Content

Introduction

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Food waste

Aspects of food wastage

- **social**
- **ethical**
- **ecological**
- **economical**

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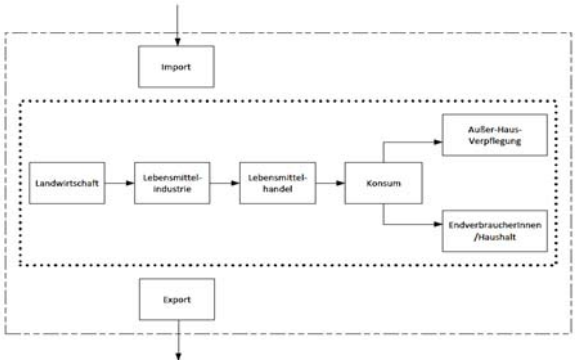
Value chain

Agriculture

Industry and crafts

Trade

Consumption



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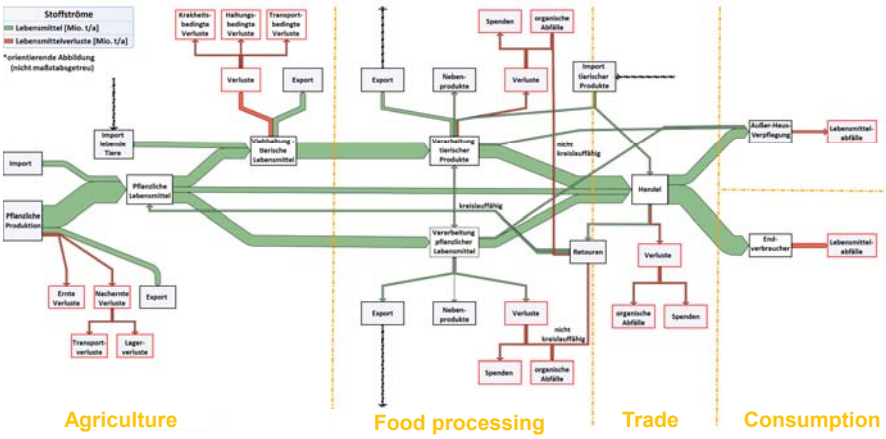
Value chain



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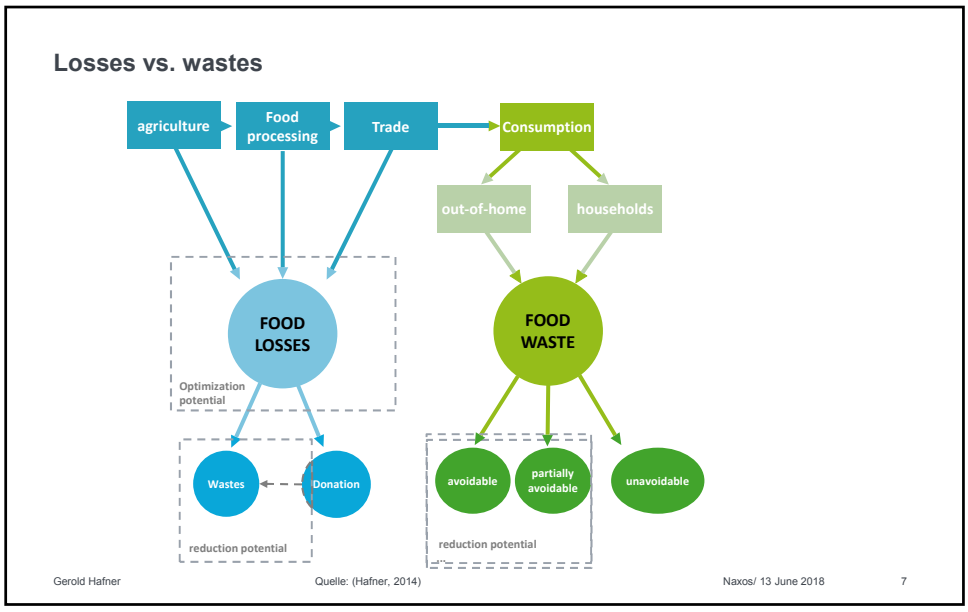
Losses vs. wastes
agriculture
Food processing
Trade
Consumption
out-of-home
households
FOOD LOSSES
FOOD WASTE
Optimization potential
Wastes
Donation
avoidable
partially avoidable
unavoidable
reduction potential
reduction potential
Gerold Hafner
Quelle: (Hafner, 2014)
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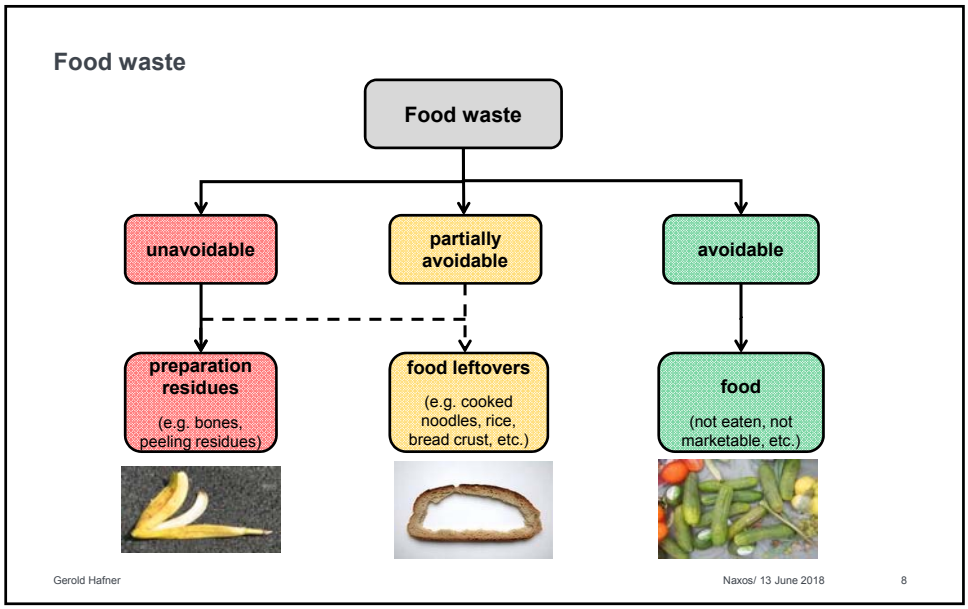
Food waste
Food waste
unavoidable
partially avoidable
avoidable
preparation residues
(e.g. bones, peeling residues)
food leftovers
(e.g. cooked noodles, rice, bread crust, etc.)
food
(not eaten, not marketable, etc.)
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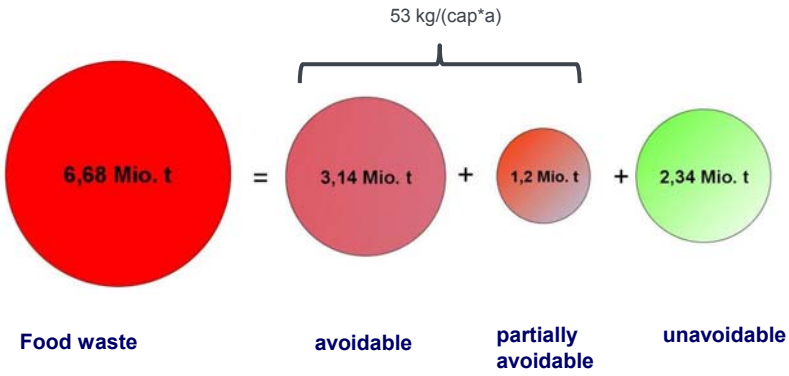
Food waste in Germany

households



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Food losses worldwide

Quelle: (FAO, http://www.fao.org/save-food, 2015)

FAO study (2011)[1]

1.3 billion tons of food waste worldwide every year.

1/3 of all food produced worldwide is thrown away

EU-study FUSIONS (2016)[2]

88 million tons of food waste in Europe per year.

20 % of all EU-wide produced food is thrown away.

Gerold Hafner [1]Quelle: (Gustavsson et al., 2011) [2]Quelle: (Stenmarck et al., 2016) Naxos/ 13 June 2018 10

United Nations prevention target

-50 %
Food losses until 2030

research projects

related to monitoring + energy

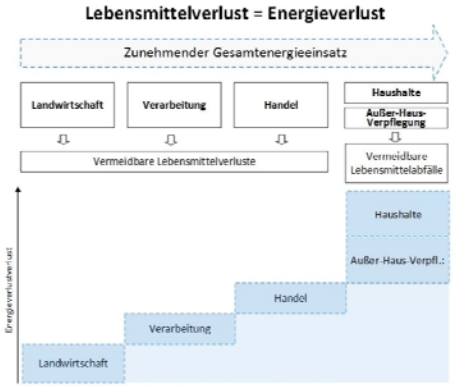
Energy savings through waste avoidance

Potential for energy saving by avoiding food waste in Bavaria

(2014 - 2015)

Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten

KErn Kompetenzzentrum für Ernährung



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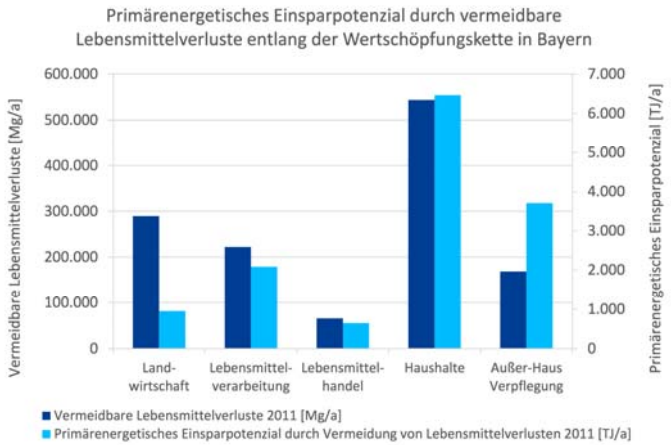
Energy savings through waste avoidance

Results (excerpt)



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EnKü – Energy efficient kitchen (2016 - 2018)

Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten

staff restaurant 1

staff restaurant 2

staff restaurant 3

school catering 1

school catering 2

KFrn Projektleitung

Irma Haberle

Universität Stuttgart Direkte Energie

Gerold Hafner Philipp Heil

Indirekte Energie

Hans Daxbeck Nathalia Kisliakova

Entwicklung Prognosetool

Bernhard Bauer

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EnKü – Energy efficient kitchen

1. **Determining the actual situation**
2. **Identification of energy-intensive areas**

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EnKü – Energy efficient kitchen

3. **Power consumption measurements**
4. **Calculation of CO_2-emissions**

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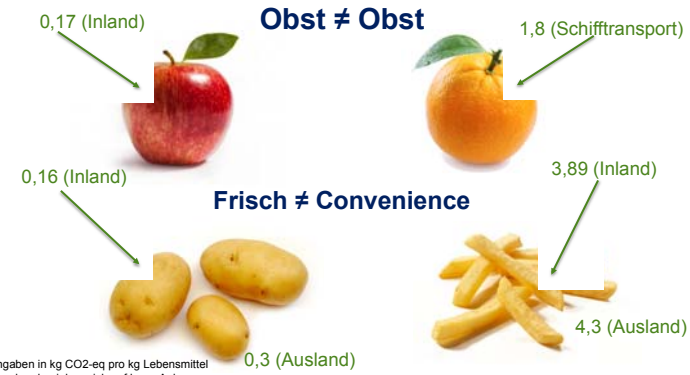
EnKü – Energy efficient kitchen

Local vs. food from abroad // fresh vs. convenience

Energetischer Rucksack (ausgewählte Beispiele)



- Angaben in kg CO2-eq pro kg Lebensmittel
- Angaben beziehen sich auf konv. Anbau

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EnKü – Energy efficient kitchen

Animal-based food vs. plant based food

ENKÜ – Energetischer Fußabdruck

CO_2-Emissionen von Lebensmittel

Tierische Lebensmittel		Pflanzliche Lebensmittel	
Rindfleisch	13,50	Blattsalat	0,18
Schweinefleisch	4,31	Kartoffel	0,12
Geflügel	3,01	Apfel	0,11
Vollmilch	0,92	Karotte	0,09
Joghurt	0,93	Gurke	0,08

- Angabe in kg CO_2eq pro kg Lebensmittel
- Ergebnisse beziehen sich auf biologische, österreichische Produkte

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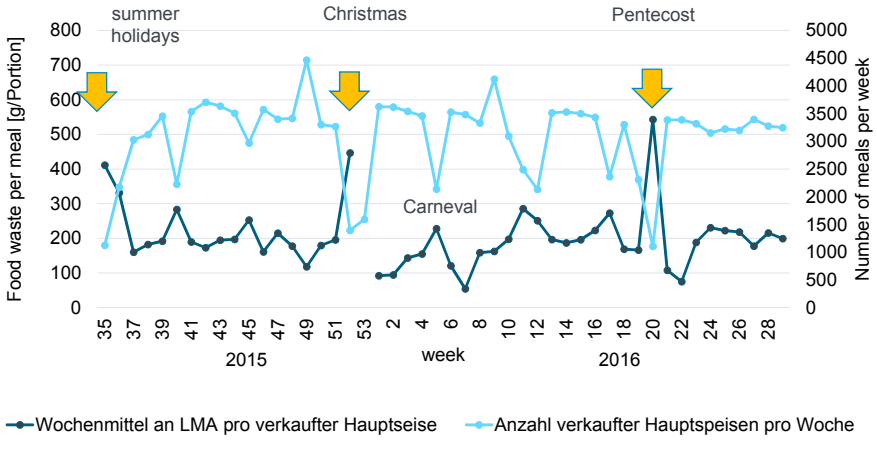
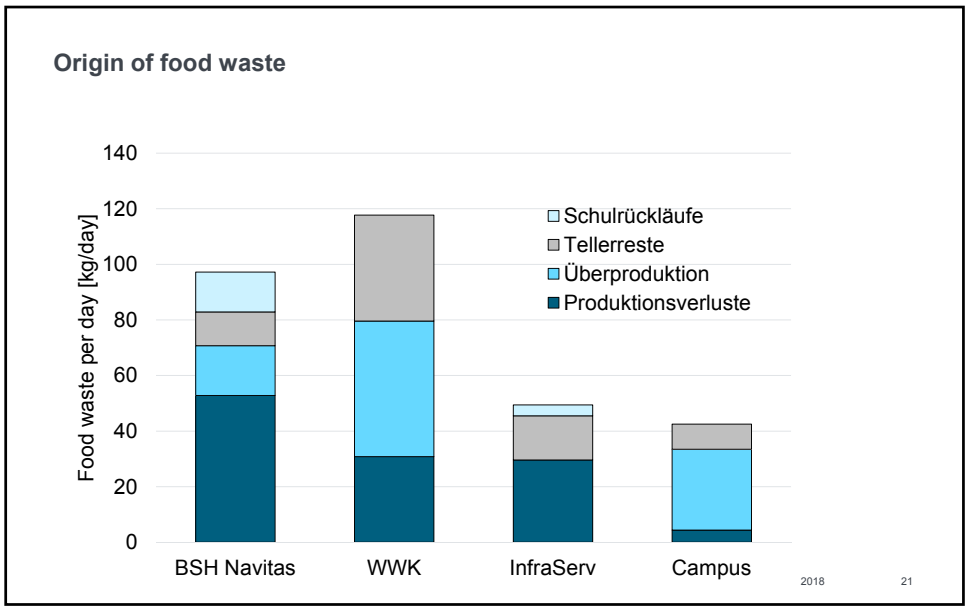
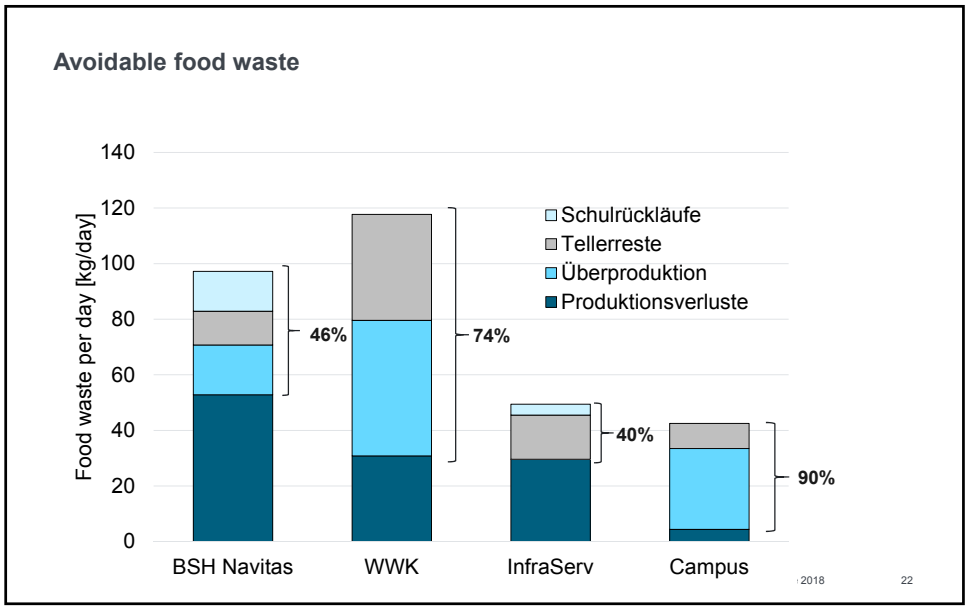
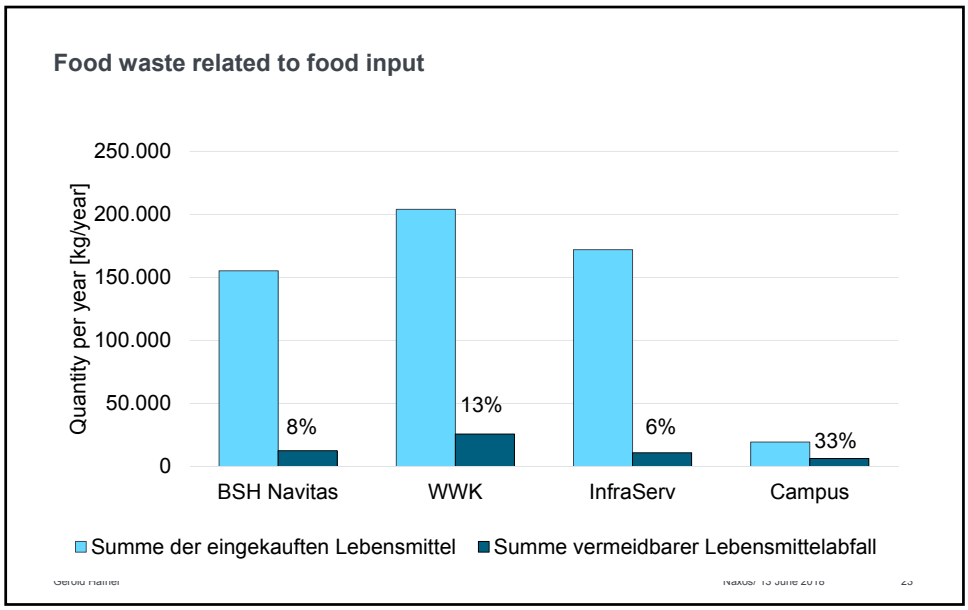
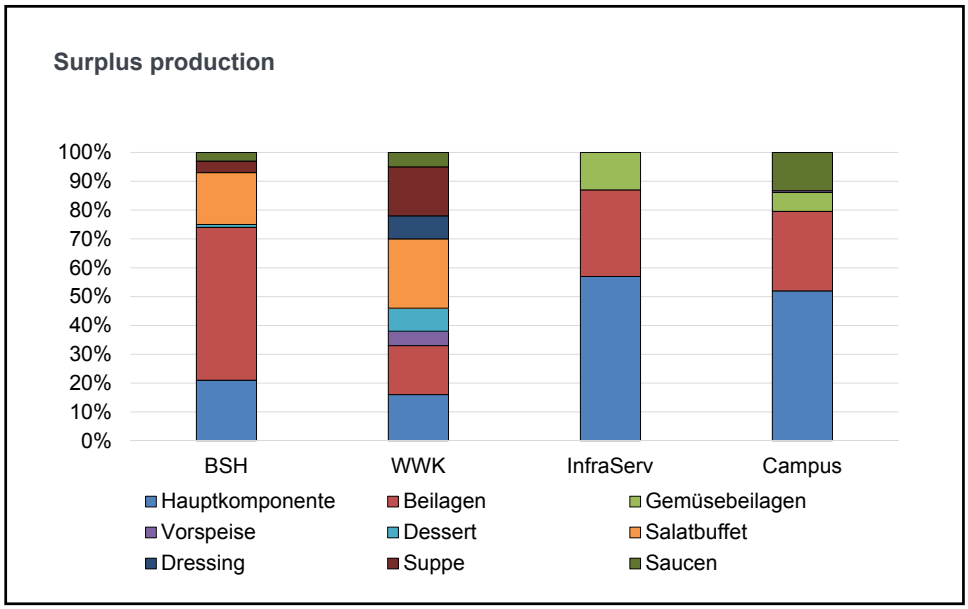
Food waste in project kitchens



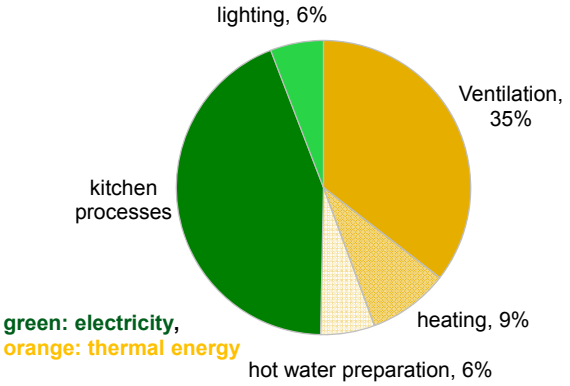

Origin of food waste
Food waste per day [kg/day]
140
120
100
80
60
40
20
0
Schulrückläufe
Tellerreste
Überproduktion
Produktionsverluste
BSH Navitas
WWK
InfraServ
Campus
2018
21


Avoidable food waste
Food waste per day [kg/day]
140
120
100
80
60
40
20
0
Schulrückläufe
Tellerreste
Überproduktion
Produktionsverluste
46%
74%
40%
90%
BSH Navitas
WWK
InfraServ
Campus
2018
22


Food waste related to food input
250.000
200.000
150.000
100.000
50.000
0
Quantity per year [kg/year]
8%
13%
6%
33%
BSH Navitas
WWK
InfraServ
Campus
Summe der eingekauften Lebensmittel
Summe vermeidbarer Lebensmittelabfall


Surplus production
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
BSH
WWK
InfraServ
Campus
Hauptkomponente
Beilagen
Gemüsebeilagen
Vorspeise
Dessert
Salatbuffet
Dressing
Suppe
Saucen

Composition of energy consumption



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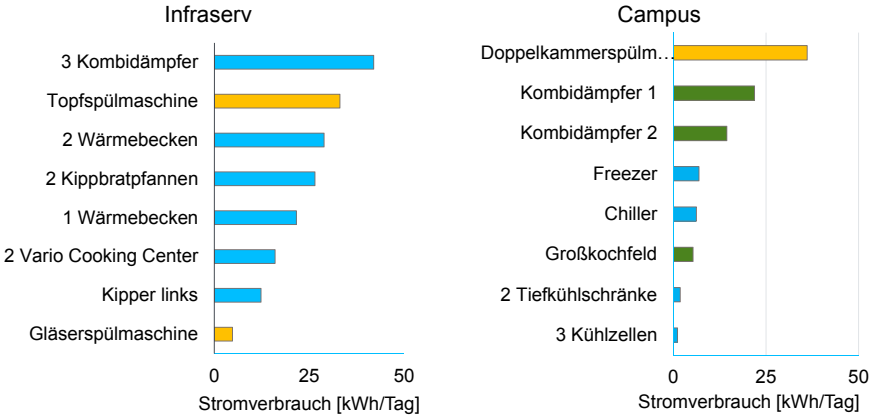
energy consumers



rot: Lüftung, blau: Kühlung, orange: Spülen, grün: Andere

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Recommendations (excerpt)

Operation

- Switching the equipment on and off according to necessity,
- Filling heating basins with warm instead of cold water,
- better utilization of dishwashers and refrigerators.

Selection of food

- Reduction of food with high energy demand.

Equipment

- Replacement of old and inefficient devices.

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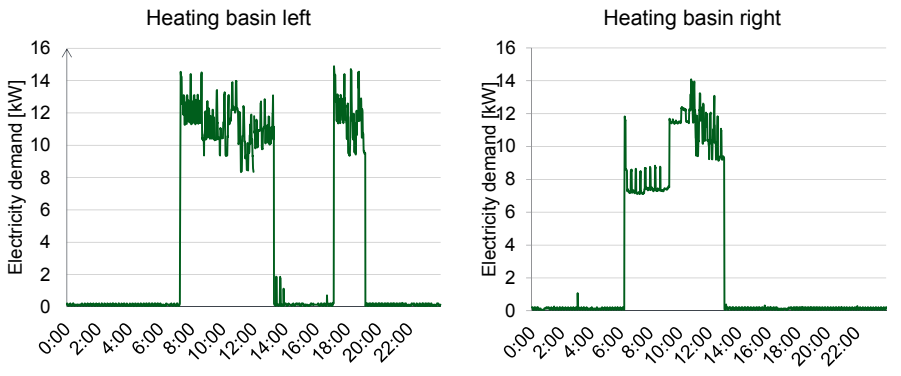
example

Heating basins – status quo ante



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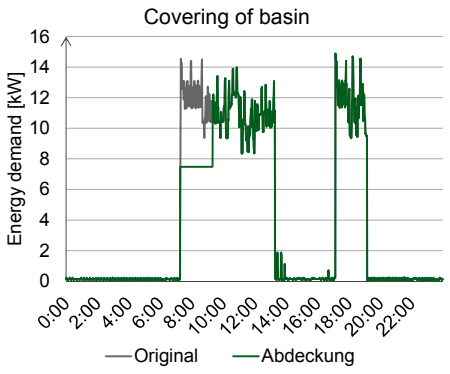
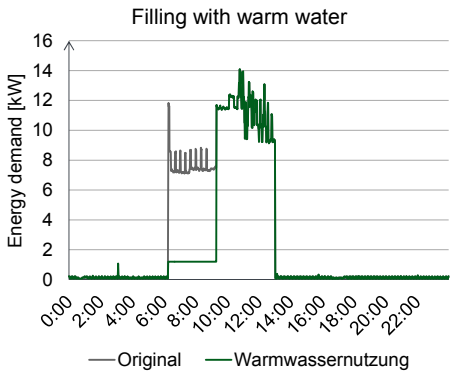
example

Heating basins – after optimization





Energy saving: 10%

Energy saving: 29%

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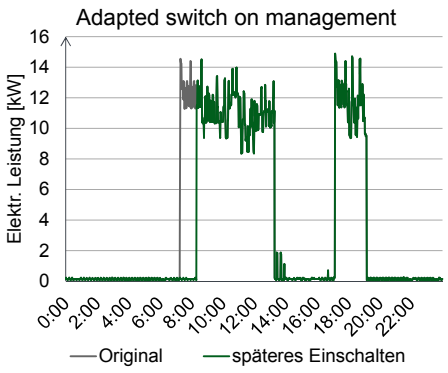
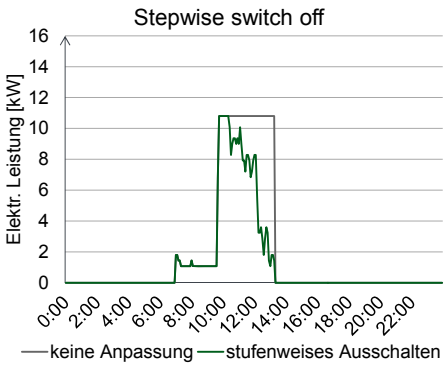
example

Heating basins – switch on when needed





Energy saving: 14%

Energy saving: 32%

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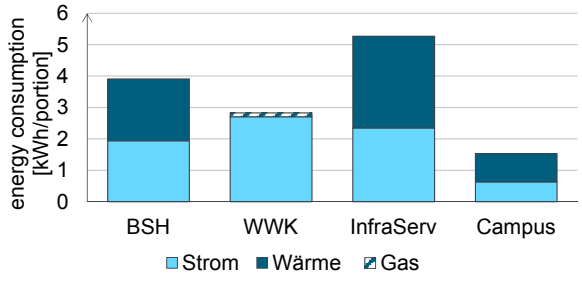
ENERGY CONSUMPTION PER PORTION

	BSH Navitas	WWK	Infraserv	Campus
Main courses [portions/year]	160.447	126.578	215.481	38.725



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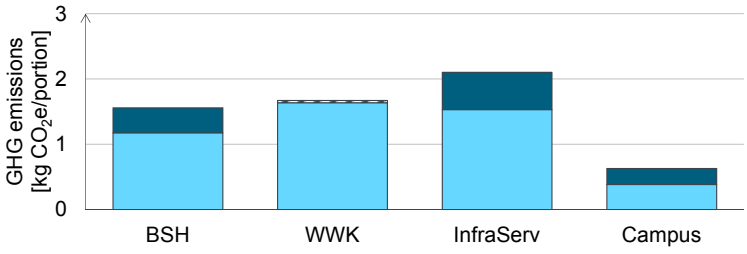
GHG EMISSIONS FROM ENERGY CONSUMPTION



emission factors:
Electricity ~ 0,61 – 0,65
Heat ~ 0,20 – 0,27
[kg CO_2e per kWh]
source: GEMIS

Strom Wärme Gas

The majority of GHG emissions are due to electricity consumption and thus above all to kitchen processes.

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A2UFood - Avoidable and Unavoidable Food Wastes

A Holistic Managing Approach for Urban Environments, **2018 - 2021**

http://www.uia-initiative.eu

- **Heraklion**, Crete (GR)
- **monitoring + system optimisation in hotels**
- restaurant for surplus food
- Production of plastics from food waste

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Tools for monitoring and waste minimization

Tools for industry, households and small restaurants, **2018 - 2020**

- industry partner: **Bizerba**
- **Zollernalbkreis**, (district in Baden-Württemberg)
- **Ministry of the Environment Stuttgart**
- **Canteens, restaurants, households** in the district

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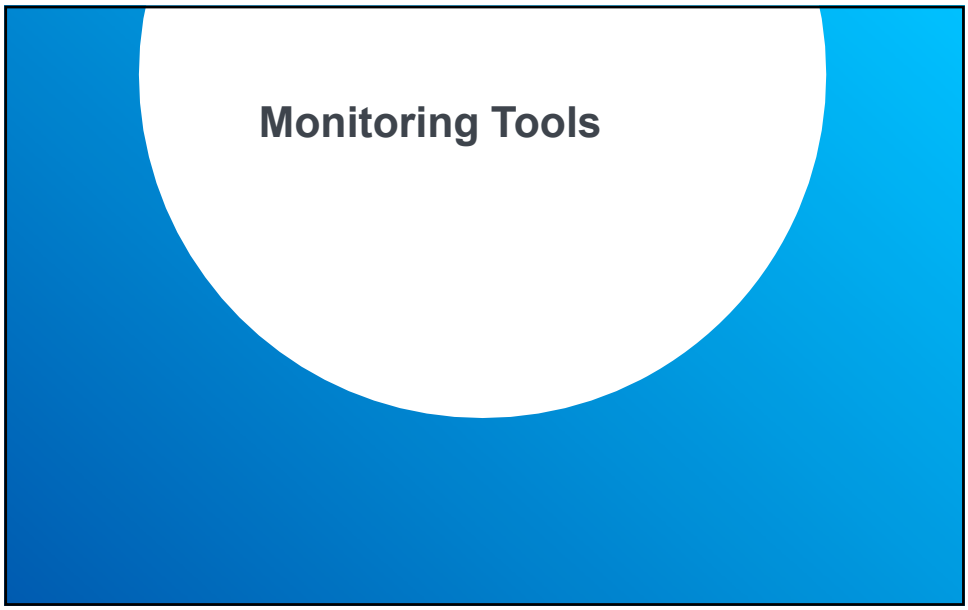
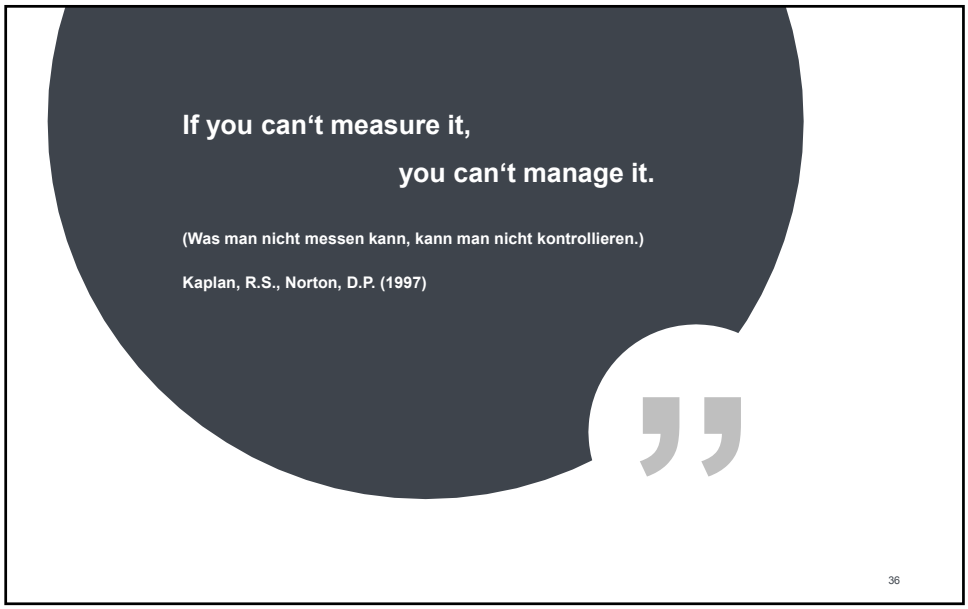

Monitoring Tools


If you can‘t measure it,
you can‘t manage it.
(Was man nicht messen kann, kann man nicht kontrollieren.)
Kaplan, R.S., Norton, D.P. (1997)
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Alliance against food losses of Bavaria

„We save food!“

Bündnis

Wir retten Lebensmittel!

Eine Initiative von

Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten

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RESOURCEMANAGER FOOD

Gefördert durch

Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten

RESOURCEMANAGER-FOOD

RESOURCEMANAGER

Wiegung » Erfassung » Echtzeit Visualisierung » Einsparung

In cooperation with

KErn Kompetenzzentrum für Ernährung

MARITIM HOTELS

Universität Stuttgart

iswa

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RESOURCEMANAGER FOOD
composition

The measuring system consists of::

- All-in-One-PC or Tablet
- electronic scale (USB)
- Software and user interface: RESOURCEMANAGER-FOOD

RESOURCEMANAGER FOOD

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RESOURCEMANAGER FOOD
User interface

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RESOURCEMANAGER FOOD

measured facilities:

- hotels,
- company canteens,
- care,
- university canteens
- school cantines
- food vending machines
- catering events
- system gastronomy

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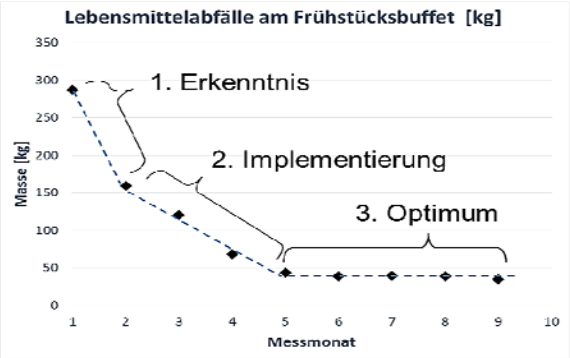
measurement results (example)

Food waste at the breakfast buffet



3 Optimierungsschritte

Dieses Beispiel zeigt die Optimierungsschritte bis zum möglichen Idealzustand (Optimum ≠ 0).

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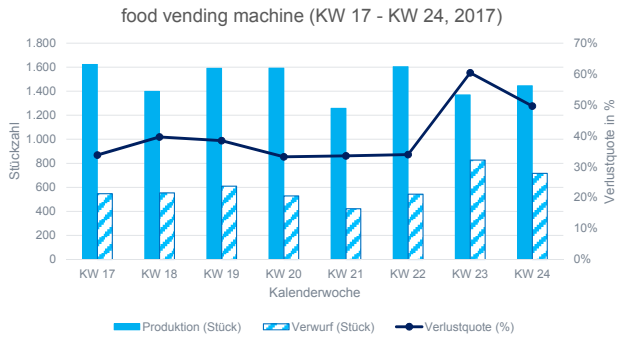
measurement results (example)

Food waste "food vending machine"



Quelle: http://www.crane-gmbh.de (2017)

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Universität Stuttgart

RMF Mobile

Online Monitoring

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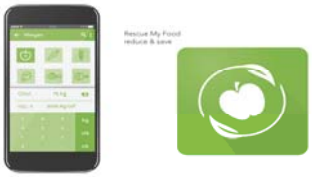
RMFOOD Mobile
RMFOOD.DE

RMFOOD.DE



Local system: Hardware + Software

Online-System

Gefördert durch
Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten

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RMFOOD Mobile
RMFOOD.DE

Mobile Website Features:

- Enter measurement data online
- Weighing or quantity recording
- Online data processing
- Visualization and Benchmarks
- Free use

www.rmfood.de

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RESOURCEMANAGER FOOD - ONLINE

www.rmfood.de

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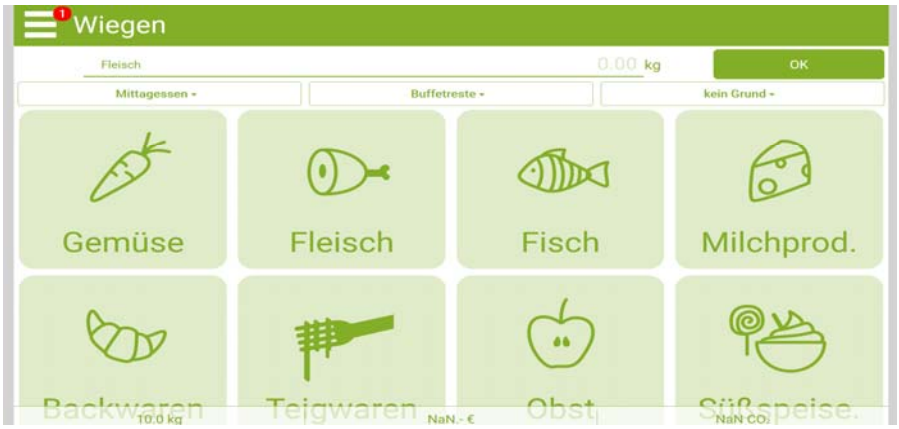
RESOURCEMANAGER FOOD - ONLINE

www.rmfood.de



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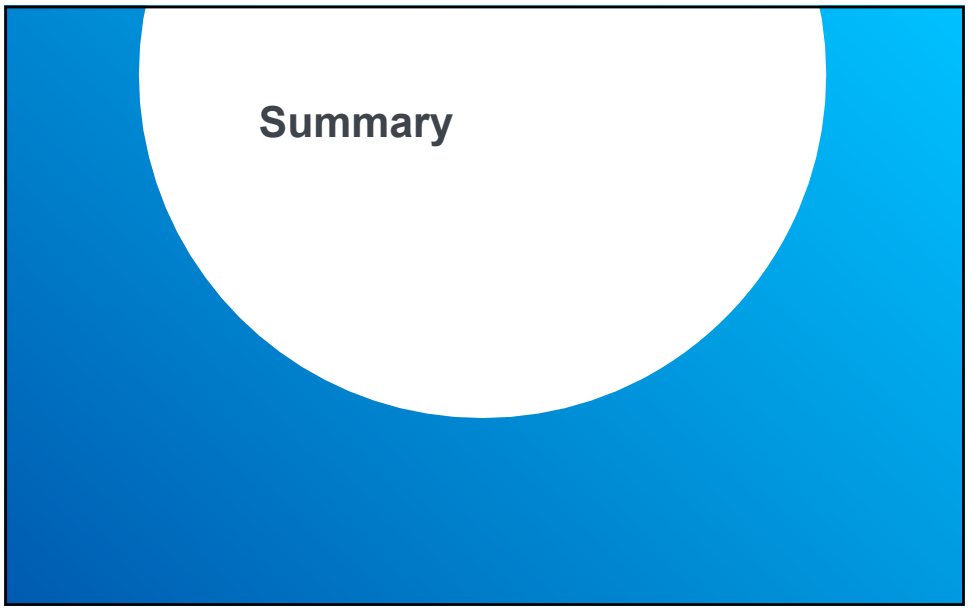

Conclusions (excerpt)

- 15% reduction of energy consumption (average)
- Most of the measures can be implemented quickly and easily, usually with economic advantages
- External incentive ecessary, e.g. awareness raising (measuring / monitoring), consulting, training and support during implementation phases.
- Significant reduction of GHG

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Co-authors

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Thank you very much!

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