



# REDUCTION OF FOOD WASTE ON CRUISE SHIPS

A project report & implementation guide

Published by



TUI Cruises GmbH

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TUI Cruises GmbH is a joint venture between TUI AG, the world's leading tourism group, and Royal Caribbean Cruises Ltd. Since May 2009, the Hamburg-based company has been offering contemporary-style cruises on its *Mein Schiff*® Fleet for the German-speaking market. With *Mein Schiff Herz* having entered service in February 2019, the fleet now comprises seven ships.



Futouris e. V.

[www.futouris.org](http://www.futouris.org)

Preserving the natural and cultural heritage of our world and shaping the future of tourism in a sustainable way – that is what Futouris e. V. stands for. Futouris members are small and medium-sized businesses as well as market leaders. Together they aim at implementing pilot projects and innovations that enable more responsibility and sustainability in the travel industry.

## Project partners



United Against Waste e. V.

[www.united-against-waste.de](http://www.united-against-waste.de)

United Against Waste is an initiative for the food industry. Together with its more than 100 members, the association develops practicable solutions that demonstrate that the reduction of food waste is feasible – and can also save a lot of money. The measures developed by United Against Waste commercial catering make the topic of food waste more tangible in everyday kitchen life.



sea chefs Holding AG

[www.seachefs.com](http://www.seachefs.com)

For many years, sea chefs has been an experienced partner in hotel management on board the cruise ships of well-known shipping companies and it ensures the provision of a first-class service on board. From conception and planning, via purchasing and logistics, recruiting and crewing, to the perfect implementation in the daily business on board, sea chefs ensures smooth processes in the premium segment.

## Kindly supported by



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Building on the potential of tourism as a force for good, the TUI Care Foundation supports and initiates partnerships and projects, which create new opportunities for the young generation and contribute to thriving communities all over the world. Connecting holidaymakers to good causes, the TUI Care

Foundation fosters education and training initiatives to open up new opportunities and perspectives for young people, the protection of the natural environment in holiday destinations and sustainable livelihoods in thriving destinations where local communities can further benefit from tourism.

## Editors

Kathrin Müller (TUI Cruises GmbH), Victoria Müller (TUI Cruises GmbH), Inga Meese (Futouris e.V.)

## Co-Editors

Torsten v. Borstel (United Against Waste e.V.), Gregor Reimann (United Against Waste e.V.)

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## TABLE OF CONTENTS

About this guide	4
Introduction: Reduction of food waste – Why deal with the topic?	5
Essentials about food waste	6
Characteristics of the gastronomy service on cruise ships	7
Food waste measurements on the <i>Mein Schiff</i> ® fleet	8
Essential measures to reduce food waste	11
Important complementary measures to reduce food waste	17
Interview with Gregor Raimann, founder and owner of raimannConcepts gastronomy consulting	18
References and useful sources	19





# UNITED AGAINST FOOD WASTE

## ABOUT THIS GUIDE

The goal of TUI Cruises (and, of course, the travel industry in general) is to offer our guests an excellent and unforgettable travel experience. This is accompanied by a high standard of quality and variety in its gastronomy. At the same time, the company is aiming to consistently reduce the environmental impact of its cruises, also in regard to food waste. Food waste is an unnecessary loss in the area of food consumption, representing unused natural resources and contributing to the greenhouse effect, agricultural land use, and water consumption.

Against this briefly sketched background, the shipping company has launched its food reduction project, which is what this guide is all about. With this guide, TUI Cruises would like

to share their approach and experiences in the project and encourage other (shipping) companies to start their own initiatives. Together, we can achieve the goal of the United Nations to reduce food waste by 50% by 2030 – one step at a time.



This guide joins the existing publications of Futouris e.V. (<https://www.futouris.org/online-tools/>), offering general background information and practical advice, as well as pointing the reader to a range of further sources. It is especially addressed to cooks, F&B managers, and their staff, as well as food lovers, sustainability practitioners, and people generally interested in the subject. Imitation is expressly welcome!

## Types of Information

The following types of information are provided in the guide:

### GOOD TO KNOW

Facts and figures



### KEY RESULTS

A summary of findings of the project



### WHAT CAN I DO?

Directly applicable tips for practitioners



### PRACTICE EXAMPLE

Experience of TUI Cruises





# INTRODUCTION

## REDUCTION OF FOOD WASTE - WHY DEAL WITH THE TOPIC?

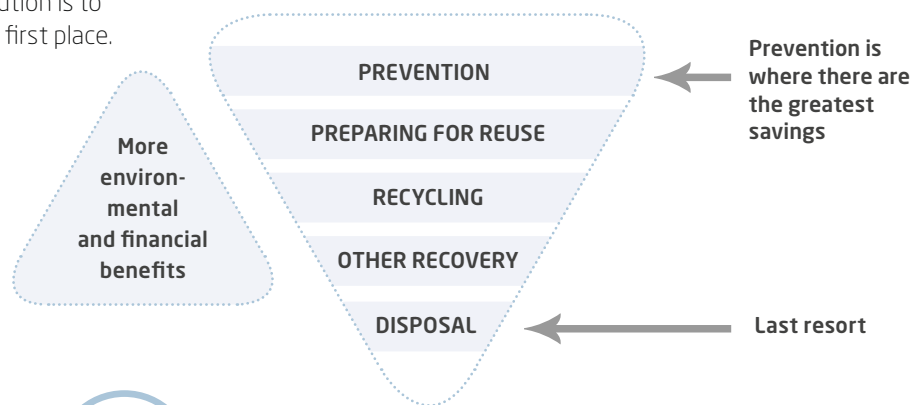
Food waste is not only poor cost management but also highly questionable from an ethical and social point of view, especially considering there are almost a billion malnourished people in the world. In fact, we face the challenge of feeding a growing global population of over nine billion people by 2050. At the same time, food waste may also harm the environment, as food decomposition in landfills gives off methane gas, which contributes to climate change.

In other words, this means that reducing food waste saves money (due to less purchasing and less disposal) and enables an increase in food quality (in terms of the food quality itself and the option of sustainable, biological, regional, or certified food products). This win-win situation saves financial and ecological resources. Therefore, it is worthwhile focusing on the reduction of food waste. Taking on this responsibility and committing to the first step is doing the right thing. Be a role model and start implementing your own similar project.

### GOOD TO KNOW



The food waste hierarchy shows cost-saving opportunities for businesses. The preferred solution is to prevent food waste from occurring in the first place.



### PRACTICE EXAMPLE



The TUI Cruises project was awarded with the DRV (German Travel Association) sustainability award EcoTrophea in December 2017.



# ESSENTIALS ABOUT FOOD WASTE

A classification of food waste is required for the targeted planning of effective measures to prevent it. It is essential to record a structured way where and in what amounts food waste is generated. With that, patterns become apparent, which then provides a starting point for improvement.

First, it is important to know that food waste can be differentiated into **preventable food waste** (still fully edible at the time of disposal or would have been edible if consumed in time), **partially preventable food waste** (due to different consumer

habits, e.g., uneaten bread crusts or apple peel, or different processing methods, e.g., production of soups from broccoli stalks versus direct disposal of the product), and **unavoidable food waste** (usually produced during food preparation and disposed of; this waste mainly contains non-edible components such as bones and banana skins, but also edible parts such as carrot peel).

In terms of the food waste structure on a cruise ship, subdividing according to process steps has proven to be reliable:



## Stock & expiration date

Creation of food waste due to stock losses or exceeding the expiration date



## Production waste

Creation of food waste mostly because of peeling and preparing



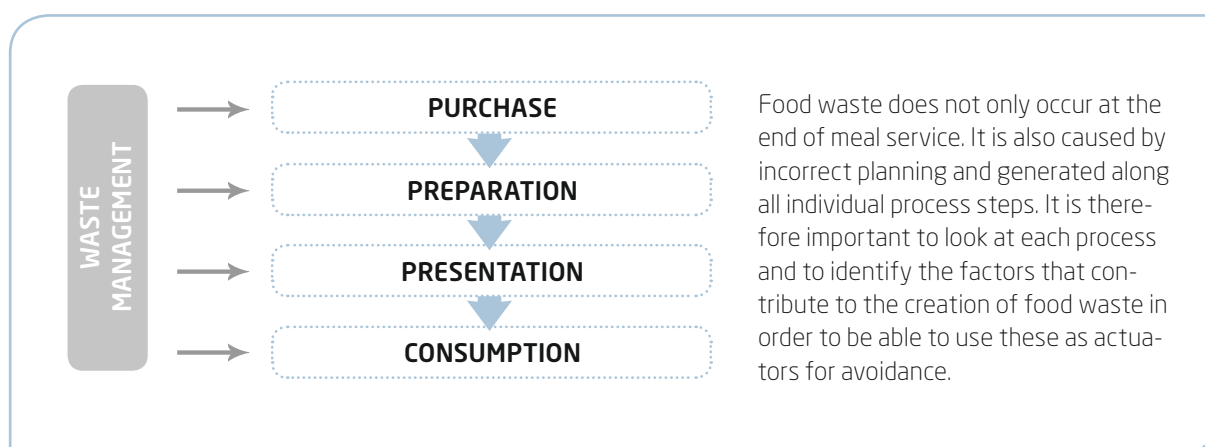
## Overproduction

Creation of losses due to the dispensing of food



## Plate leftovers

Creation of losses due to unconsumed food caused by the quantity on the plate and/or the quality of food



## GOOD TO KNOW

Did you know that the management of food waste falls within the scope of a holistic sustainable food concept? For further information, see Futouris Sustainable Food Manual: <https://www.futouris.org/online-tools/>



# CHARACTERISTICS OF THE GASTRONOMY SERVICE ON CRUISE SHIPS

Good food is an essential part of a vacation. In addition, it is a crucial aspect of the way the guests perceive the quality of the overall service bundle.

A cruise includes the offer of a variety of restaurant concepts. TUI Cruises offers its guests up to twelve restaurant concepts in different styles. A guest can easily dine at different places for a few days at a time, which affects the size of the food offer. This entails the purchase of large quantities of food, and in turn the potential risk of disposing of large quantities of food.

The processes in the galleys (large kitchens on a cruise ship) scarcely differ from those in a large hotel restaurant on shore, but the dimensions on a cruise ship are larger. Against this background, long-term planning of the menus is necessary. All onboard food rotations are set months in advance and usually follow a fortnightly repetition cycle. This makes the supply of food predictable.

Food logistics for operating a medium-sized cruise ship follow a precisely devised purchase plan. In order to ensure delivery of the required quantities and, in particular, product qualities, about 80 to 90% of all goods are purchased centrally and transported by sea container to the respective destinations of the ship. Central logistics are necessary because the quantities



and qualities required for a cruise ship are not available at any time in any place. In addition, there are also sea days where no delivery is possible. Consequently, there must always be a sufficient amount of goods on board, including a certain amount of buffer quantities so as not to cause shortfalls (for example, in the unlikely event of emergencies or reroutings that do not allow the punctual delivery of food).

Strict hygiene rules for handling foods such as Hazard Analysis and Critical Control Points (HACCP) and United States Public Health Service (USPH) are another cause of food waste. These state, for example, that food that is still on the buffet after four hours must be disposed of. As a result, any goods that were on display must be thrown away.







## FOOD WASTE MEASUREMENTS ON THE *Mein Schiff*® FLEET

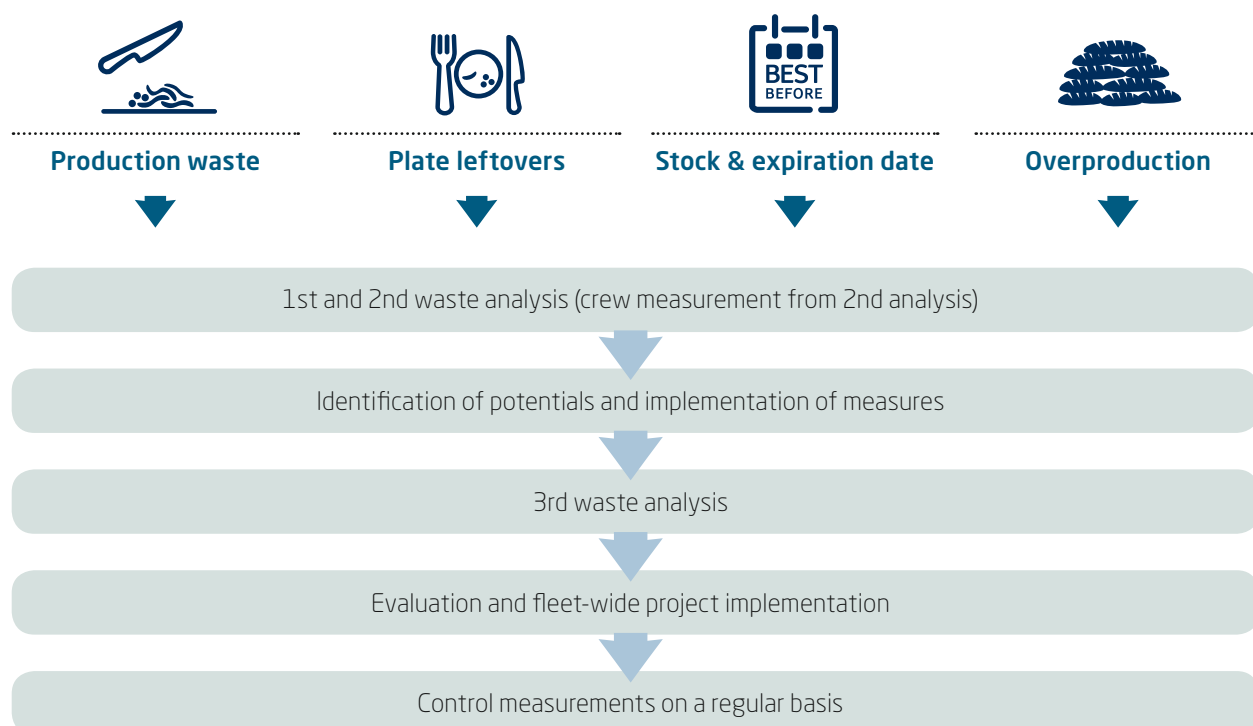
The project to reduce food waste on cruise ships was launched by TUI Cruises together with Futouris within the Sustainable Food industry project. With the support of United Against Waste e.V., an association for the prevention of food waste, it has been ongoing since fall 2016.

The pilot project started on board *Mein Schiff 4*, where food waste reduction measures were trialed after two waste

measurements. After a further measurement in fall 2017 and the final evaluation of the results in December 2017, a catalog of measures summarized the results. In 2018, successful measures were expanded within the whole *Mein Schiff*® fleet. The success of the implementation was validated by two comparative measurements on board of *Mein Schiff Herz* in June 2018 and *Mein Schiff 1* in August 2018.

### Phases of the project

(Method: UaW food waste measurement tool)



## Description of waste analysis measurements

TUI Cruises and United Against Waste initially conducted two one-week measurements on *Mein Schiff 4*. In each case, the two main restaurants of the ship – Anckelmannsplatz and Atlantik – were analyzed during the breakfast service, lunch, and dinner. The food waste from overproduction (return from buffet) and plate leftovers was quantified and documented. In addition, waste from food storage (storage/expiration date) and production waste were measured on the entire ship.

During the second measuring phase, food waste in the crew mess (crew buffet restaurant) was also analyzed and weighed. The data was collected in a food waste analysis tool from United Against Waste e.V. (UaW) in order to identify the potential for preventing food waste.

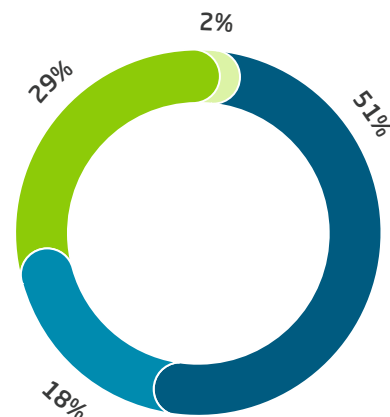
### KEY RESULTS



An average of 50 % of TUI Cruises' food waste is generated in the overproduction segment. This area offers the highest potential for savings. This was followed by the segment of plate leftovers (18 %). Production waste is mainly due to waste in the form of peelings, etc., which is why there is little potential in this area. Storage losses and losses through exceeded expiration dates make an average of 2 % on board the *Mein Schiff*® fleet.

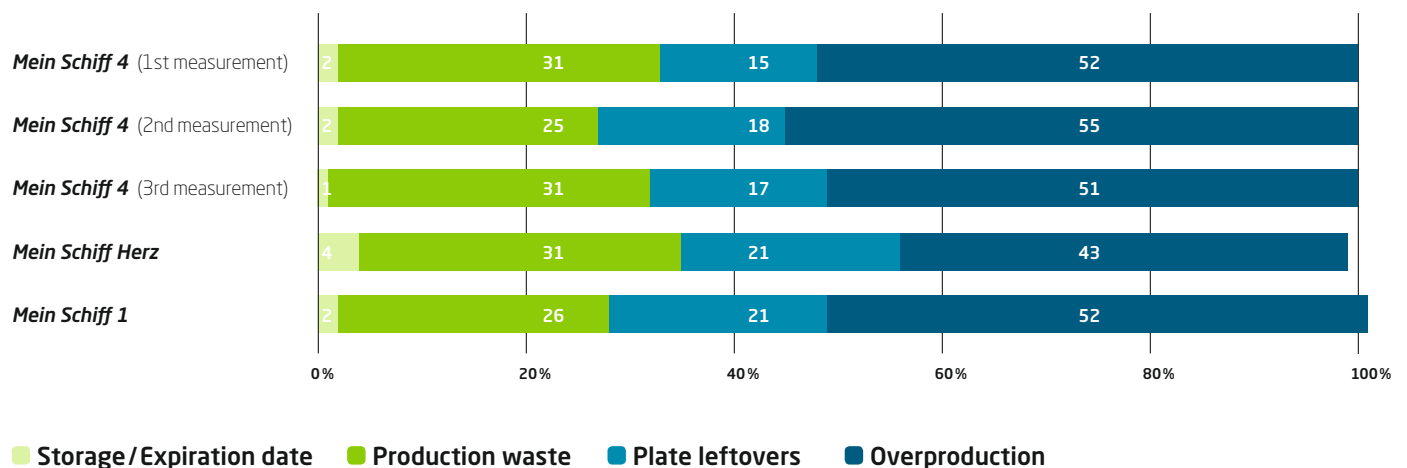
At the same time, this value is quite normal and typical for commercial catering, although the conditions for service at sea are even more difficult than those for hotels on land (see the chapter "Characteristics of the gastronomy service on cruise ships" on page 7).

## Proportion of waste types in total food waste



AVERAGE OF ALL MEASUREMENTS

### INDIVIDUAL MEASUREMENTS





For the daily reporting of food waste

Analysis period (date): from 7.10 to 11.10

Day of waste measurement: 14.10 calendar week 54

Weekday (Mon - Sun): Sa

In charge for the day:

Please separate the food waste in:

- Best before date – Purchasing & Storage
- Production Waste – Kitchen
- Overproduction – Buffet, Banquet
- Plate left-over – Remains of the guests

Dispose the waste in the four areas and enter your result into the list. At the end of the day you will have a first overview of the amount of food waste. Dispose all waste that are not food waste (for example: glass, plastic, etc.) in a dedicated, separate trash bin. Always register the weight during the analysis period in the same unit of measurement (kg or g).

	Best before date	Production Waste	Overproduction	Plate left
Weight (g) Container				35
Weight (g) Container				
Weight (g) Container				

## PRACTICE EXAMPLE



In order to carry out the waste measurement on board, the food waste pulpers were closed and the food waste was collected in bins instead – categorized by storage waste, production waste, overproduction, and plate leftovers – and then transported to the garbage room. The procedure took place daily at breakfast, lunch, and dinner times. In the garbage room, the bins were weighed and the waste figures were recorded before disposal was carried out via the pulper located in the garbage room.

## WHAT CAN I DO?



To identify potential savings, it is important to know where, when, why, and how much waste is being produced during day-to-day operations. The data can then be used to identify practical actions that will lead to waste reduction and cost savings.

## Steps to measure your food waste:

1

Over a set period of time, segregate food waste into separate bins for spoilage, preparation, buffet, and customer plate waste.

2

Weigh or count the food waste bins at the end of each monitoring period. Use a waste tracking sheet such as the one from United Against Waste e.V. The results will provide the baseline against which the impact of changes in day-to-day practices can be compared.

3

Monitor what type of food is left on the buffet and returned on the customers' plates. Customer feedback might help to determine the reason why food has not been eaten. It may even indicate that the menu design needs to be changed.



# ESSENTIAL MEASURES TO REDUCE FOOD WASTE



The best solution to reduce food waste is not to allow it to occur in the first place. However, there is also food waste that is not avoidable in the course of providing a gastronomy experience. It is usually produced

during food preparation and essentially consists of non-edible components such as bones or banana skins. These have to be disposed of.

In principle, avoidable and partially avoidable food waste offers potential for the prevention of food waste. Both types of waste provide an important starting point for the TUI Cruises project to reduce food waste.

On the basis of the results presented, concrete measures were defined to reduce waste in the two main restaurants, Anckelmannsplatz and Atlantik. These included changes in equipment such as smaller buffet inserts and containers, adjustments to the arrangement and quantities of food, and table-laying and refill behavior. Of course, the variety of choice remains the same. The smaller containers are simply filled more frequently. This also means that freshness is better maintained.

## Brief overview of food waste reduction measures (short list)

MEASUREMENT CATEGORIES AND MEASURES	EXPLANATIONS/EXAMPLES
<b>Measurement category I: Changes in catering equipment</b>	
Smaller buffet inserts	Smaller display containers and buffet trays
Smaller buffet containers	Smaller bowls, sauce boats, baskets
<b>Measurement category II: Changes in processes</b>	
Arrangement of food	New arrangement concept, e.g., with single-serve glasses
Quantities of food	Use of reference values, consideration of table sizes
Table-laying behavior in the à la carte restaurant	Bread and butter only as required
Refill behavior	Careful refilling (especially shortly before restaurant closure)
Continuous opening hours between breakfast and dinner	Smooth transitions without direct clearing phases
<b>Measurement category III: Awareness-raising activities</b>	
Communication with passengers	Table displays, social media, daily program, e-mail notifications
Communication with crew	Table displays, posters, donation projects, captain's announcements, social media
Training for the crew	Sensitization for food waste topic

Regarding communication, guests on board are informed about the project via table displays in Anckelmannsplatz and are asked not to waste resources unnecessarily. The commencement of the project was also shared via other means, for example Facebook. The crew is also informed via table displays, as well as posters and an appeal by the captain calling for support.

The Anckelmannsplatz buffet restaurant is now open continuously between breakfast and dinner, meaning that there are no clearance phases in which food is disposed of before time control (four hours due to hygiene standards) and smooth overlaps take place between the individual meals. For example, part of the breakfast buffet remains set up while the lunch buffet is offered in parallel. At the wok station, smaller bowls are in use.

At the dessert buffet, guests will now rarely find whole cakes or pies, but rather cut pieces and single-serve glasses. The decoration consists mainly of durable foods that can be used later, such as pasta, or it is made out of artificial materials.



## PRACTICE EXAMPLE



### TUI Cruises' top 3 ways to reduce food waste:

1. Continuous opening hours of buffet restaurant: opening hours for Anckelmannsplatz of 6:30 a.m. to 9:30 p.m.
2. Bread on demand: Setting up the table when guests arrive.
3. Consistent quality and variety – but less is more: smaller bowls, buffet inserts and food containers on the buffet in conjunction with careful replenishing/refill behavior.



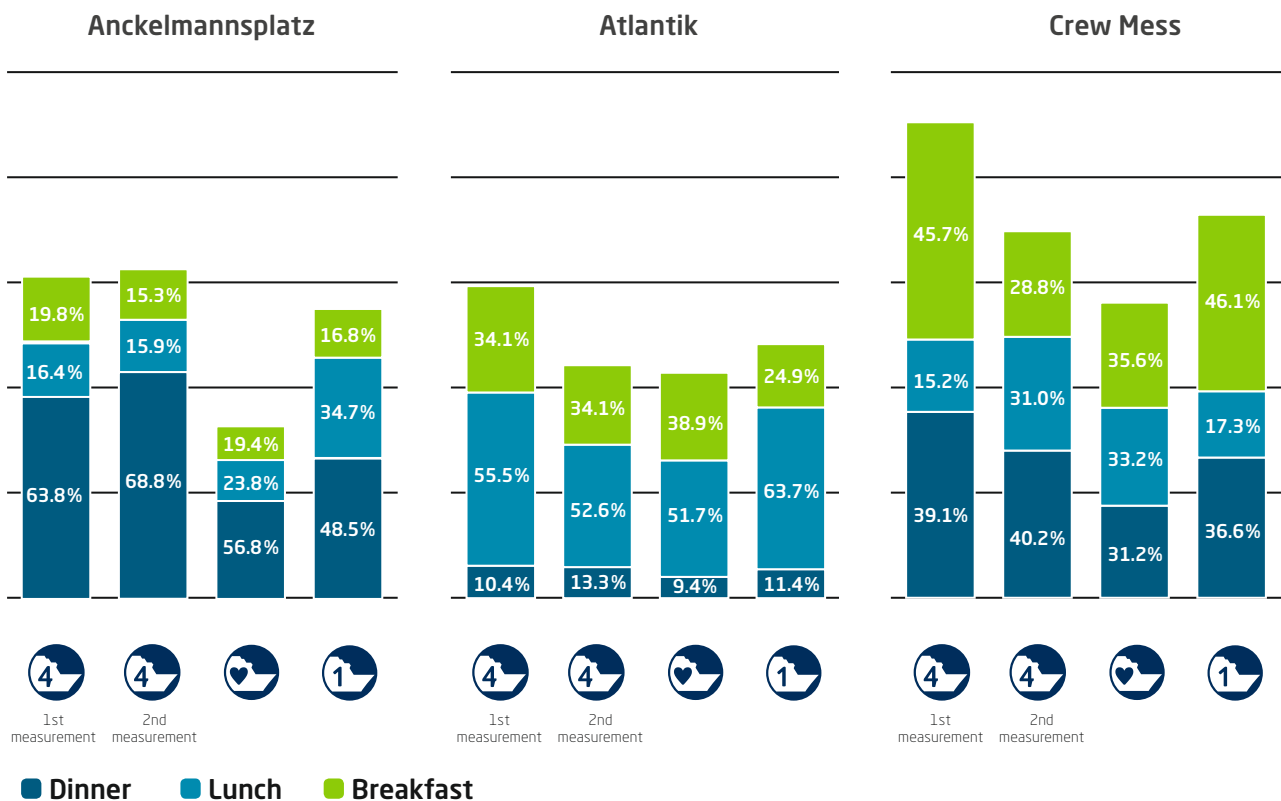
## KEY RESULTS



The buffet restaurant offers potential for preventing food waste, especially at dinnertime. On the other hand, in the à la carte restaurant, the greatest potential for savings was in terms of lunch. The crew buffet restaurant offers almost the same potential for savings at lunch and at dinnertime.

### Proportion of waste types at different meal times according to departments on board

Per person or meal/day in percent  
(overproduction and plate leftovers)



The third waste measurement checked whether the changes that had been made had resulted in savings. The evaluation of the results showed that after implementation of various measures on *Mein Schiff 4*, a **reduction of 17.41%**<sup>1</sup> in food waste was achieved.

<sup>1</sup> Average result from three one-week measurement periods, each on *Mein Schiff 4* in the Anckelmannsplatz and Atlantic restaurants, as well as from two one-week measuring periods in the crew mess. The result has excluded waste from storage, expiration date, and production waste, as no measures have been implemented in these segments.



## GOOD TO KNOW



Different destinations, weather conditions, guests, target groups, and eating habits hamper the comparison of the individual food waste measurements. In addition, different ship sizes go hand in hand with a different number of passengers and crew. The solution: observation of the food waste per person per day (crew and passengers) in grams or per meal in grams.





## Smart menu planning

Smart menu planning is the key to waste prevention. Optimize your menu planning and remember that more complexity generates more waste. Careful menu planning may prevent waste in many ways.



- Design new menus with food waste reduction and packaging reduction in mind, for example, when choosing your selection of fruits and vegetables.
- Plan smart menus based on the reservation forecasts. Consider the number, demographics (age, nationality), and past food choices of guests.
- Keep the range of ingredients down so that more of each ingredient is used leading to greater stock turnover.
- Maximize the use of ingredients, e.g., by using a whole bunch of basil for pesto or trimming-based leftovers (for sauces, soups, jams, etc.).
- Use perishable items in more than one menu option so they become used up faster.
- Buy small quantities of short-shelf-life items, or use ingredients with a longer shelf life.
- Use a computer-based system for recipe management.
- Give your customer the right amount of choice. The more items there are on the buffet or menu, the greater the number of ingredients and the higher the potential for waste.

## Preventing spoilage

Optimizing your purchasing procedures is the first step toward preventing spoilage. If you order the right amount of the right types of food, then you will have less waste and accrue more cost savings. The measures shown on the right can be taken to prevent spoilage.



- Establish good purchasing procedures based on good stock control and forecasting (e.g., use a tool such as a stock control and purchasing list).
- Extend shelf life by vacuum packing, freezing, and marinating meat and vegetables.
- A "special dish of the day" is a good way to use up stock approaching its use-by date.
- Increase the use of sous vide cooking to increase the shelf life of ingredients.
- Consider new technologies for extending shelf life such as ozone food preservation.

## Preventing waste on buffets and customers' plates



- Avoid displaying too much at once. Instead, put out less of each and top up as demand dictates. Use smaller buffet inserts and containers as well.
- Use flat and separable containers, such as basket inserts for bread, which allow you to adjust the amount of food presented.
- Label the ingredients of dishes to avoid extensive tasting. That way guests can choose more wisely which dishes they would like to take/try.
- Present food creatively, reducing the quantity served, for example present more precut pieces and pre-portioned food.
- Present meat and fish in smaller portions (e.g., 50 g).
- Closely monitor the amount of food that is put out on the buffet and carefully replenish it if needed.
- Use single portions toward the end of the buffet.
- Be creative and think about initiatives such as continuous opening hours.
- Offer as much front/show cooking as possible. This allows you to prepare fresh, correctly portioned dishes in front of the guests.

## Preventing waste in a la carte restaurants



- Do not generally set up the table with appetizers such as bread and butter, but have your setup prepared to serve the guests when they arrive.
- Apply good portion control by working out optimum portion sizes and keeping to them.
- Make the choice of side dishes more flexible, e.g., smaller portion sizes with refill options.
- Use more voluminous garnishes such as curly salad leaves; they create the same volume on the plate, but use fewer leaves.
- Adapt menus so that items that customers often leave behind are reduced or made optional.

## Communication, raising awareness, and training

Communication and awareness creation are among the main drivers for successful project implementation:

- Communicate with crew/staff and guests – for example, in the form of a table display – to inform them about the project and to encourage participation. See the following practice example. For additional information and examples of communication materials in the context of a sustainable approach, see the corresponding Futouris manual at: <https://www.futouris.org/online-tools/>.
- Offering on-site visits of the garbage room, as well as information about the amount of food waste, can greatly increase awareness.
- From the very beginning, ensure good and continuous communication, as well as a steady flow of information among all project participants.
- Train the responsible staff regarding all changes (in terms of both equipment and processes). Consider the management structure as well as the hierarchy.
- Raising general awareness about food waste and its costs automatically drives waste down.





### Gemeinsam gegen Lebensmittelverschwendung

Wir möchten, dass Sie sich rundum bei uns wohlfühlen. Gleichzeitig übernehmen wir Verantwortung für unsere wertvollen Ressourcen. Deshalb engagieren wir uns für die Reduzierung von Lebensmittelabfällen. Helfen auch Sie mit.

Unser Beitrag:	Ihr Beitrag:
<ul style="list-style-type: none"><li>▪ Gründliche Planung der Speisen und kontrollierter Einkauf</li><li>▪ Wir produzieren möglichst nur so viel wie benötigt wird</li><li>▪ Frische Lebensmittelzubereitung für Haltbarkeit und hohe Qualität</li><li>▪ Einsatz neuer Verfahren zur Messung von Lebensmittelabfällen</li></ul>	<ul style="list-style-type: none"><li>▪ Probieren Sie unsere vielfältigen Köstlichkeiten und holen Sie sich dann Nachschlag</li><li>▪ Gehen Sie ruhig mehrmals zum Buffet – es wird kontinuierlich frisch für Sie aufgefüllt</li><li>▪ Fragen, Wünsche, Ideen? Sprechen Sie jederzeit gern unsere Crew an.</li></ul>

Ein Gemeinschaftsprojekt von:



### PRACTICE EXAMPLE



Customer surveys have revealed that some guests already feel responsible and are happy to participate in the project to reduce food waste. This example shows the table display in the Anckelmannsplatz buffet restaurant on the *Mein Schiff*® fleet.





## IMPORTANT COMPLEMENTARY MEASURES TO REDUCE FOOD WASTE

When implementing a waste reduction program into the operations of a cruise ship, the hotel and kitchen management play an important role. Without confident and fully motivated executives, there will be no change toward more sustainable practices.

Awareness raising, staff training, and communication are the main drivers for the successful implementation of such projects and structural changes.

This implies the need to raise awareness of sustainable operations and continuously educate those responsible. In addition to measures in the areas of food purchasing, preparation, presentation, and waste management, awareness raising, training, and guest communication were identified as particularly important for the implementation of sustainable operations. In addition, it is advisable to set goals and regularly review them (for example, goals for suppliers, resource consumption, waste volumes).

TUI Cruises is taking the next step in 2019 and will train the crew so the changes become constant. The chefs will be trained in the field of defined waste reduction measures and in terms of process optimization in this context. Standards are defined and created for this purpose, for example, in the form of training programs and courses. In addition, it is planned to include the responsible use of food in the standard operating procedure (SOP), which provides a binding, textual description of the processes of operations – especially in areas of critical processes with potential impacts on the environment, health, and safety – and must be adhered to in the long term for all crew members.

The aim of the shipping company is also to carry out its own waste measurements to keep track of future trends. The environmental officers working on board are suitable for this purpose and will also be trained in the process. This has the advantage of both enabling continuous monitoring and promoting another field of expertise.





## INTERVIEW WITH GREGOR RAIMANN, FOUNDER AND OWNER OF raimannCONCEPTS GASTRONOMY CONSULTING

Gregor Raimann, top chef and gastronomy consultant, is an expert in food waste management for United Against Waste. He performed all the waste measurements on board the *Mein Schiff*® fleet.

### What is your conclusion after having supervised the waste measurement on five cruises?

"Waste measurement ensures transparency and shows where the potential for reduction lies. All measurements on board *Mein Schiff 4* have made it clear that even simple measures can achieve considerable reductions in food waste. The waste bins in combination with the waste analysis tool make food waste visible in the first place. This can lead to savings of up to ten percent after just a few days. In other words, the measuring itself creates enormous awareness."

### How did that make itself felt?

"Despite the size of the cruise ship and the general conditions – i.e., strict HACCP regulations – we are pleased with the results. Our measures against food waste had an immediate effect in all restaurants. In Anckelmannsplatz we were able

to significantly reduce overproduction and leftovers at breakfast and lunch. The same applies in the Atlantik in the dinner and breakfast segments."

### Did the waste measurements during the three cruises show up differently?

"Yes, definitely. During the second cruise, for example, the average age of the guests was 67. In this group, leftovers were remarkably low."

### How quickly do changes that help reduce food waste take effect?

"As soon as a chef sees the daily leftovers with their own eyes, a change sets in immediately. The measurements on board *Mein Schiff 4* show that a turnaround in waste management is a long-term process. That's why continuity is so important."

### What do you think are the biggest hurdles aside from that?

"The workload in large-scale kitchens is high.

Neither kitchen managers nor cooks have time to worry about the analysis of food waste. In addition, nowadays sculleries are separate. This means that the kitchen manager often does not see how much food is left on the guests' plates. In general, the majority of chefs do not normally have an overview of how much waste is generated in which areas. Food waste is simply not perceived. And kitchen managers and chefs are afraid that measuring it will cause a considerable increase in effort – in addition to their already high workload. Many initially do not know that these measures are quickly integrated into the workflow and take up relatively little time. That's the biggest hurdle."



## REFERENCES AND USEFUL SOURCES

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<http://www.futouris.org/online-tools/>

Futouris Manual – Sustainable Food Tools

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[www.united-against-waste.de/](http://www.united-against-waste.de/)

offers **background information and tips to reduce waste**

[www.foodsave.org](http://www.foodsave.org) <http://bit.ly/320YGCf>

offers **more great food savings tips.**

[www.umweltbundesamt.de](http://www.umweltbundesamt.de) <http://bit.ly/327VeFS>

offers **guides and manuals to reduce food waste**, such as "Prevention of food waste in the catering sector"

[www.bmel.de](http://www.bmel.de) <http://bit.ly/2KPTKlj> and

[www.wwf.de](http://www.wwf.de) <http://bit.ly/2J3NKw4> show

**studies on food waste in Germany**





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**info@futouris.org**

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