is a city wide festival in Ghent (Belgium), which is organised yearly in July. This was the 177th edition. The city has been a frontrunner for years regarding sustainability and reuse policy, including the introduction of reusable cups before the obligation through Flemish legislation. The festival has 14 festival areas, which each have their own area coordinator and responsible. Most food stalls are auctioned by the city.

The festival has been experimenting with reusable cups since 1996 and made it obligatory in 2018. The cups can be returned at the bar or at the designated collection points throughout the festival.

Photo by City of Ghent

GHENT - Gentse Feesten

Policy

Existing policy framework:

- Since 2017, food vendors are not allowed to use pure plastic or aluminium packaging; only paper and cardboard are allowed.
- Since january 2020, the region of Flanders prohibited disposable cups, bottles and cans unless 95% is separately collected for recycling.
- Since january 2021, the city of Ghent no longer allows disposables, through the recycling exception
- During the Gentse feesten disposable cups are prohibited as described in the police regulation of the Gentse Feesten and applies to both the temporary vendors in the party zone as the terraces of existing businesses in the designated party area.

Additional policy measures in 2022:

- Since january 2022, the region of Flanders prohibited disposable catering material for Flemish authorities and local authorities
- The city determined 1 euro as the mandatory minimum price for deposit on reusable cups
- Subsidies support collaboration between vendors across the city, to create uniformity in the system and a network of return points

Reusable and edible food packaging

GHENT - Gentse Feesten

Cups

The cups were used in an almost city-wide system, which enhanced the consumer experience and resulted in the a return rate of 95%.

- 10 out of 14 festival areas used the same cup system, some combined with glasses
- some existing cafés used reusable cups from the same provider
- 13 festival areas accepted the return of the overall system
- 8 festival areas had separate return locations for cups, that were open till at least 30 minutes after the bars closed

However in practice, not all types of cups were accepted everywhere which created confusion for visitors and employees. The diversity of cups and systems creates confusion, especially caused by the unbranded cups that were used by existing restaurants alongside the quasi uniform system. As they look similar to the cups in the reusable system of the vendors, deposit were falsely reimbursed. This confusion can lead to unintentional reimbursement of deposit fees and intentional fraude. One bar even intentionally nudged customers to return their cups elsewhere to create profit. To avoid this a uniform system with good agreements is crucial.

GHENT - Gentse Feesten

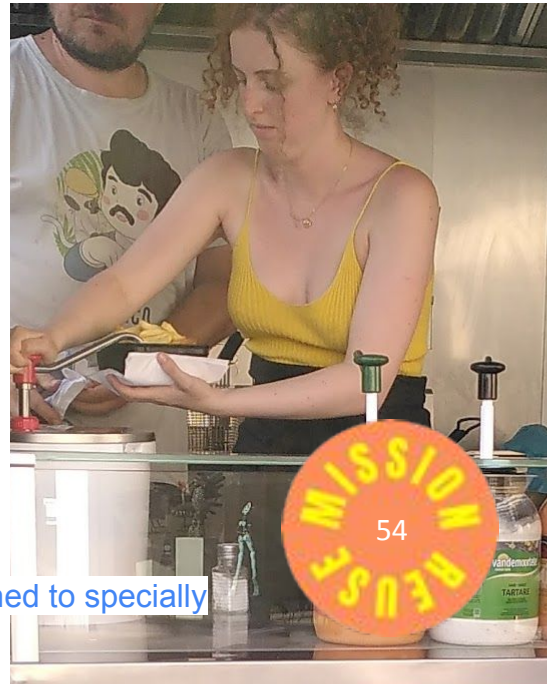
Reuse packaging/system

The shared reuse system consisted of one type of black plastic PP containers. A deposit system was used with a 1 euro fee.The containers could be returned at all vendors that were using the system, as clearly communicated with large signs. Some vendors, outside of the 2 areas that used the shared system, also introduced their own system with e.g. orange plates.

Return logistics

Food vendors rented boxes with tableware from a company. They payed a rental fee (20%) and a washing fee (80%). The washing fee was charged only if they opened the box.

Vendors could wash the tableware themselves, but every used item was washed afterwards in the rental company's facility.



Reusable food containers are returned to specially designed areas

GHENT - Gentse Feesten

Learnings tableware

The application of reusable tableware on this scale and within an open environment provides some valuable insights:

- Good communication was shown to be successful in instructing visitors
- Simplicity and uniformity reduces confusion and facilitates operational procedures
- Enforcement is necessary, 6 vendors still issued disposables the first days and were closed down till they switched to reusables the same/next day
- A large section of the current waste originates from disposable packaging from the existing restaurants, so it is valuable to include these businesses in the policy measures, just like the obligation for reusable cups for all vendors within the festival area
- This shows the advantage of establishing a reuse system throughout the year so that the existing restaurants get accustomed before the peak time of the summer festival
- Tableware return rate was 89.2%, which was indicated by the system provider as normal for an open event

Cups being sorted for washing

GHENT - Gentse Feesten

Results waste streams

The **uniform reusable tableware system for take away** and optimisation of the existing reusable cup system resulted in a staggering **40% waste reduction per visitor** compared to the previous edition in 2019. Twenty ton less waste was collected, despite a 62% increase in visitors.

Total costs were reduced by 12% compared to 2018. These costs include staff (-9%), vehicles (-20%), and waste processing (-14%). In total, 440 hours of cleaning was avoided in 2022 compared to 2018.

Compared to 2019 total waste costs were reduced by 8%. These costs include wages (- 5%), vehicles (-17%), and waste collection and management (-12%).

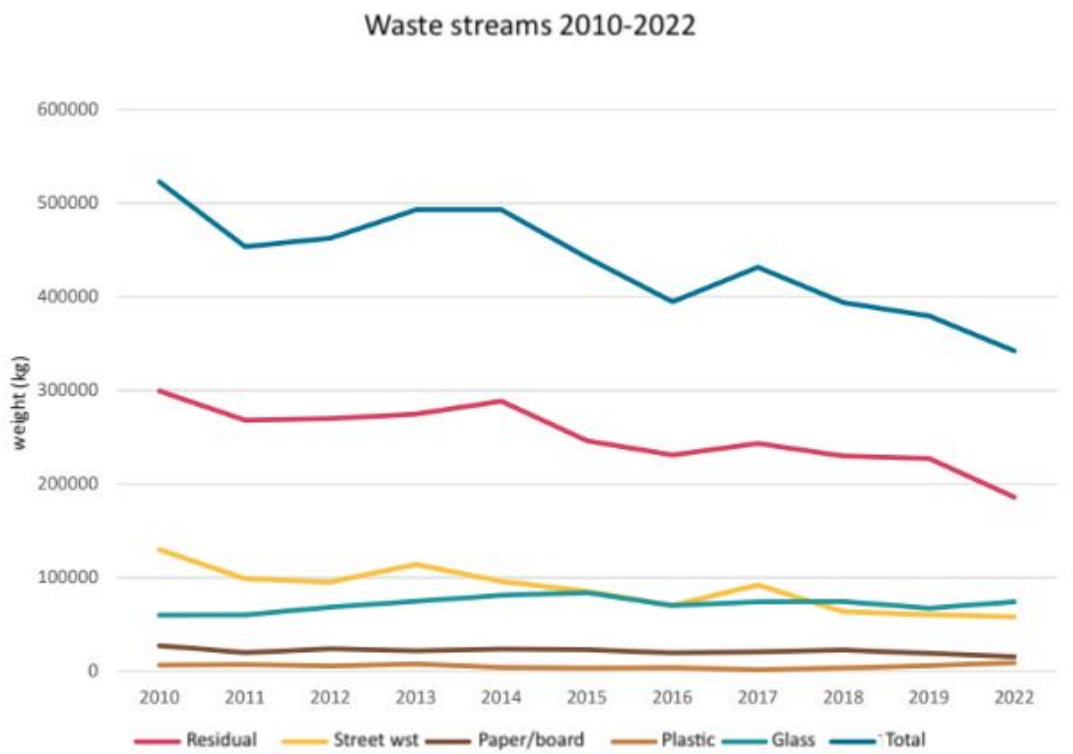


Photo by City of Ghent

WASHING

WASHING

Washing - one off-site scenario highlighted

Off-site washing was done after all three festivals. Here we highlight DGTL. Three days after the DGTL festival, the crates with used tableware went to an **industrial washing facility** (De Bekerwasstraat, Amersfoort) where all items were cleaned and checked. With the experiences of this pilot, the relatively small scale should be taken into account.

The pollution from food scraps was not too bad, there were some left over sauces, but they could go straight into the machine. If full meals were left on the tableware, a plate scraper (trash can with plastic scraper) was used and they had to be rinsed by hand.

The plates and trays were washed per type to optimize stacking. Compared to cups, it was immediately apparent that food leftovers require **extra handling** and attention and that tableware takes up a lot more volume, which reduces the **washing efficiency**. With this set-up about **2000 plates or 1500 containers can be washed per hour.**

The washing installation and washing trays in which the tableware is stacked for cleaning is not optimised. For every type of tableware, with different shapes, the loading process needs to be optimised. When several types of reusable tableware options are considered, the standardised washing installations and loading capacity should be weighed into the decision. Especially when tableware gets more standardised, it could greatly optimise the environmental impact and time for washing.

The plastic material requires **additional drying steps** due to less heat retention and causes items to float, potentially coming out of the machine cluttered. Due to format standardization, this optimization for cups has already been implemented.

WASHING

Advantages local on-site washing vs. off-site centralized washing

- items can be used several times on location
- less transportation of reusables
- less stock and thus space required

Disadvantages local on-site washing vs. off-site centralized washing

- requires an additional wash step by the system provider before storage to ensure hygiene
- washing facilities need to be transported to and from location
- infrastructure needs to be build up, i.e. electricity and water
- needs to be optimized per location

Both for local and centralized washing the use of different types of tableware creates the need for additional optimization for every packaging.

For the impact analysis and comparison of washing see page 67.

WASHING

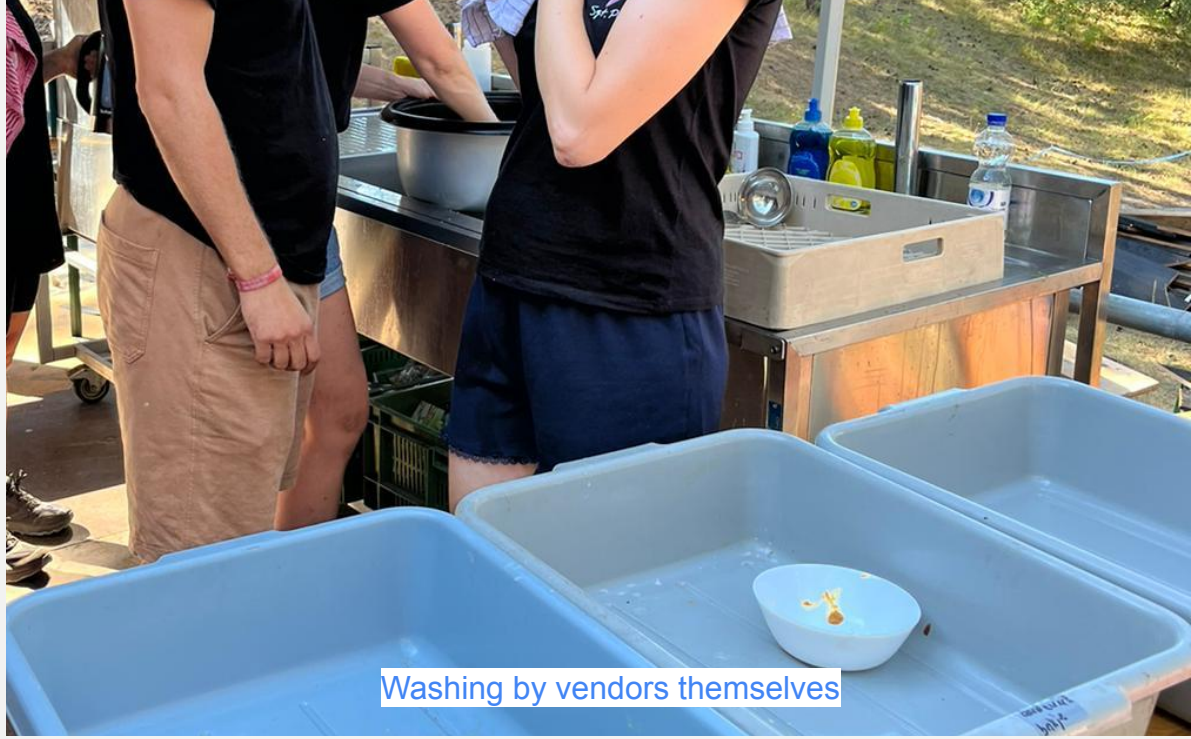
Washing at ITGWO - on-site & off-site

The plastic reusable tableware within the reuse system (see page 41) was washed by several food vendors on-site, by the festival organisation on-site and off-site by the reuse solution providers.

Food vendors often washed by hand using a sink and washing basins. There is no data available on the number of tableware they washed.

The festival organisation installed a mobile dishwashing unit next to the sorting centre (see page 43 for the map). This was intended for washing reusable plastic cups. Additionally approximately 5,800 small deep plates (or bowls) and 6,000 pieces of cutlery were cleaned by rinsing off food residue, washing with a pass-through dishwasher and manual drying using towels.

All tableware was washed (again) off-site at the end of the festival by the reuse solution provider to warrant compliance with food hygiene requirements for the next client.



Washing by vendors themselves

Rinsing and washing on site by festival crew. Still from video by Ole Zumpolle for ITGWO

IMPACT ANALYSIS & COMPARISON

Analysis & comparison

Aim

At the ITGWO-festival, nearly 85,000 meals were catered. These meals were served using several types of reusable tableware (page 31, 38 & 39). Used reusables of the shared system were washed on-site and (again) off-site (page 60).

The life cycle environmental impacts have been calculated for one serving with a small deep plate - bowl (further referred to as bowl) and a fork (as a reference for cutlery) of the shared reuse system (page 39). The same has been done for disposable alternatives. The results have been used to compare the reusable bowl and fork with their disposable alternatives for each of the covered life cycle stages as well as for their whole life cycle.

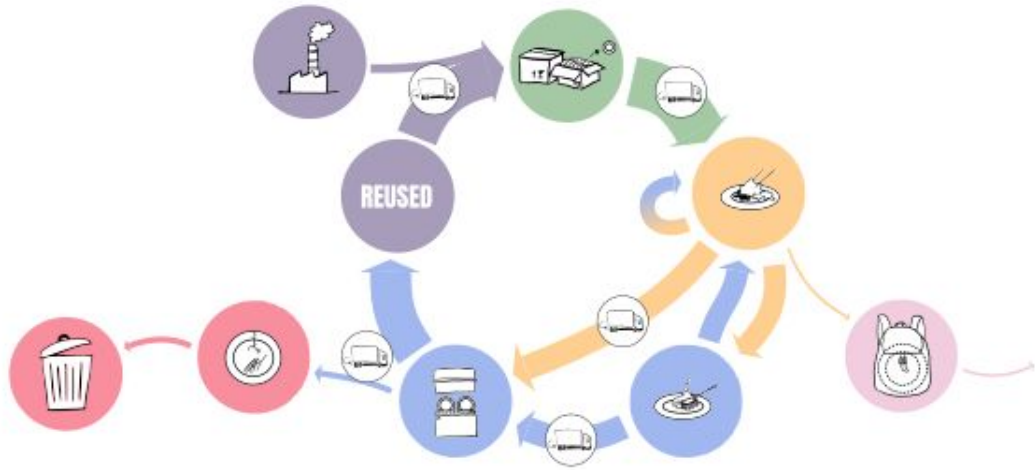
Approach

The analysis and comparison take a life cycle approach but don't represent a detailed life cycle assessment. Available time nor the quality of ITGWO-data allowed for that. This chapter presents results for the following life-cycle stages:

1) Cradle-to-production (C2P) of materials for reusable and disposable items
2) Washing (incl. drying) onsite and off-site of the used reusable items
3) Transport for washing & all other transport
4) Waste processing of discarded reusable and disposable items
5) Overall, combining the above

For each life cycle stage, the calculation of the environmental impact is explained before presenting its results. The quantified environmental impacts cover energy use, water use and climate change.

Disposable flow



Reusable flow (see page 40 for detailed version)

System alternatives

Reusable versus disposable system

The reusable bowls and forks of the shared system at the ITGWO-festival have been compared disposable alternatives (next page). For the reusables, where relevant, the calculations have used their worst and best case number of rotations. As the **WORST** case, the number of rotations for bowls (7.7) and forks (3.9) at the ITGWO-festival (page 3) have been taken. As the **BEST** case, for both reusable items, the 25 rotations achieved for reusable plates at the DGTL-festival (page 12) has been used.

On-site versus off-site dishwashing

Part of the reusable tableware at the ITGWO-festival was washed on-site (namely 5,800 bowls and 6,000 pieces of cutlery), and all of it was washed again off-site (page 60), namely 6,000 bowls and 49,500 pieces of cutlery. On-site washing requires transport of dishwashing facilities to the festival, but reduces transport of tableware from the warehouse to the festival site and back via the off-site dishwasher. Compared to off-site dishwashing. On-site dishwashing reduces transport if this means less tableware needs to be stocked. An on-site dishwasher may on the other hand be less resource-efficient and less environmentally benign than an off-site dishwasher, even though the latter typically includes (energy-intensive) machine-drying of the washed dishes, and the former doesn't.

Waste processing alternatives

Once discarded, tableware can be recycled, incinerated with energy recovery, composted or digested for biogas production. These waste processing alternatives have been compared.

Compared tableware

Reusable bowl

Bowl (Ø17cm, ~840 ml):
54 gram polypropylene (+minerals)

Disposable bowl alternatives

Paper tray (~300 ml):
- 8.1 gram core board
- PLA-lining

Plastic tray (~350 ml):
4.1 gram polystyrene

Paper napkin:
1.9 gram kraft paper

Greaseproof paper:
4.6 gram kraft paper

Reusable fork

Fork: 7.5 gram poly-propylene (+ minerals)

Disposable fork

Waxed wood:
2.7 gram

- The volume of the reusable bowl more than doubles the volume of the paper and plastic tray
- The weight of the shipping boxes was lacking for some items, and this secondary packaging has therefore been excluded from the calculations

Cradle-to-production

Number of reusables versus disposable pieces of tableware needed

Page 62 already specified the number of worst and best case rotations for the reusable bowl and fork. This implies, per serving, that one disposable bowl alternative compares to 1 / 7.7 = 0,13 reusable bowl in the worst case and 1 / 25 = 0.04 reusable bowl in the best case. Similarly, per serving, one disposable fork compares to 1 / 3.9 = 0.26 and 1 / 25 = 0,04 reusable fork in respectively the worst and best case.

Calculating C2P environmental impacts

The material weights per serving for each reusable and disposable tableware item have been translated with conversion factors from Potting et al. (2022) into their cradle-to-production energy use, climate change and water use. The conversion factors do not cover, and thus the calculated impact results do not include product manufacturing.

Cradle-to-production

Results & discussion - bowl

In the **BEST** case, the reusable bowl scores better than all of its disposable alternatives, except for the paper napkin on energy use and climate change and for the greaseproof paper on climate change. The environmental impacts of the paper napkin are roughly half those of the greaseproof paper, which is explained by their similar difference in weight. Compared to the paper tray, the plastic tray scores worse on energy use, similar on climate change, but better on water use. The paper and plastic trays score worse on climate change than the paper napkin and greaseproof paper. However, the paper tray and greaseproof paper score similarly for energy use, while the plastic tray scores better on water use than the greaseproof paper.

In the **WORST** case, the reusable bowl still performs better on water use than all of its disposable alternatives but the paper napkin. It performs worse on energy use and climate change. It should be noted that the volume of the reusable bowl more than doubles the volume of the paper and plastic tray. The results may change with a reusable bowl of similar volume as both trays, thus probably weighing less than the reusable bowl here.

Also notable is the low weight (3.7 gram polystyrene) of the plastic tray, which scores better on energy use and climate change than the reusable plastic bowl in the **WORST** case. According to Potting & Van de Harst (2015), a small disposable polystyrene cup for use in warm beverage vending machines weighs 4.2 gram. The disposable tray and reusable bowl are made of similar materials. Their difference in weight per serving thus largely explains their difference in environmental impacts. Hence, the plastic tray weight may be underestimated, thus its environmental impacts as well.

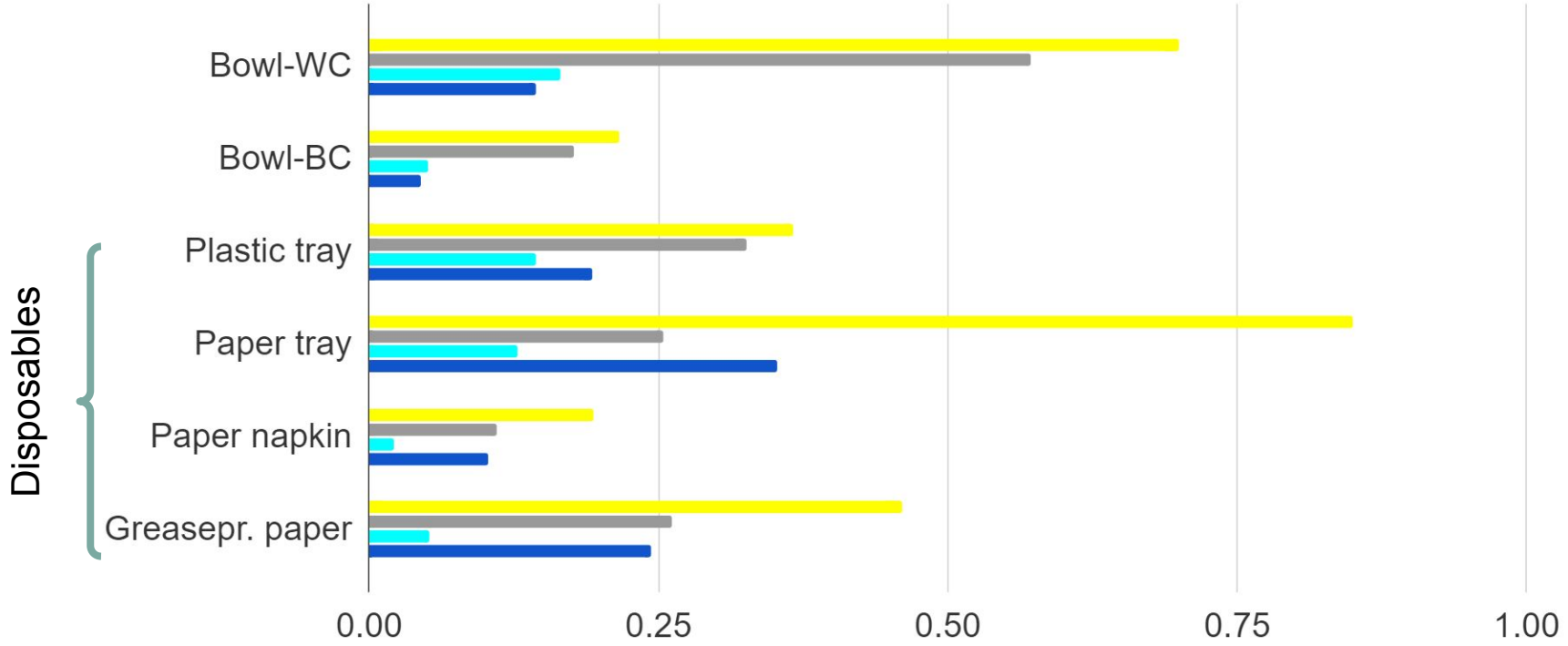
	Disposables versus reusable bowl per serving (%) in the **BEST** case (25 rotations)		
	Energy use	Climate change	Water use
Plastic tray	185%	282%	432%
Paper tray	144%	252%	790%
Paper napkin	62%	42%	229%
Greaseproof paper	148%	101%	546%

	Disposables versus reusable bowl per serving (%) in the **WORST** case (7.7 rotations)		
	Energy use	Climate change	Water use
Plastic tray	57%	87%	133%
Paper tray	44%	78%	244%
Paper napkin	19%	13%	71%
Greaseproof paper	46%	31%	168%

Disposable scores worse / similar / better than reusable

The bar graph on the next page shows the absolute values of the comparison.

C2P environmental impacts - bowl



Per serving:

- Weight (10 g)
- Energy use (MJ)
- Climate change (0,1 kg CO2-eq.)
- Water use (liter)

WC = Worst case
BC = Best case

Cradle-to-production

Results & discussion - fork

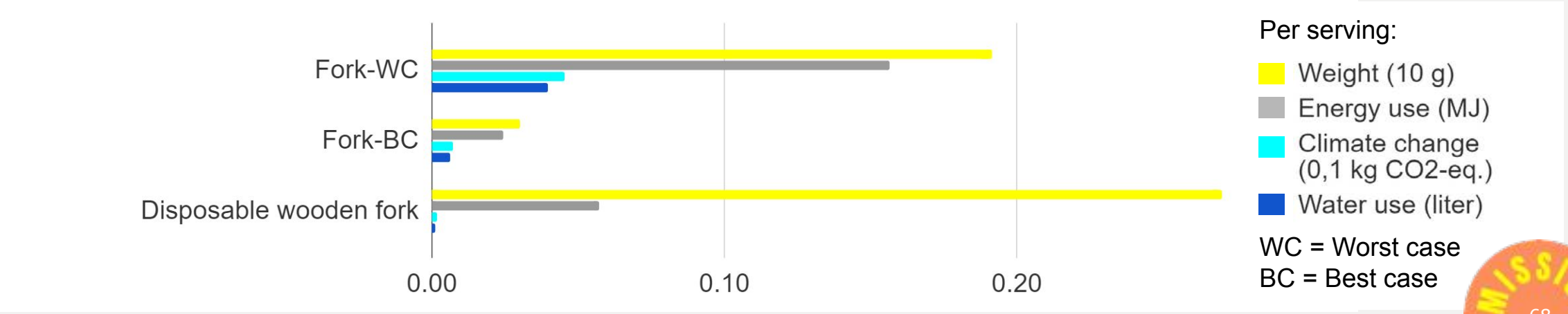
The reusable fork, in the **BEST** case, only scores better on energy but less on climate change and water use than it's disposable alternative. Thus only based on the cradle-to-production of the fork, the reusable fork does not outperform the disposable wooden one (with energy use being the exception in the best case). The results do not include the thin wax coating of the wood, but this is expected to not significantly change the results.

The bar graph shows the absolute values of the comparison.

	Disposables versus reusable bowl per serving (%) in the **BEST** case (25 rotations)		
	Energy use	Climate change	Water use
Wooden fork	234%	27%	16%

	Disposables versus reusable bowl per serving (%) in the **WORST** case (3.9 rotations)		
	Energy use	Climate change	Water use
Wooden fork	37%	4%	2%

Disposable scores worse / similar / better than reusable



Dishwashing

On-site and off-site dishwashing

The on-site mobile dishwashing unit as used at ITWGO covers an inlet and outlet table with in between a pass-through dishwasher. This dishwasher does not provide pre-rinsing and post-drying. So this was done manually at ITWGO. Water use for manual pre-rinsing was not recorded and therefore ignored here. Manual post-drying was done with dishcloths that were reused after hang-drying. The number of (re-) used dishcloths were not counted, and their washing is therefore also ignored here. Manual pre-rinsing (not included in the analysis because of no data) and a belt dishwasher were used for off-site washing. This belt dishwasher integrated dishwashing and post-drying.

Calculating environmental impacts of dishwashing (& drying)

Electricity and water use data, and the load capacity of the on-site dishwasher are taken from the website and user manual of the rental company. Data for the off-site dishwasher are taken from an information brochure. Festival sites often are located in remote areas with no access to the regular grid. On-site dishwashing typically uses electricity from a generator fueled by fossil diesel, although at ITWGO biodiesel (HVO) was used instead. According to Greener Power Solutions, (2023), one liter of diesel is needed to generate 3 kWh. The conversion factor for climate change from fossil diesel is taken from ANWB (2023), and 11% of that is applied for biodiesel (Dutch Emission Authority, 2020). The off-site dishwasher for ITWGO runs on solar electricity, but other ones may use regular grid power. Energy use and climate change for solar and grid power are calculated with conversion factors from RVO (2018).

↑

Mobile pass-through dishwasher: representative for on-site model

Belt dishwasher (incl. dryer): representative for off-site model

↓

Dishwashing

Results & discussion - bowl & fork

The next two pages show the results for on-site and off-site dishwashing bowls and forks. The results are presented per item and not per serving as to put emphasis on the differences between both dishwashers as such. However, per serving, on-site dishwashing involves one-time dishwashing on-site and one-time dishwashing off-site for two servings, whereas only off-site dishwashing involves two times off-site dishwashing per two servings. This is further explained in the section on transport (page 74).

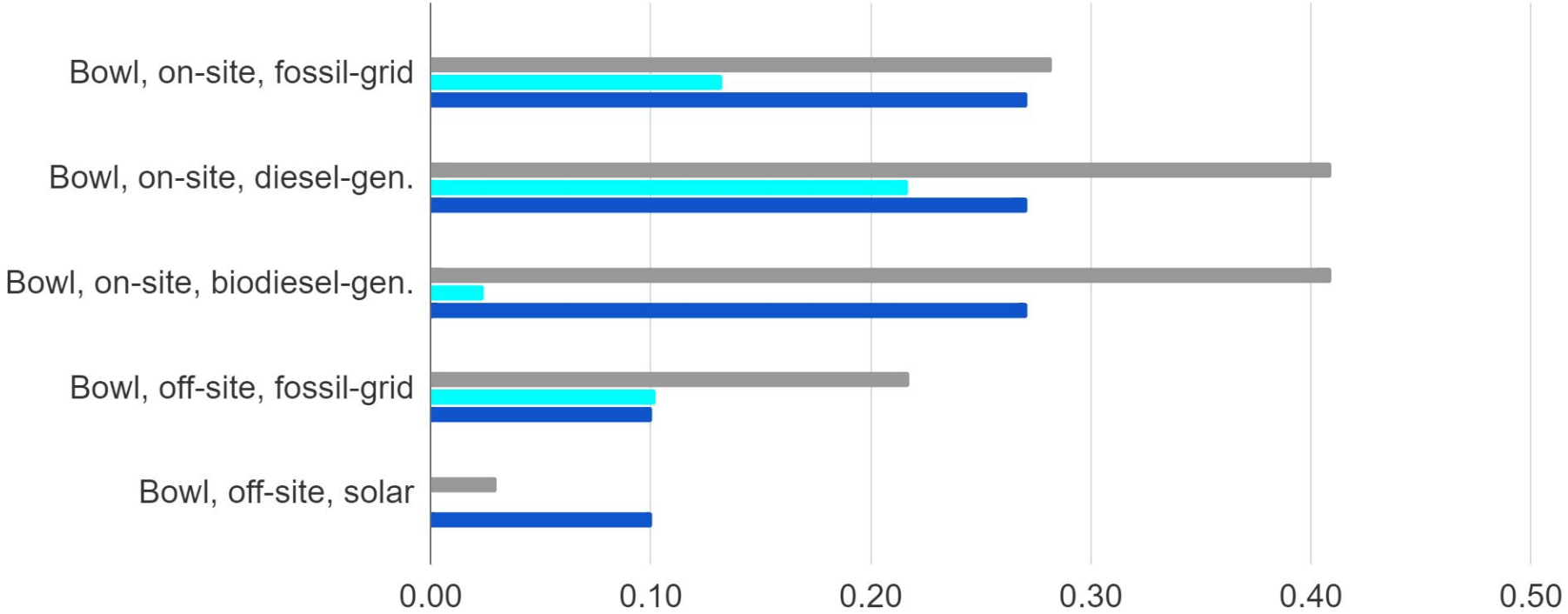
The dishwashing pattern for the on-site and off-site dishwashing alternatives, is exactly the same but differs a factor of magnitude between the reusable bowl and the reusable fork. This difference traces back to the load capacity that for bowls is considerably smaller than for forks. As a result, the environmental impacts per dishwashed bowl are larger than those for the fork.

Energy use for and climate change from electricity generation for the off-site dishwasher is, despite including drying, lower with fossil grid power and substantially lower with solar panel electricity than the on-site dishwasher supplied with fossil grid power or electricity from a fossil diesel-generator. For on-site dishwashing, energy use and climate change for fossil grid power is lower than for electricity by fossil diesel-generator due to a lower conversion efficiency of the latter. Climate change from electricity by a ***bio***diesel generator on the other hand is substantially lower than fossil grid power and electricity by fossil diesel-generator. This makes a fossil diesel generator the least favourable choice as an electricity supplier.

Water use relates to dishwashing itself. The off-site dishwasher needs less than half of the water for the on-site dishwasher. Note the here calculated water use excludes water use for manual pre-rinsing for both dishwashing on-site and off-site, and for washing used dishcloths for dishwashing on-site.

As already mentioned, on-site dishwashed tableware nevertheless needs off-site dishwashing afterwards (page 60), which is not included in the results here (but it is in the life cycle result from page 84 onwards), because the related environmental impacts per serving depending on the number of (re-)uses at the festival.

Env. impacts for dishwashing - bowl



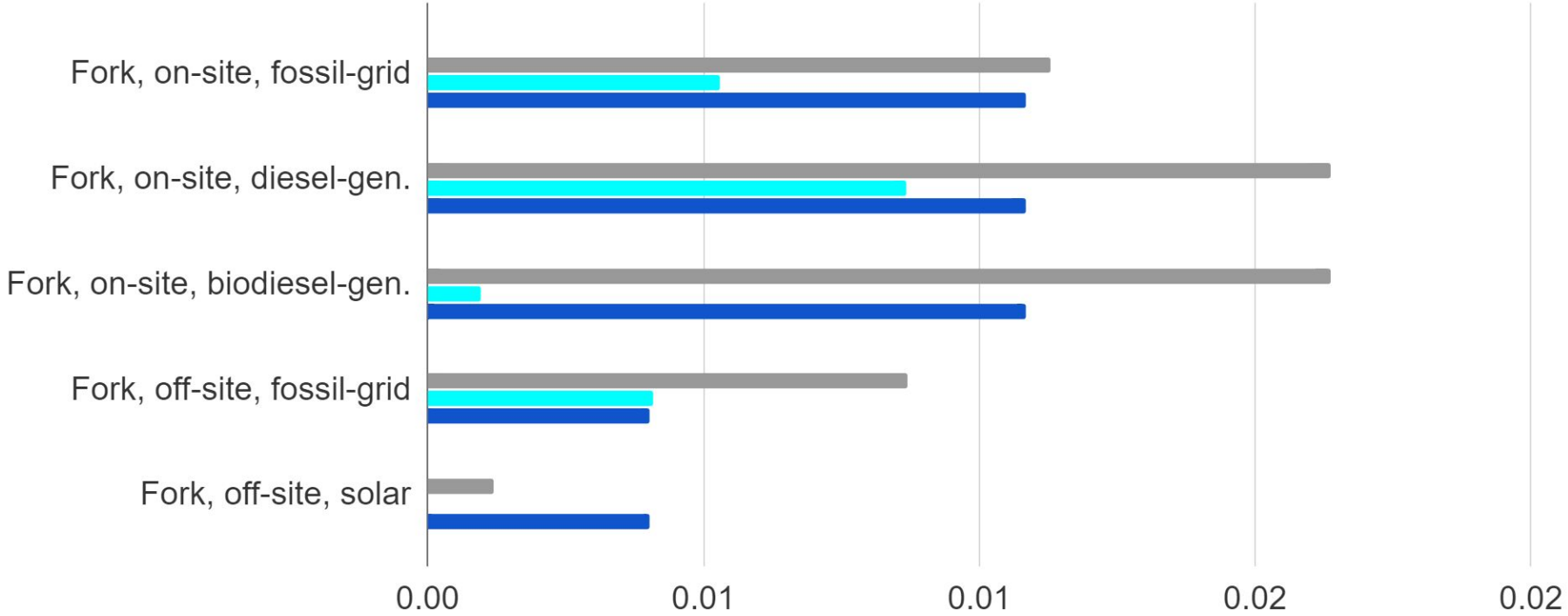
Per dishwashed item:

- Weight (10 g)
- Energy use (MJ)
- Climate change (0,1 kg CO2-eq.)
- Water use (liter)

WC = Worst case
BC = Best case

The graph relates to the reusable bowl only as the disposable ones are not washed

Env. impacts for dishwashing - fork



Per dishwashed item:

- Weight (10 g)
- Energy use (MJ)
- Climate change (0,1 kg CO2-eq.)
- Water use (liter)

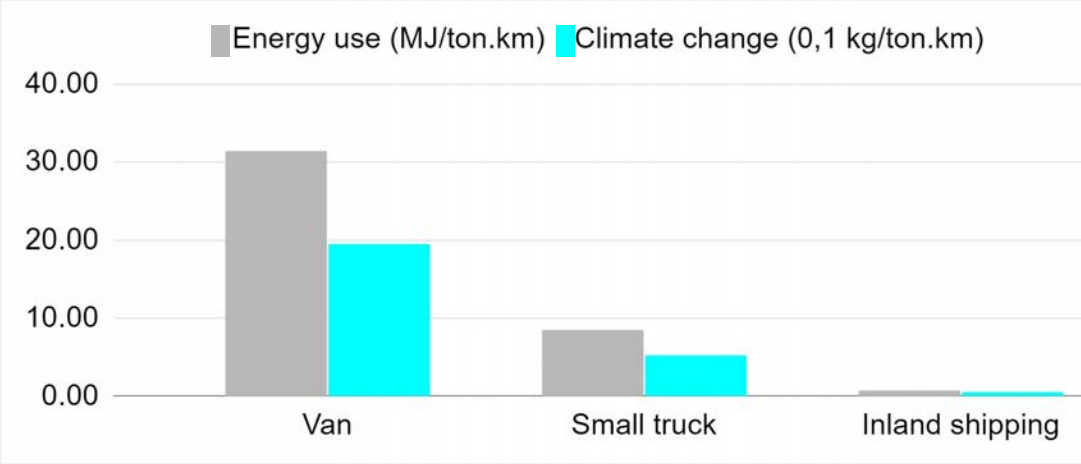
WC = Worst case
BC = Best case

The graph relates to the reusable fork only as the disposable ones are not washed

Transport

Transport differences

Before being used initially, new reusable and disposable tableware is usually transported from Rotterdam harbour to a warehouse, and from there to the location where they will be used (here ITGWO on the island of Vlieland). Once used, the disposable tableware needs to be transported to an onshore waste processor. Transport of reusable tableware to the waste processor, at the end of its life, depends on the number of rotations (i.e. its environmental impacts are evenly distributed over the number of rotations to achieve the environmental impacts per serving). On-site dishwashing of used reusable tableware requires transport of the mobile dishwashing unit of 115 kg, from the rental company in Amstelveen to the festival site and back. Compared to off-site dishwashing, however, on-site dishwashing reduces transporting reusable tableware from the warehouse to the festival and back to the warehouse in Beuningen, Gelderland via the off-site dishwasher in Amersfoort.



Calculating environmental impacts of transport

Energy use and climate change from fuel production and combustion increases linearly with the transport distance times the weight to be transported, and varies across transport vehicles (see right; based on RVO (2018)). See the next page for all distances and vehicles used in the calculations. The ferry to the Vlieland has been put on par with inland shipping of goods.

Transport

Calculating environmental impacts per serving

The mobile dishwasher unit at the ITGWO-festival (page 42) washed 5,800 bowls and 6,000 pieces of cutlery for 3 and 1 hours a day respectively, while other items were dishwashed 6 hours per day (personal communication Daan Stigter). The ratio of dishwashing hours was used to divide the environmental impacts of transporting the mobile dishwashing unit over bowls, forks and other items. The number of dishwashed items was then used to calculate the environmental impacts per item dishwashed on-site.

The 5,800 on-site dishwashed reusable bowls more or less equal the 6000 reusable bowls in the shared system delivered to the ITGWO-festival (page 38). We assumed that reusable bowls were used for a second serving after on-site dishwashing, but transported “dirty” to the off-site dishwashing after the second serving. The 6,000 on-site dishwashed pieces of cutlery, on the other hand, compared to 49,500 pieces of reusable cutlery in the shared system that were delivered to the ITGWO-festival. This suggests that the larger part of cutlery was not dishwashed on-site at all. Either way, the calculations here assume that each reusable item is two times used and one time dishwashed on-site (i.e., the second time transported “dirty” to the off-site dishwasher). This means that for on-site dishwashing, the environmental impacts of transporting the on-site dishwasher and reusable tableware are distributed evenly over two servings. For off-site dishwashing, the environmental impacts of this transport are allocated to one serving only.

Overview of distance and transport vehicle from location to location (distances one way only)

Item	Location	Small truck	Ferry
Reusables	Rotterdam harbour - warehouse	130 km	
Reusables	Warehouse - Vlieland	200 km	36 km
Mobile dish-washing unit	Amstelveen - Vlieland	135 km	36 km
Reusables to off-site dishwashing	Vlieland - Amersfoort	165 km	36 km
Clean reusables	Amersfoort - Warehouse	75 km	
Rejected reusables	Amersfoort - Waste processor	50 km	
Disposables	Rotterdam harbour - warehouse - Vlieland	330 km	36 km
Disposables	Vlieland - waste processor	50 km	36 km

Transport

Results & discussion for transport - bowl and fork

The bar graphs on page 77 and 78 present the results for bowls and forks respectively. The environmental impacts of transporting reusables from Rotterdam harbour to the warehouse and to the waste processor at the end of their life are divided over ***all rotations*** that the reusable bowl and fork make (either on the ITGWO-festival or elsewhere). This transport of the reusable bowl and fork, further referred to as other transport (also in the bar graphs), therefore performs better than similar transport plus that from the warehouse to the festival site for (most of) their disposable alternatives. However, reusable bowls and forks also need to be transported from warehouse to festival site and back via the off-site dishwasher. The latter transport dominates in the overall environmental impacts of transport for the reusable bowl and fork. That is because the environmental impacts of this transport are allocated to only two servings for on-site dishwashing and to one serving only for off-site dishwashing. As a result, overall transport of the reusable items performs worse than their disposable alternatives

The patterns for transporting the reusable bowl and forks are similar but not the same. The difference in weight between them explains the difference in the environmental impacts of transporting them from the warehouse to the festival site and back via the off-site dishwasher, and for other transport in the best case. The best case number of rotations is the same for both items, but they have a different worst case number of rotations. Their different number of worst caste rotations adds to the worst case difference between both items for other transport. The difference between reusable bowls and forks for transporting the on-site dishwasher unit traces back to the differences in load capacity and dishwashing hours for reusable bowls and forks.

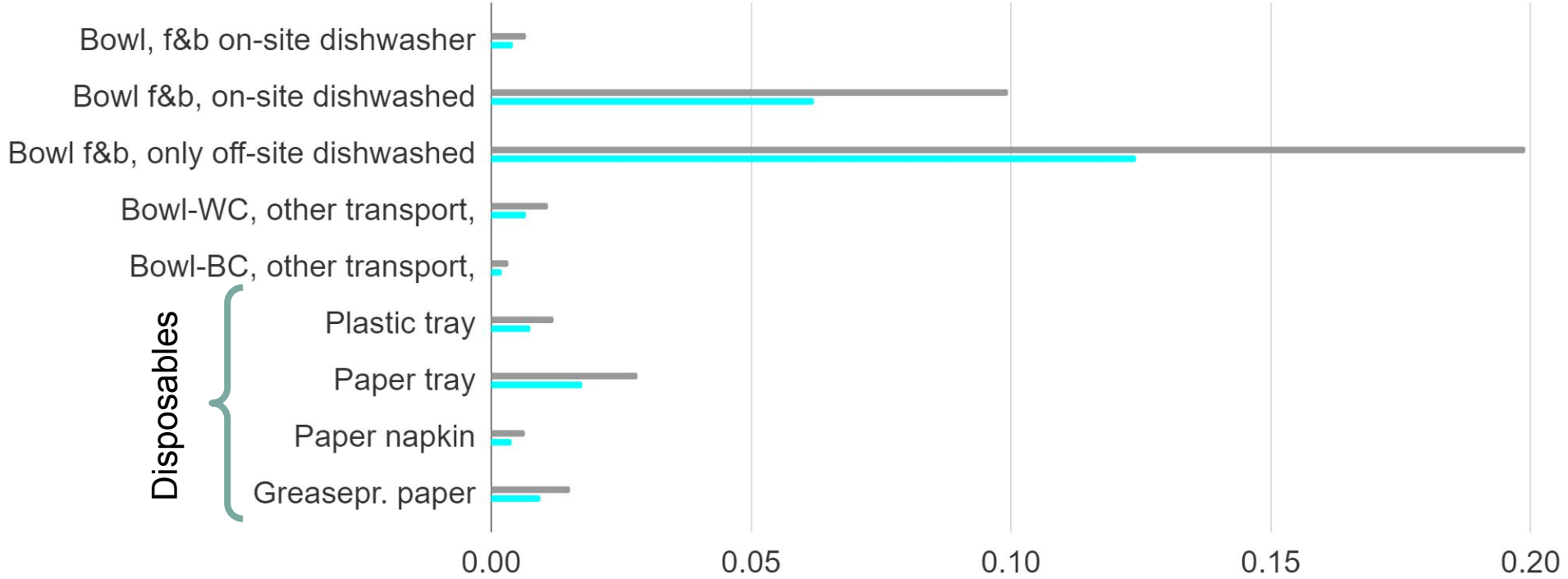
It should be noted here that the distance between Vlieland and the warehouse (Beuningen, Gelderland) via the off-site dishwasher (Amersfoort) is relatively large for Dutch conditions. Halving the involved distances would also halve the environmental impacts of related transport. Also here, the reflections on the weights of the reusable bowl and plastic tray apply, and may lead to an overestimation of the environmental impacts of the reusable bowl and an underestimation for the plastic tray (page 68).

Transport for dishwashing

Results & discussion - transport in relation to dishwashing

The environmental impacts from transporting the reusable bowl and fork between the ITGWO-festival and the warehouse via the off-site dishwasher (where it needs dishwashing before being stored in the warehouse) is for on-site dishwashing halve those for (only) off-site dishwashing (because the distances are distributed over the two on-site servings). Compared to transport per serving of the reusable bowl and fork for on-site dishwashing, the environmental impacts from transporting the mobile dishwashing between its warehouse and ITWGO are relatively small because the latter impacts are divided over all on-site dishwasher items (page 74). It remains to be seen whether on-site dishwashing also performs better than (only) off-site dishwashing from a life cycle perspective. The off-site dishwasher itself after all performs better than the on-site dishwasher unit (pages 71-73). The influence of the distance between Vlieland and the warehouse (Beuningen, Gelderland) via the off-site dishwasher (Amersfoort) plays an important role in this comparison. Possibly there is a distance, the break-even point, where the environmental impact of transport will become larger than the possible profit from (only) off-site dishwashing. This will be further discussed below where results for the full life cycle will be presented.

Environmental impacts transport - bowl



Per serving:

- Weight (10 g)
- Energy use (MJ)
- Climate change (0,1 kg CO2-eq.)
- Water use (liter)

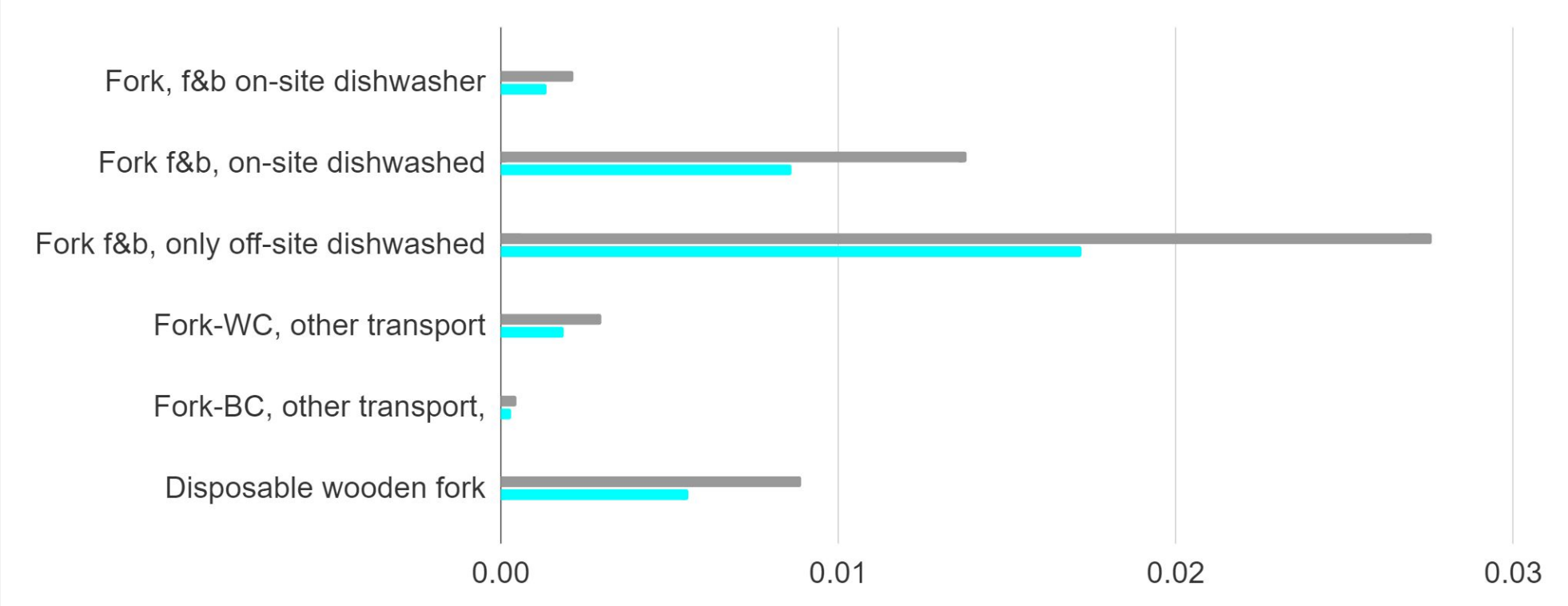
WC = Worst case
BC = Best case

f&b = forth & back

Dishwasher = refers to the transport of the actual dishwasher itself
Dishwashed = refers to the transport of reusable items from the warehouse to the festival and back passing the off-site dishwasher location
Other transport = transporting reusables from Rotterdam harbour to the warehouse and the waste processor at the end of their life

The environmental impacts of other transport are divided over all rotations, these for transporting the reusable bowl for on-site dishwashing over two servings, and those for back & forth (f&b) the dishwasher first over all items and next over two servings (page 74). The environmental impacts of transporting the reusable bowl for off-site dishwashing and the disposable alternatives are attributed to one serving.

Environmental impacts transport - fork



Per serving:

- Weight (10 g)
- Energy use (MJ)
- Climate change (0,1 kg CO2-eq.)
- Water use (liter)

WC = Worst case
BC = Best case

f&b = forth & back

Dishwasher = refers to the transport of the actual dishwasher itself
Dishwashed = refers to the transport of reusable items from the warehouse to the festival and back passing the off-site dishwasher location
Other transport = transporting reusables from Rotterdam harbour to the warehouse and the waste processor at the end of their life

The environmental impacts of other transport are divided over all rotations, these for transporting the reusable fork for on-site dishwashing over two servings, and those for back & forth (f&b) the dishwasher first over all items and next over two servings (page 74). The environmental impacts of transporting the reusable fork for off-site dishwashing and the disposable wooden fork are attributed to one serving.

Waste processing

Waste processing alternatives

Disposable tableware typically turns into waste after one use, while reusable items after a number of rotations. A new Dutch regulation will enter into force in 2024 that from then onwards only allows disposable tableware if 70% is collected for high-grade recycling (going up to 90% by 2027). High-grade recycling is technically possible, but currently mainly relevant for PolyEthylene Terephthalate (PET) if collected as a mono-stream (like PET-bottles). Except for beer cups, no PET tableware is currently on the market. Other plastic packaging is often collected as a mix. This hampers high-grade recycling of plastic tableware, which is thus possible though considered unlikely to be achievable, but nevertheless included in this analysis. Currently and in the future, high-grade recycling of paper and wooden tableware is unlikely because it often gets polluted with grease when in contact with food. This hampers recycling. Wooden and paper tableware items may be composted, which leads to decomposition into carbon dioxide and water, but will not yield any environmental benefits. So recycling and composting of paper and wooden tableware are ignored here, but biodigesting and incineration with heat recovery are included.

Calculating environmental impacts of waste processing

The calculations assume that all discarded tableware at some point in time enter waste processing. Energy recovery from waste incineration is credited by avoided fossil energy production and carbon dioxide emission taken from CE Delft (2007). Avoided material production from recycling is credited following a simple 50-50 approach that assumes 90% recycling leading to 45% avoided C2P environmental impacts. According to CE Delft (2020), digestion yields 250 kg of biogas per ton of biomass (dry substance). This is credited with avoided natural gas production based on RVO (2018).

	Waste processing types and whether they are relevant for tableware of the given material		
	Wood	Paper	Plastic
High-grade recycling	Unlikely	Unlikely	Possible, not likely
Incineration with heat recovery	Possible	Possible	Possible
Biogas from biodigesting	Possible	Possible	No
Composting	Possible	Possible	No

Excluded in calculations

Included in calculations

Waste processing

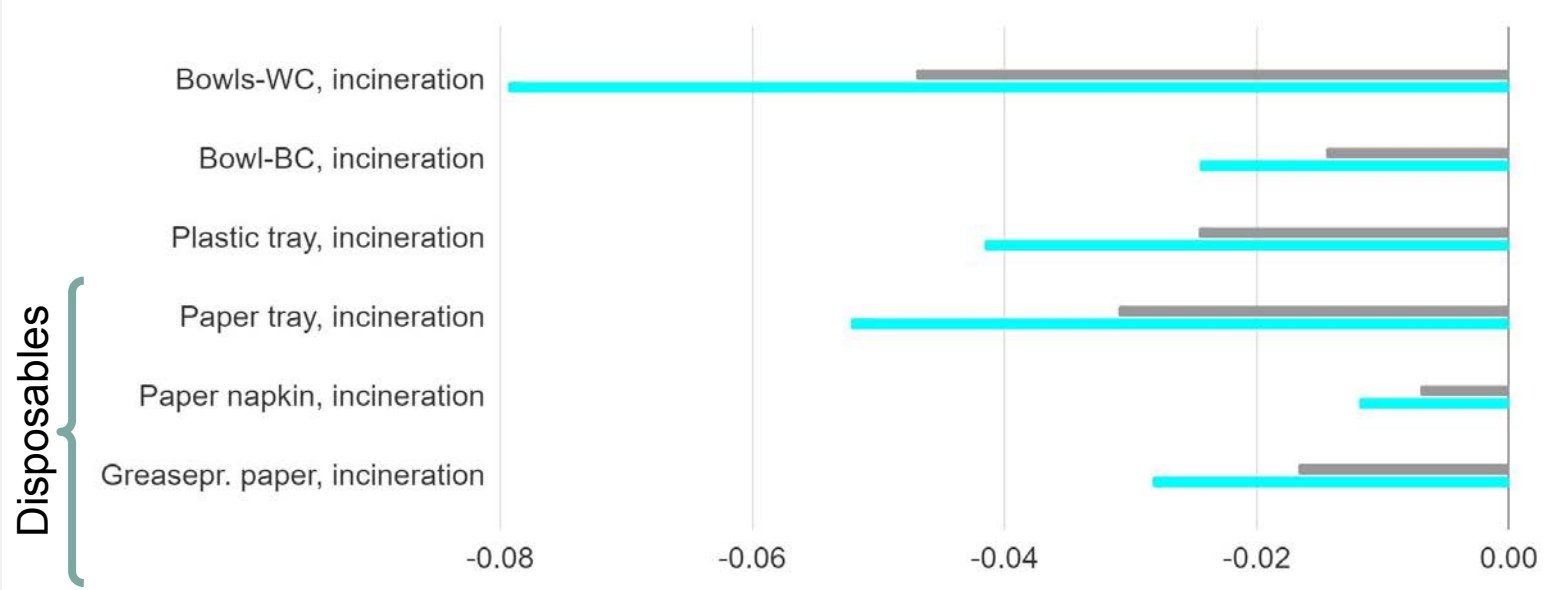
Results & discussion - bowl

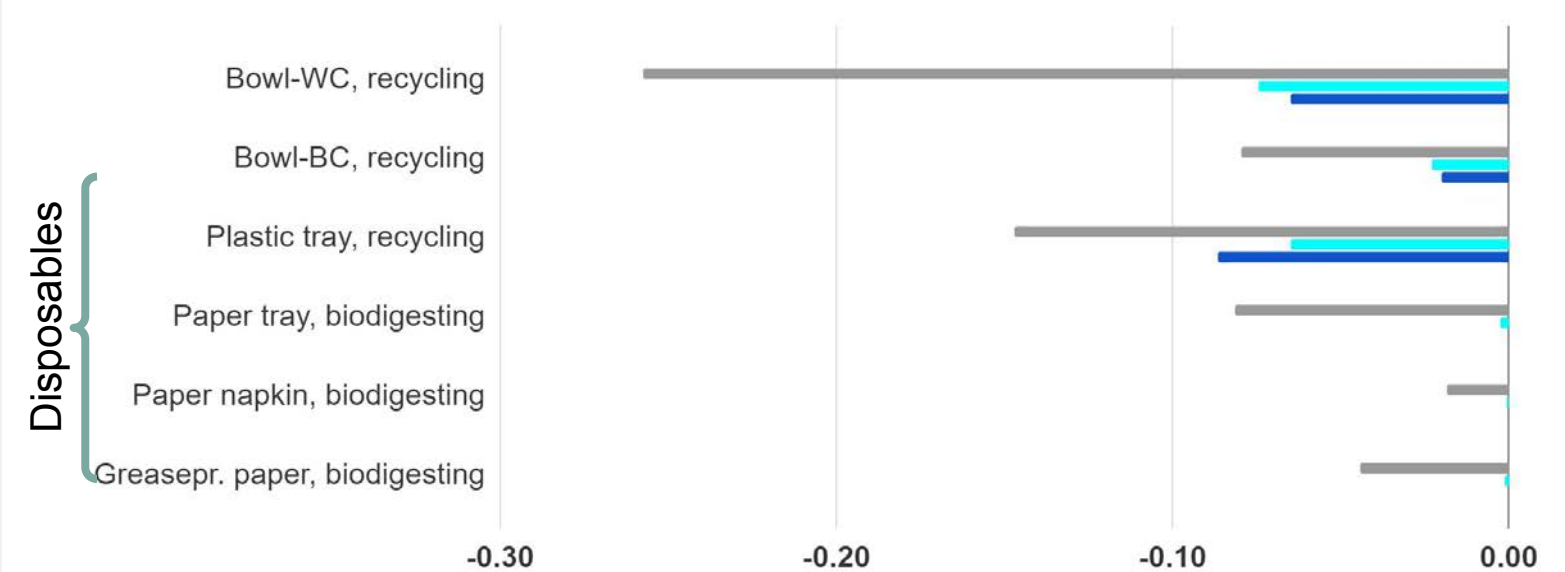
The calculations assume all discarded products will sooner or later enter waste processing (e.g., also not returned reusable tableware at ITGWO). However, some of it may become litter (most likely disposable easier than reusable tableware). The calculations ignore this, which is expected to not significantly influence the results. It should be noted, however, that particularly littering plastic waste leads to environmental damage. However, there is no (widely accepted) indicator for litter in life cycle assessment.

All covered waste processing methods yield avoided environmental impacts and thus credits, i.e. recycling avoids the production of virgin material, and incineration and biogas avoid fossil energy generation. The net avoided environmental impacts are largest for recycling of the reusable bowl and the plastic tray. This gives a too positive result, because sorting and washing is not included and neither is the quality of the recyclate. The latter is here assumed to be high-grade, as required by the upcoming Dutch regulation, but that is unlikely to be achieved soon given the present recycling results for plastics.

The credits for waste processing of the reusable bowl and the disposable plastic tray, both from a similar plastic, are linear with their weight. That is why the reusable bowl with worst case rotation, i.e. with the largest weight per serving, provides more credits than the disposable tray for recycling. The credits for the reusable bowl with best case rotation are smaller than for the disposable plastic tray. Also here the reflections on the used weight of the reusable bowl and disposable plastic tray and their influence on the results apply again (page 68).

Env. impacts waste processing - bowls





Per serving:

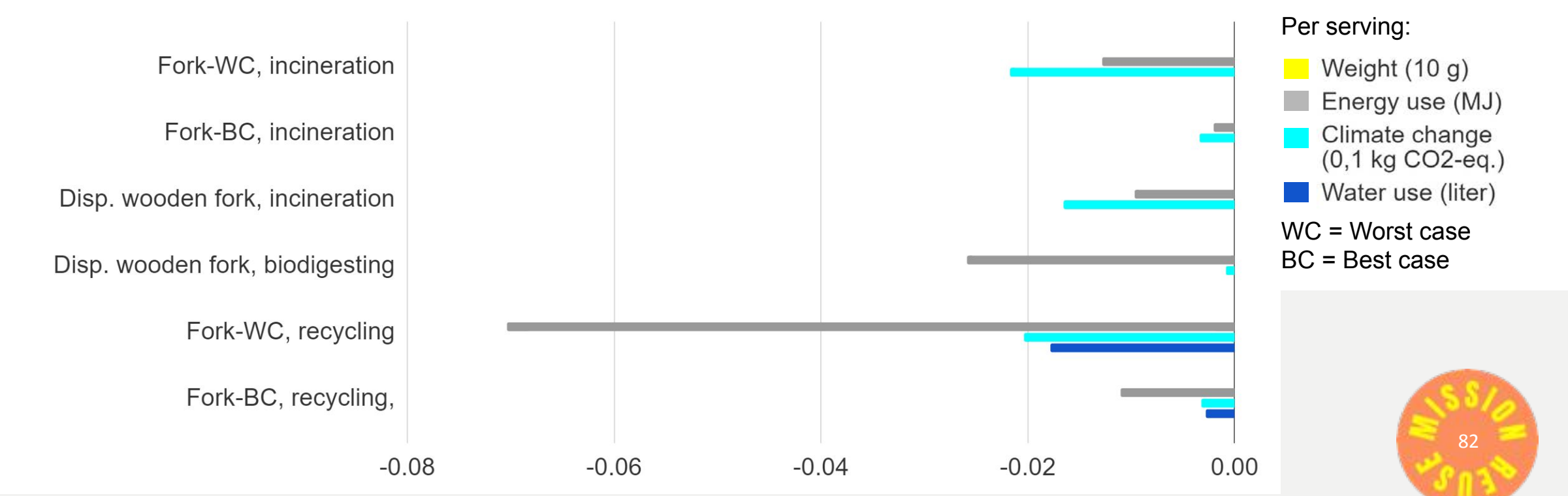
- Weight (10 g)
- Energy use (MJ)
- Climate change (0,1 kg CO2-eq.)
- Water use (liter)

WC = Worst case
BC = Best case

Env. impacts waste processing - forks

Results & discussion - fork

Similar to the reusable bowl, the avoided impacts are the largest for recycling the reusable fork with a worst case number of rotations. Also here, this is due to the difference in weight per serving for the bowl with the worst and best case number of rotations.



Life cycle results

Overall results - selection of life cycle scenarios

The environmental impacts of the reusable bowl and fork, and their disposable alternatives have above been presented and discussed per life cycle stage. This chapter puts together all life-cycle stages to show their contribution in a full life-cycle perspective, and to compare alternative life-cycle scenarios. Several alternative scenarios are possible for dishwashing in the case of the reusable bowl and fork, and for waste processing of the reusables as well as for their disposable alternatives. This consecutively multiplies the number of alternative life cycle scenarios. All alternatives for waste processing are included. For on-site dishwashing of the reusable bowl and fork, results are presented only for electricity from a fossil generator for on-site dishwashing in combination with solar electricity for the necessary off-site dishwashing. For off-site dishwashing only, fossil grid power and solar-based electricity are both included as alternatives. All alternative life cycle scenarios for the reusables have been calculated for the worst and best case number of rotations.

	Dishwashing scenarios		
	(1) Off-site fossil	(2) Off-site solar	(3) On-site
On-site, fossil diesel-generator			x
On-site, biodiesel-generator			
Off-site fossil-grid	x		
Off-site solar		x	x

Life cycle results - bowl

Results & discussion - overall reflections

Before presenting and discussing the life cycle results, it is important to repeat that these are not based on a detailed life cycle assessment due to time constraints and the quality of data available from ITWGO. Data from ITWGO were missing for manual pre-rinsing and post-drying of on-site dishwashed tableware and for pre-rising off-site dishwasher tableware, and uncertain for the numbers of times reusables were dishwashed and used again on-site (page 75). These latter numbers determine the environmental impacts per serving for transporting tableware from the warehouse to the festival site and back via the off-site dishwasher in particular. It is assumed here that each reusable item is on-site used twice and dishwashed on-site once (i.e., the second time transported “dirty” to the off-site dishwasher; page 75). However, every additional use following on-site dishwashing halves the environmental impacts of this transport per serving. On the other hand, it increases the environmental impacts of dishwashing itself as the environmental impacts from every on-site dishwash are larger than the (slightly improved) results for the off-site dishwashing. If a used reusable item is not dishwashed on-site at all, but only off-site, this obviously reduces the environmental impact for on-site dishwashing per serving to zero, but it increases the environmental impacts of transport.

It should also be noted that the data from ITGWO represents a pilot situation, and results thus also specifically relate to this ITGWO-pilot. Furthermore, the volume of the reusable bowl doubles that of the disposable plastic and paper trays (page 64). Moreover, the weight of the disposable plastic tray seems low (page 68). If a bowl with half the volume would halve its weight (which probably is a too simple extrapolation), this would halve the environmental impact for all life cycle stages except those related to dishwashing. Despite these limitations, the results are nevertheless expected to have some generic value.

Life cycle results - bowl

Results & discussion - bowl - energy use & climate change

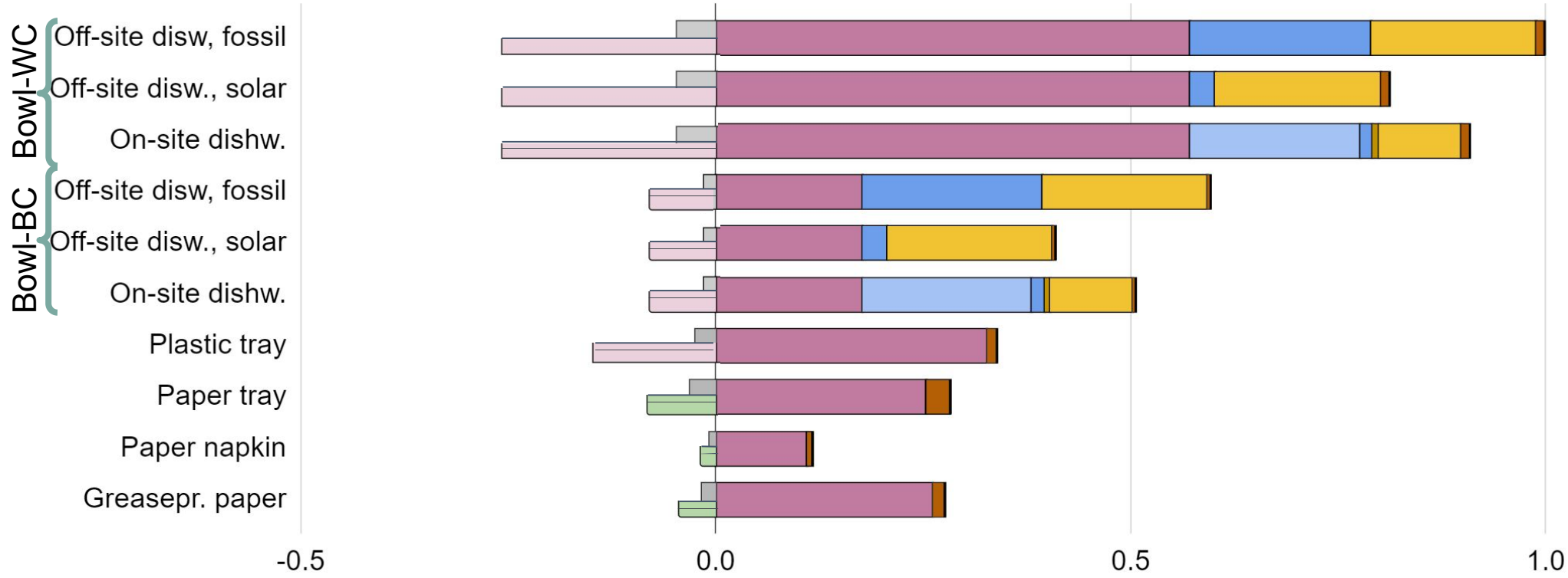
Life cycle energy use and climate change for the reusable bowl and its alternatives are presented on following two slides. The life cycle results for both impact categories show mainly parallels and no strong differences. For both, the reusable bowl In the best case would outperform all its disposable alternatives but the napkin in a scenario for off-site dishwashing on solar energy but without transport from the warehouse to the festival site and back via the off-site dishwasher. However, this transport makes a large contribution to the overall life cycle results. As mentioned above, for Dutch conditions, the distance between the warehouse and the festival site is relatively long.

Ignoring transport from the warehouse to the festival site and back via the off-site dishwasher, the reusable bowl in the best case scenario with (only) off-site dishwashing on solar electricity becomes better than its disposable alternatives but the napkin. This is not the case for the best case scenarios with (only) off-site dishwashing with electricity supply from the grid or with on-site dishwashing in combination with off-site dishwashing afterwards. Then the reusable bowl never becomes better than its disposable alternatives.

Overall, from a life cycle perspective, dishwashing a reusable bowl off-site on solar energy is always preferred over dishwashing off-site with electricity supply from the regular grid or with on-site dishwashing (with off-site dishwashing afterwards). It would be interesting, in further research, to explore the transport distance for which there is a break-even point between where the reusable bowl in the best case becomes better than its disposable alternatives but the paper napkin.

The reusable bowl and paper napkin are only to some extent functional alternatives. One obviously cannot use a paper napkin for e.g. soup. However, where relevant, a napkin is preferred over a reusable bowl (especially when caterers as extra service tend to add a napkin to dishes on reusable bowl).

Life cycle energy use - bowl



Avoided energy use by the following scenarios:

- Energy recovery from incineration
- Material recovery from recycling
- Energy recovery from biodigesting

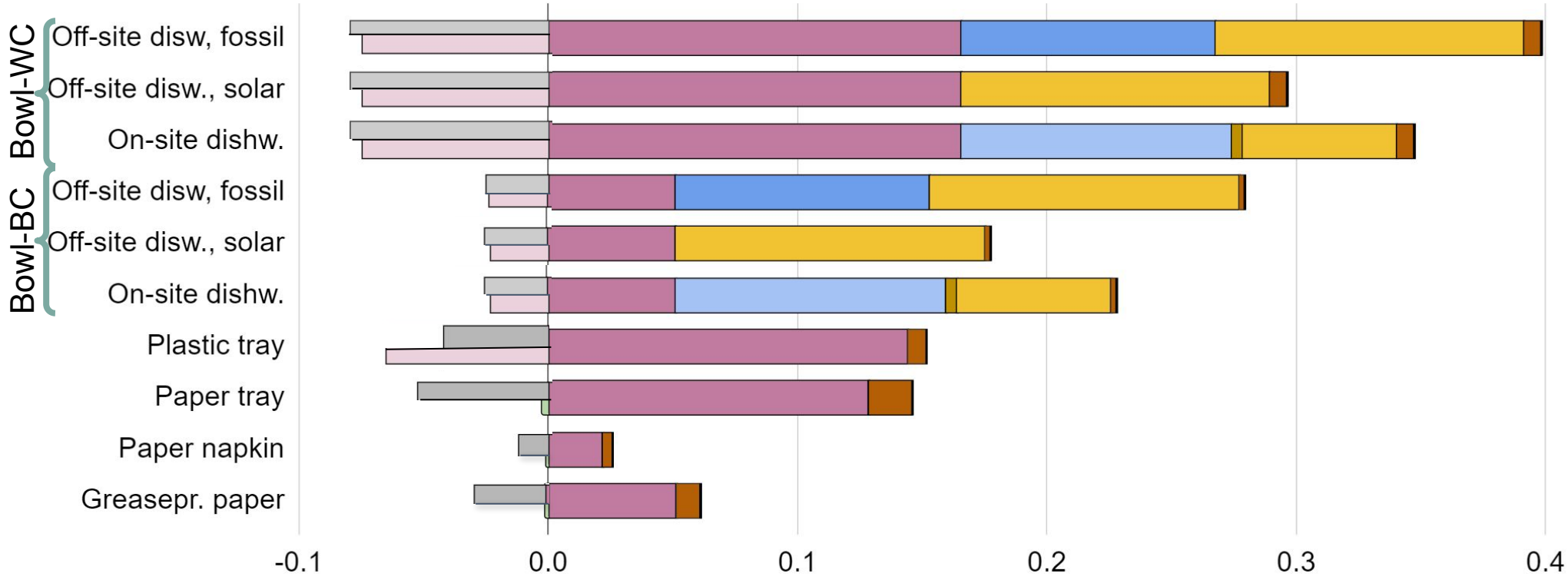
Energy use by:

- C2P material production
- On-site dishwashing
- Off-site dishwashing
- Transport for on-site dishwashing
- Transport for off-site dishwashing
- Other transport

MJ per serving

WC = Worst case
BC = Best case

Life cycle climate change - bowl



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- Transport for on-site dishwashing
- Transport for off-site dishwashing
- Other transport

0.1 kg CO_2-eq. per serving

WC = Worst case
BC = Best case

Life cycle results - bowl

Results & discussion - bowl - water use

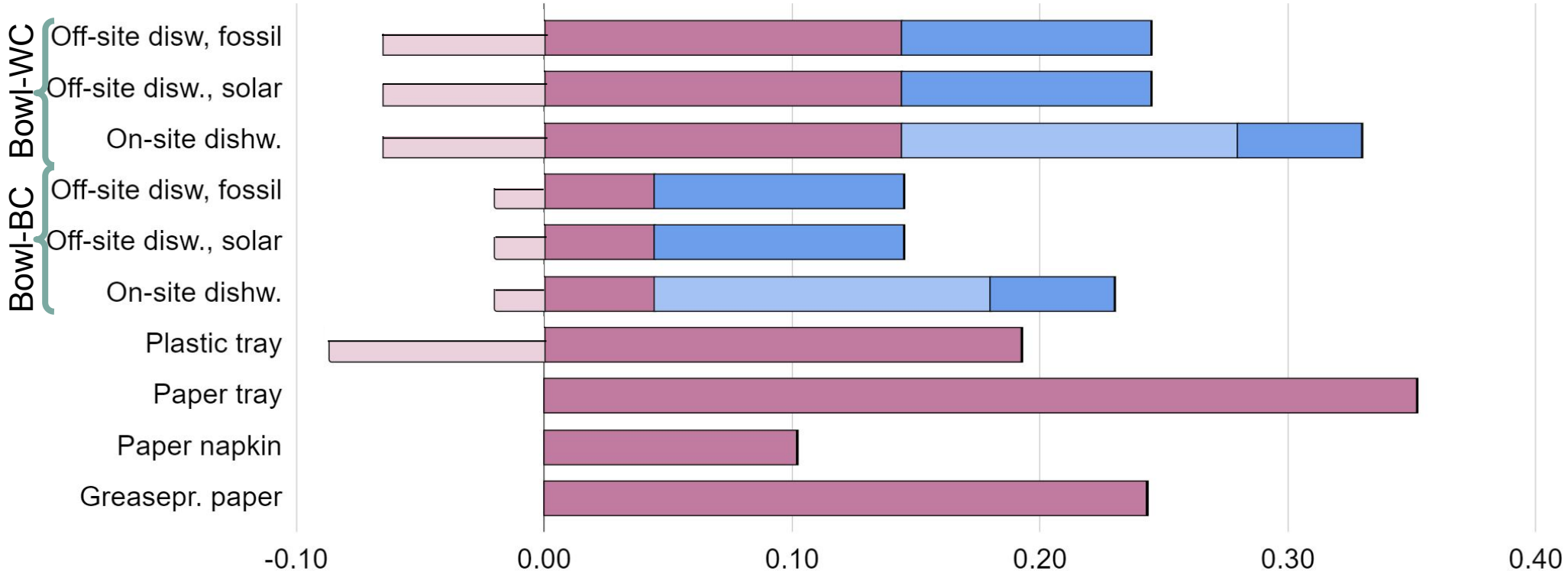
Water use covers only the production and recycling of disposables and reusables, and dishwashing reusables. Water use of dishwashing does not differ between the scenarios for the reusable bowl with the worst and best case number of rotations. That is because both use the same load capacities on which water use of dishwashing is based. There is a difference though between on-site dishwashing and off-site dishwashing. Since the off-site dishwasher is more efficient in its water use, only dishwashing off-site still outperforms dishwashing on-site The life cycle result over the latter are based on one-time dishwashing but two uses on-site, and one-time dishwashing off-site (meaning the environmental impact of one-time on-site and one time off-site dishwashing are distributed over two servings).

Per serving, dishwashing off-site takes less water than producing the reusable in the worst case (because of its higher weight), and is about the same as for dishwashing on-site (note that dishwashing here is distributed over two servings, similar to the necessary off-site dishwashing afterwards). That is because the on-site dishwasher and off-site both recycle their used water and use it in the next dishwashing turn. As a result, relatively little water is used for dishwashing.

Together with the water use for off-site dishwashing, the reusable bowl in the best case still outperforms the disposable paper tray and greaseproof paper, but becomes comparable with the plastic tray thanks to the credits for recycling. In the worst case, the reusable bowl only scores better than the paper tray, but just nearly in the case of on-site dishwashing.

As mentioned before, the volume of the reusable bowl doubles that of the disposable plastic tray. A reusable bowl with comparable content will impact the conclusion.

Life cycle water use - bowl



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Energy use by:

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- Off-site dishwashing
- Transport for on-site dishwashing
- Transport for off-site dishwashing
- Other transport

Liter per serving

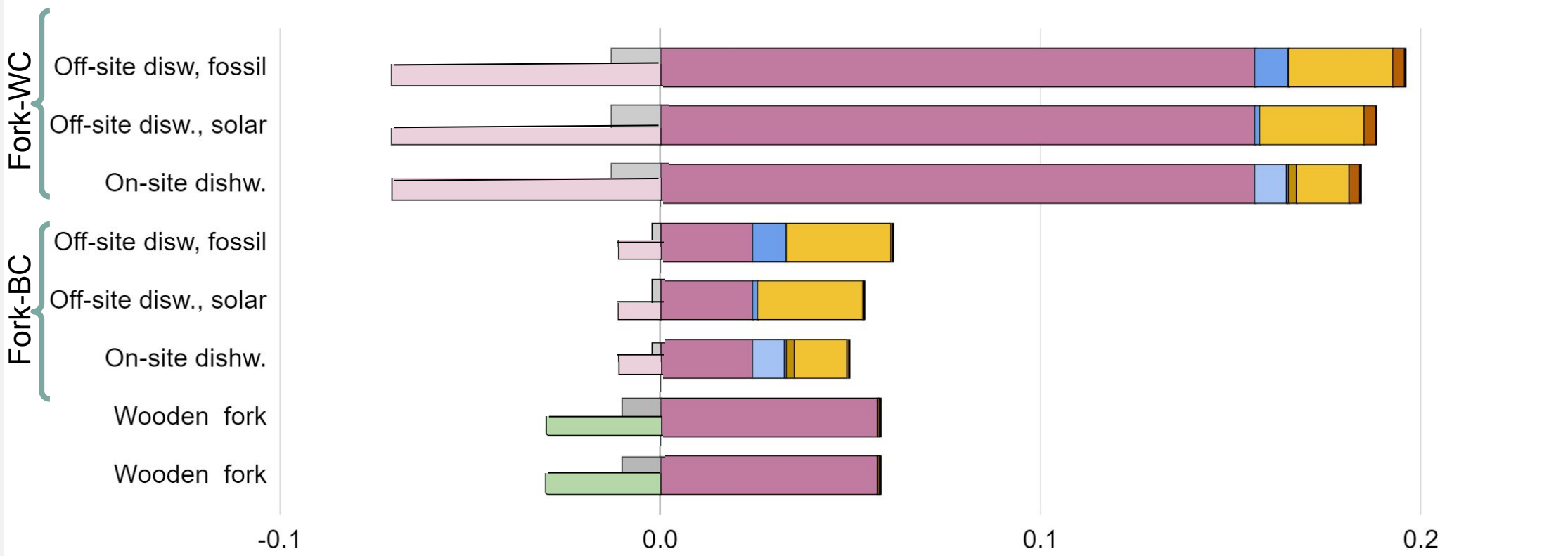
WC = Worst case
BC = Best case

Life cycle results - fork

Results & discussion - fork

Many remarks about the environmental impacts of dishwashing the bowl apply to the fork as well and will not be repeated here. In short, off-site dishwashing on solar energy is preferred above on-site dishwashing and off-site dishwashing with electricity supply from the grid. Also here transport from warehouse to the festival site and back via the off-site dishwashing has a large influence and prevents the reusable fork in the best case performing better than the disposable wooden fork for energy use. Ignoring this transport, however, the reusable fork in the best case does outperform the disposable wooden for energy use, but not for climate change nor water use. For climate change and water use the reusable fork performs worse than the disposable wooden fork in all scenarios.

Life cycle energy use - fork



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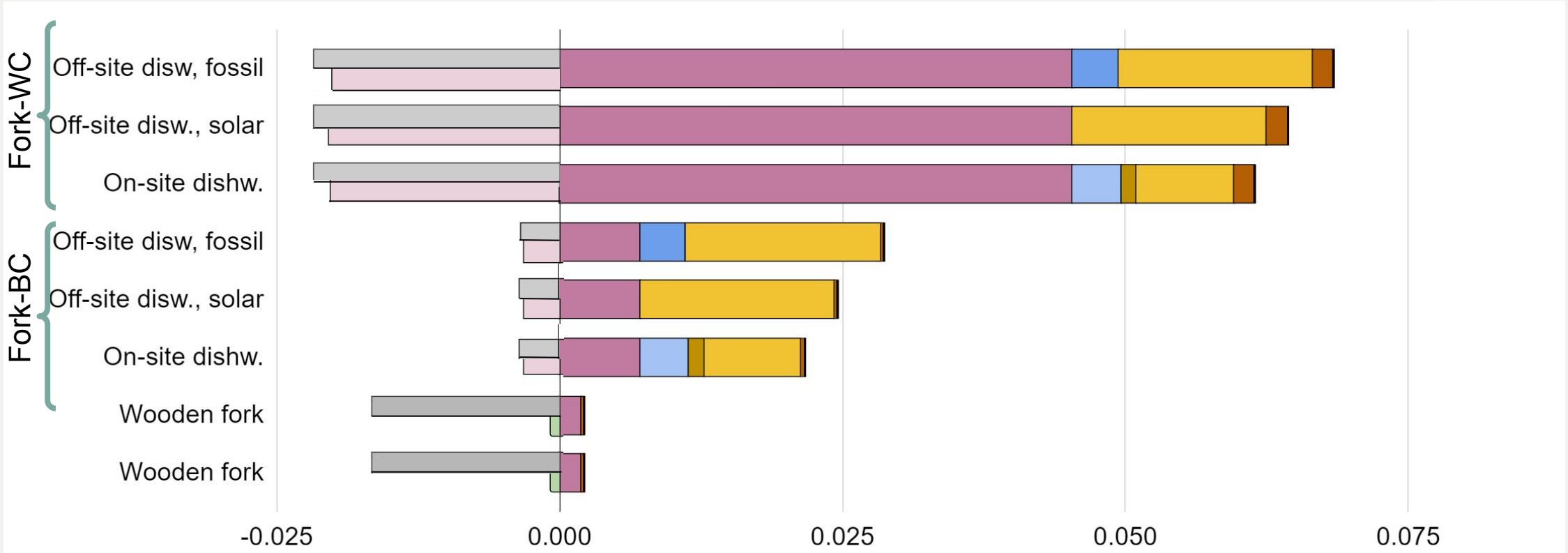
- Transport for on-site dishwashing
- Transport for off-site dishwashing
- Other transport

MJ per serving

WC = Worst case
BC = Best case

Life cycle climate change - fork



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- Transport for on-site dishwashing
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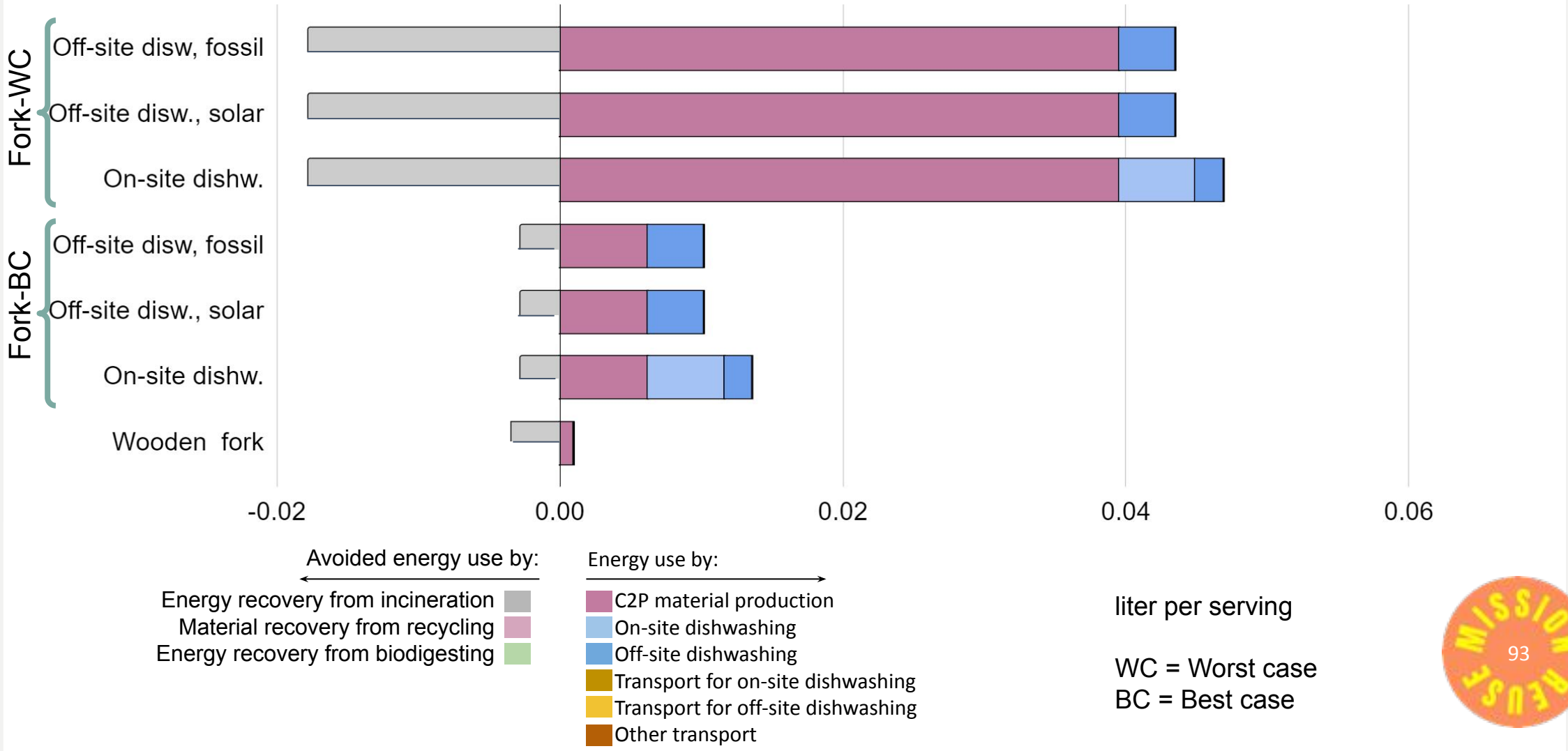
BC = Best case

Life cycle water use - fork



liter per serving

WC = Worst case
BC = Best case




Life cycle conclusions

Conclusions - bowl

Whenever possible a paper napkin is preferred, especially when only one is needed per serving. Although this has not been covered explicitly in the analysis and comparison, the napkin should be fully paper-based, recycled, unprinted and unbleached. If paper napkins are insufficient, reusable bowls are preferred over other disposable alternatives, if they are durable for at least 25 rotations and the return system facilitates a high return rate. For disposables, follow-up research should identify the break-even point at which the number of rotations of the reusable bowl becomes better. The optimal dishwashing scenario is off-site.

Conclusion - fork

The reusable fork performs worse than the disposable wooden fork for climate change and water use in all scenarios. Transport from the warehouse to the festival-site and back via off-site dishwashing prevents the reusable fork in the best case to perform better than the disposable wooden fork for energy use. So reusable cutlery, here put on a par with a fork, needs optimization. Until the reuse system facilitates more returns and/or fewer rejections, the disposable wooden fork seems preferable. It should be noted that the consumer experience strongly indicated a preference for non-wooden cutlery due to mouthfeel and eating experience.

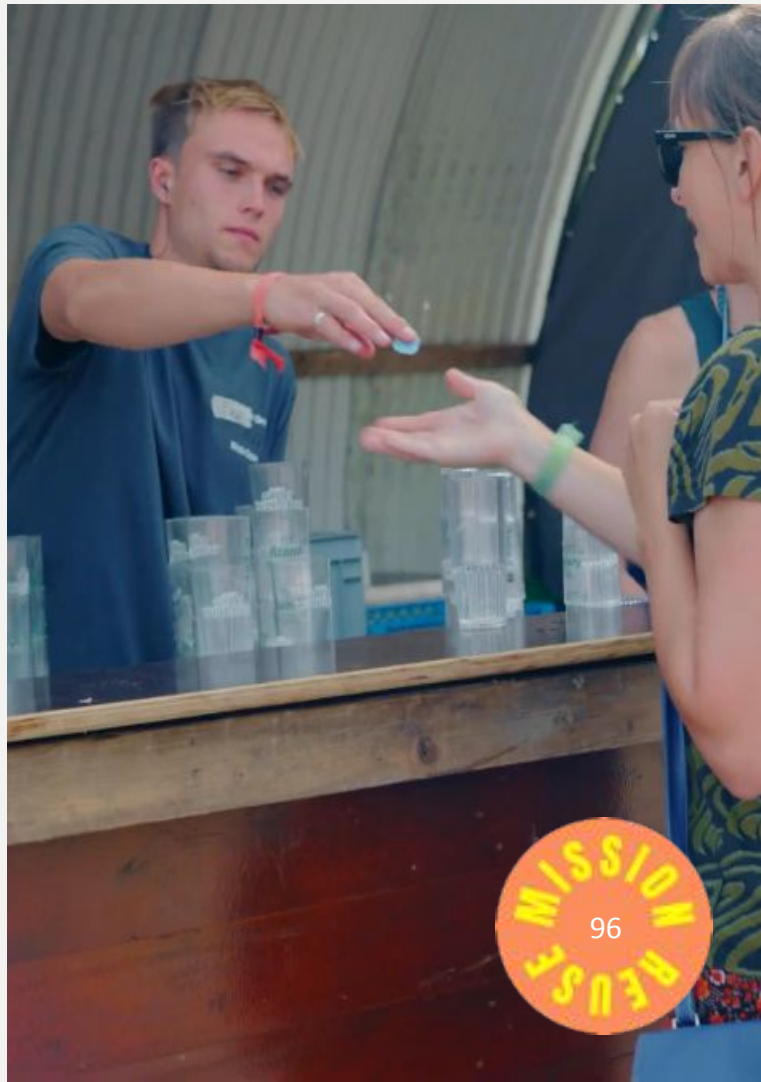
The set-up at the ITGWO festival used an extremely large amount of cutlery, which could be avoided by only handing out the cutlery items that people need. Additionally, when several items like a spoon, fork and knife are needed, a spork can be considered. Even though a spork will weigh more, and thus consume more materials per item, it can be designed to replace multiple items and thus weigh less than a fork plus a knife for example. Hereby also reducing the number of items people have to return.

SCALING & RECOMMENDATIONS

SCALING - DEPOSIT

Reverse vending machines

Returning used cups and tableware can be made easy by reverse vending machines. These machines take empty cups and tableware and automatically return the deposit (usually by putting it on a card, either a specially designed card for the festival, or a regular debit/credit card).
The biggest challenge is keeping these machines clean. Reverse vending machines for cups usually work all right. However, people tend to pour out the last milliliters of their drink in front of the machine, which may lead to puddles and messy areas. This problem increases with reverse vending machines for tableware, which may get blocked by leftovers getting into the machinery.



Setting determines the need for deposit

The return rates were a good start for this first edition and smaller pilot setting at DGTL, Castlefest and ITGWO. By habituation and better communication a return rate can be achieved that ensures sufficient cycles of reuse and thus a reduced environmental impact compared to disposable alternatives. Applying a deposit/incentive free system in a city wide festival like Gentse Feesten would have been a lot more challenging because of its open character.

Festival **characteristics** that could allow **for deposit free systems**:

- Closed off environment with checkpoints at the exit
- No trash bins for other waste, but a resource point
- Centralised food court area
- No camping (nearby): because visitors stated they would find the reusable tableware and cutlery handy for personal use
- Clear communication on what is expected of the visitors regarding the tableware
- Simple and clear reuse systems with only a limited amount of reusables to reduce confusion

SCALING - ALTERNATIVES

Cashless deposit

The Gentse Feesten operated with a cash deposit return but many festivals operate cashless, which can also be facilitated for deposit returns. At Ros Beiaard 2022, a one day city wide festival in the Belgian town of Dendermonde, a digital **system with a prepaid card** was used for food, drinks and deposit. The advantage over using standard debit or credit cards is the avoidance of transaction costs. The deposit is paid back at the end of the festival (only one transaction).

Learnings from the cup systems

The pilots at DGTL, Castlefest and ITGWO did not apply any deposit fee. Interestingly this fee was present for the reusable cup systems. Learnings from cup systems show the challenges a deposit model can create to align economical and ecological advantages.

The deposit fee on cups is higher than the purchase cost; thus, cups that aren't returned create profit. Setting a deposit fee on cups can therefore create a business model that incentives organisers to impede deposit returns and favor the loss of cups. Hence, with a deposit system, we have to ensure that the cups come back properly and continue to be reused. The cup system at DGTL and ITGWO did not refund cups or cup coins, which thus only facilitates the exchange of dirty cups for a new drink. This results in a lacking return incentive for the final cup. Castlefest on the other hand returns the deposit fee of cups into coins that can be used for food, drinks, or exchanged at the counter for a refund. However, the cups are designed as a collector's item per edition and therefore many visitors take them home.
Just as with cups, deposit values on reusable tableware could be a valuable return incentive, especially in more open festival settings, when return is sufficiently facilitated.

RECOMMENDATIONS

FOR STEERING VISITORS

- Apply a **simple and clear system** where the same handling is expected from the visitors
- Apply **uniform color scheme** for all the resource streams throughout the festival terrain
- Try to include **external parties** such as supermarkets and restaurants at the campsite to join in the uniform system of the festival

Communication

- Announce and explain the system beforehand through the **website and social media**
- Put **signing on site** e.g. visible from the queue to order food and again at the dining tables with a reminder and instruction where packaging can be returned. Also state the reasoning for reusables, which motivates visitors and reduces the rejected tableware by inducing conscious behaviour like not sticking chewing gum on it.
- **Pictograms** next to or instead of text on signs would be helpful for **non-Dutch speaking visitors**.

Return points

- Provide plenty and visible **return points,** refer to them as return/resource/reuse/collection hubs so people handle the products with more care. Take into account visibility at night and when it gets crowded
- Add **clear instructions** to the collection points to avoid reusable in undesired waste streams and ideally make the set-up in such a way that the reusables cannot be disposed of in the other bins

FOR THE BUSINESS MODEL

- It has been observed during a pilot that when applying a **pay per use** model - which only tracks how many items the food vendors receive - it might incentivize food vendors to wash tableware themselves on site. This can create undesirable washing circumstances and rerotations that cannot be traced. This unintended consequence needs to be considered.
- Costs for reusable tableware are reduced with scale, thus there's a financial advantage of using the same system throughout a festival. This gives the added bonus of being more clear to the consumer.

RECOMMENDATIONS

FOR FOODTRUCKS

- **Employees should be well informed** about the system, as well as how they communicate about it to each visitor
- Use a **festival wide reuse system** where possible, to improve recognisability for visitors
- **Standardization** and applying only a few types of trays atl festivals has the advantage that vendors who are at multiple festivals do not have to adjust their portion sizes, cost calculation and food experience each time

FOR FESTIVAL EMPLOYEES/VOLUNTEERS

- Include the reusable system in the **general staff briefing**
- Assign people who manage collection points, ideally also appoint one person who is the **contact person** for internal and external questions
- Design a return logistics process that is **safe**
- Facilitate a reusable system and try to **limit the number of reusable packaging** that is offered to improve clarity of the system and reduce logistic streams needed down the line
- At only 1 of the 3 festivals **additional branded disposable items** - like napkins - were added and the food vendors at other festivals did not show any need for additional branding. Festival organisers should be aware that their food vendors might start adding disposable items which is inadvisable

Deposit

- A **deposit-free system** showed to be possible, especially in a closed festival environment. To compensate for the lack of incentive, there is a strong need for clear communication. The incentive could also be provided by a lottery system for example through which people who hand in tableware can win a backstage access pass or a ticket for the next edition or so.
- Apply a **deposit** to increase return rates and avoid extensive post sorting. Especially for city wide events it makes more sense to return the tableware at return points and the food vendors that give out the tableware than putting collection bins throughout the city. Make sure to create an easy system that avoids queues, possibly combining the return of cups and tableware.

Acknowledgements

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