MITIGATING CLIMATE CHANGE THROUGH PRACTICAL MEASURES AND POLICIES TO REDUCE FOOD WASTE, PERSPECTIVE FROM SWEDEN

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Mitigating climate change through practical measures and policies to reduce food waste
Perspective from Germany

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Umweltbundesamt - German Environment Agency
III 2.4 Waste Technology, Waste Technology Transfer
The waste hierarchy – basic principle for waste management
Treatment of household waste, 1975-2016

- Landfilling
- Energy recovery
- Biological treatment
- Material recycling

2017:
- Material recycling: 33.8%
- Bio Treatment: 15.5%
- Incineration: 50.2%
- Landfilling: 0.5%
Used instruments

- Local waste management planning since 1979
- Tax on landfilling since 1999
- Ban on landfilling combustible waste (2002) and organic waste (2005)
- Extended producer responsibility since 1994
- No tax on biogas (when used as vehicle fuel)
- Government investment grants 1998-2005
- Material recycling
- Biological treatment
- Energy recovery
- Landfilling
GERMANY: Separate Waste Collection

Household Waste Generation in total 455 kg per Inhabitant

<table>
<thead>
<tr>
<th>Year</th>
<th>Residues</th>
<th>Biowaste</th>
<th>Glass</th>
<th>Paper</th>
<th>Packaging Materials</th>
<th>Recyclable Waste</th>
<th>Other Waste</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>34 million tonnes</td>
<td>5 million tonnes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2004</td>
<td>18 million tonnes</td>
<td>25 million tonnes</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2010</td>
<td>15.9 million tonnes</td>
<td>27.6 million tonnes</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Source: Federal Statistical Office (Statistisches Bundesamt) 2012, own calculations

Source: https://www.destatis.de/DE/ZahlenFakten/GesamtwirtschaftUmwelt/Umwelt/UmweltstatistischeErhebungen/Abfallwirtschaft/Abfallwirtschaft.html
GERMANY: Waste Management + Instruments / 1990 - 2016

- **1990**: Initial waste management strategies.
- **1991**: Extended Producer Responsibility.
- **2005**: Landfill ban for untreated household & similar waste.
- **2015**: Separate collection of biowaste mandatory.

**Recycling (separately collected waste)**

**Biological Treatment (separately collected biowaste)**

**Mechanical-Biological Treatment**

**Incineration**

**Landfill**


Source: adapted from [https://www.destatis.de/DE/ZahlenFakten/GesamtwirtschaftUmwelt/Umwelt/UmweltstatistischeErhebungen/Abfallwirtschaft/Abfallwirtschaft.html;jsessionid=7932509700875DE6FD392EB684247BEA.InternetLive1](https://www.destatis.de/DE/ZahlenFakten/GesamtwirtschaftUmwelt/Umwelt/UmweltstatistischeErhebungen/Abfallwirtschaft/Abfallwirtschaft.html;jsessionid=7932509700875DE6FD392EB684247BEA.InternetLive1)
GERMANY: CH4 Emission Reduction, Landfills

Strict legal limitation for landfilling of waste:
Total Organic Carbon TOC: < 1 % landfill class I; < 3 % landfill class II (both classes: non-hazardous waste)

Special criteria for landfilling of waste from bio-mechanical treatment facilities:
TOC: < 18 %, Respiration Activity AT4 < 5 mg/m³, Gas Formation Rate GB21 < 20 ml/g

Source: Wolfgang Butz/ Umweltbundesamt
The Flow of Collecting in Sweden

Producers and importers → The store → Consumer

Household waste → Recycling center municipality → Recycling center municipality

Municipality's responsibility

Collection system → Collection site

Legal Producer responsibility

Recycling center municipality → Treatment plant

Municipality's responsibility

Treatment plant

THE FLOW OF COLLECTING IN SWEDEN
Collection schemes for food waste in Sweden

- Source separation in paper bags and separate bins is the most common collection scheme
- Source separation in biodegradable bags and separate bins
- Source separation in green plastic bags and optic sorting
- Home composting
- Collection of windfall-fruit in big 1 m³ bags
How biogas and bio-fertilizer are used as resources in Sweden

80% of the biogas produced from food waste is upgraded to vehicle fuel

21% of fuel that municipal garbage trucks run on is biogas

1.7 million ton bio-fertilizer is used in agricultural farm land.

2000 city buses run on biogas
Biological treatment plants 2017

Total production of biogas in Sweden 2017, 2.1 TWh

- 51 landfill and 1 gasification plant
- 138 Waste water treatment plants
- 36 anaerobic digestion plants
- 43 smaller anaerobic digestion plants at farms
- 6 anaerobic digestion plants at industries

65 upgrading facilities (biogas),
65% of the total amount of biogas was upgraded

37 larger composting facilities

Important instruments

✓ National target on biological treatment of food waste
✓ Government investment support
✓ Ban on landfilling of organic waste
GERMANY: Waste Management

Separately Collected Waste
- Backyard Composting
- Sorting...
- Biological Treatment

Household + similar Waste
- Preparation for Re-use + Re-use
- Mechanical - Biological Processing

Residual Waste
- Mechanical - Biological Processing
- Co-Incineration

Bulky Waste
- Incineration

Recycling + Recovery
- Energy Recovery + Recycling (metals, construction backfilling material, landfill cover...)

Disposal / Landfill

Photo References:
- Biologische Behandlung_Tim Herrmann
- Verbrennungsanlage_Bernd Engelmann
- All other photos: Anja Schweitje

German Environment Agency / ISWA World Congress 2019, Bilbao
Germany: Backyard Composting

Separate Collection & Treatment of Biowaste

Bio-waste: bio-bins, garden & park waste, food and catering waste

Solid state, structured plant materials, slightly moist

Easily degradable, poorly structured, solid or liquid state, e.g. catering waste

Dry, woody plant materials, e.g. hedge cutting wastes

Composting

Compost

> 60% Agriculture + Forestry
17% Landscaping
20% Private use

Anaerobic Digestion

Biogas (energy)

Digestate (fertilizer)

97% Agriculture + Forestry
3% Landscaping

Combustion

Energy

Ash (fertilizer)

© Ellen Schnee
National target regarding food waste in Sweden

Target: By 2018, at least 50 percent of food waste from households, institutional kitchens, shops and restaurants must be sorted and processed biologically so that plant nutrients are utilized, with at least 40 percent being processed so that energy is also utilized.

<table>
<thead>
<tr>
<th>Year</th>
<th>Target</th>
<th>By composting</th>
<th>By anaerobic digestion</th>
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<tbody>
<tr>
<td>Target 2018</td>
<td>50 %</td>
<td>10 %</td>
<td>40 %</td>
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</table>

In 2014, 47 % of food waste was biologically treated...However!

Not all plant nutrients in treated food waste were recycled

<table>
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<tr>
<th>Year</th>
<th>Result</th>
<th>By composting</th>
<th>By anaerobic digestion</th>
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</thead>
<tbody>
<tr>
<td>2014</td>
<td>38 %</td>
<td>11 %</td>
<td>27 %</td>
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Governmental assignments to reduce food waste in Sweden

- Swedish Board of Agriculture, Swedish Environmental Protection Agency and the Swedish Food Agency

- Action Plan will contribute to the global sustainability goal "to halve by 2030 the global food waste per person in the store and consumer to
Challenges for the future

Food waste in Sweden 2016

Total: 1 255 000 tonnes
Total per person: 129 kilogram

- Agriculture and fishery: 98 000 tonnes (10 kilogram per person)
- Food industry: 45 000 tonnes (5 kilogram per person)
- Food stores: 30 000 tonnes (3 kilogram per person)
- Large-scale catering establishments: 73 000 tonnes (7 kilogram per person)
- Restaurants: 71 000 tonnes (7 kilogram per person)
- Households*: 938 000 tonnes (97 kilogram per person)

*Including food and beverages discarded in the drain
GERMANY: Food Waste, Responsibility, Strategy + Policy

**German Government**

German Sustainability Strategy

**Federal Ministry of Food and Agriculture (BMEL):**

- *National Strategy for Food Waste Reduction* adopted in February 2019
  - aiming to implement SDG 12.3, so to substantial reduce of food waste along the food supply chain
  - sets the framework for a process to jointly define measures to
    (1) avoid food waste
    (2) achieve a change of mindset in society for greater appreciation of foodstuffs and of the resources used for their production
- Initiative [www.zugutfuerdietonne.de](http://www.zugutfuerdietonne.de) (only in German)

**Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)**

- Waste related legislation (*Circular Economy Act* and others...) and strategies, including Waste Prevention Programme
GERMANY: Development of Baseline

2015
Annually about
12 mil tons
Food Waste

52% Households

14 % Consumption away-from-home (catering..)
   (1.69 mil tons)
4 % Retail
   (0.49 mil tons)
18 % Food processing
   (2.17 mil tons)
12 % Primary production (after harvest/slaughter)
   (1.36 mil tons)

Source: https://www.thuenen.de/media/institute/lr/Startseite_Aktuelles/baseline_summary_190916.pdf
Food waste in Germany–Baseline 2015 –SummaryThünen Report 71
GERMANY: Development of Baseline

Figure S.2: Food waste (2015) and avoidable shares in Germany (1,000 t / a)

The mean value of each area of the food value chain is plotted, indicating the range (minimum and maximum).

Source: https://www.thuenen.de/media/institute/lr/Startseite_Aktuelles/baseline_summary_190916.pdf
Food waste in Germany–Baseline 2015 –SummaryThünen Report 71
GERMANY: Primary production

Post-harvest/slaughter
Data insecurity relatively high
No standardized methods available

Causes of wastage:
- Losses during transportation and storage
- Overproduction, i.e. no sale on the market
- Product and quality standards if no other use is possible

Source: National Strategy for Food Reduction, Federal Ministry of Food and Agriculture (BMEL)
GERMANY: Processing Sector

Causes of wastage:
- Damage during production, packaging, interim storage or transport
- Contamination;
- Technical problems, e.g. malfunction of control devices, defects/errors in packaging, labelling, manufacturing or quality management;
- Necessary samples and retained samples to furnish proof of the quality of delivered raw materials and processed products;
- Overproduction, planned sales not achieved;
- Returned goods from trade that can no longer be sold as food;
- Short duration of the best-before date;
- Hygiene practice.

Source: National Strategy for Food Reduction, Federal Ministry of Food and Agriculture (BMEL)
GERMANY: wholesale + retail Trade

Causes of wastage:

- Inappropriate stock management (e.g. too large order volumes resulting in the products passing their best-before or use-by dates);
- Products no longer marketable due to damage or lack of freshness (sub-optimal storage (temperatures), disruption in the cold chain, or light)
- Damage to packaging, e.g. „air ingress“;
- Inappropriate portioning of packages;
- Uncertainties about liability, if food is passed on or donated ;
- Legal aspects / deviation from commercial grades; product requirements; official order to destroy products due to labelling errors;
- Product recall due to violation of food law requirements.

Source: National Strategy for Food Reduction, Federal Ministry of Food and Agriculture (BMEL)
GERMANY: Consumption away-from-home

No statistical data available
Use of indicators and size of units, persons catered etc.

Causes of wastage:
- Inappropriate purchases and meal planning, e.g. incorrect orders or too much food served;
- Lack of monitoring of surpluses;
- Legal aspects (e.g. hygiene guidelines);
- Consumer behavior (food tastes bad, portions are too large, no possibility of taking leftovers home);
- Requirements changing at short notice (number of persons);
- Rules governing the donation/passing-on of food

Source: National Strategy for Food Reduction, Federal Ministry of Food and Agriculture (BMEL)
GERMANY: Households

Annually:

• 1 out of 8 food items bought ends up as waste;
• equivalent to about €230

Causes of wastage:

➢ Shopping: Durability of (fresh) food is not well-considered;
➢ Shopping: Purchase of too large quantities or inadequate products (e.g. does not taste nice);
➢ Shopping: Overly large pack sizes (on the supply side);
➢ Incorrect storage;
➢ Lack of domestic skills in the handling of food;
➢ Cooking: Inappropriate planning, for instance too much is cooked, and/or errors in preparation.

Sources: National Strategy for Food Reduction, Federal Ministry of Food and Agriculture (BMEL), German Environment Agency
GERMANY: research, households

Research Project „REFOWAS - Pathways to Reduce Food Waste” targets food waste in private households and analyses findings of a representative survey conducted by GfK SE in 2016/2017

- Covers about 7,000 households on food waste generated;
- Method:
  The heads of households enter their handling of food waste in diaries over a fortnightly period, with around 500 households being assigned a specific 2-weeks section between July 2016 and June 2017.

GERMANY: research, data base development

Results for avoidable food waste:

- Almost 54% of discarded food is discarded loose or open,
- about 21% is prepared or cooked,
- 13% is in opened packaging,
- 6% is discarded in unopened packaging.

About 1/3 ➔ bio-waste/organic waste bins (mostly fruits, vegetables),
About 1/3 ➔ residual waste bin (all product groups),
14% ➔ sewer (mostly liquid foods, dairy products),
9% ➔ home composting (mostly fruits, vegetables)
6% ➔ animal feed (mostly bread, backed goods, prepared foods)
Around 3% ➔ other disposal routes.

GERMANY: Action, Tafeln

TAFELN

• SAVING ANNUALLY ABOUT 260,000 TONS OF FOOD FROM ABOUT 30,000 SUPERMARKETS IN GERMANY

• MORE THAN 1.5 MILLION PEOPLE IN NEED RECEIVE HIGH QUALITY GROCERIES

• GOOD FOOD THAT WOULD GO THE WASTE IS COLLECTED AND DISTRIBUTED FOR FREE OR A SYMBOLIC AMOUNT TO SOCIALLY AND ECONOMICALLY DISADVANTAGED

• First Tafel in Berlin in 1993, currently more than 930 Tafel
• Large volunteer based non-profit organizations
• Only food, which is donated, is distributed
• Rent, transport and administrative costs are covered by private donations and the business community

The Tafel are bridging the gap between excess on the one hand and lack on the other
GERMANY: Action, Developing tools and guidance

GUIDANCE

„PREVENTION OF FOOD WASTE IN THE CATERING SECTOR“
https://www.umweltbundesamt.de/publikationen/development-of-tools-to-prevent-food-waste

INITIATIVE „UNITED AGAINST WASTE“ is an association aiming to raise awareness and to develop practical solutions to reduce food waste in the sector that caters for away-from-home consumption like restaurants...

Food waste analysis tool available online:
https://www.united-against-waste.de/14-abfall-analyse-tool-teaser
REDUCING FOOD WASTE?

IT IS ABOUT US!

IT IS OUR BEHAVIOUR THAT MAKES THE DIFFERENCE!
Thank you for your attention!

Åsa Bergérus Rensvik

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*Pictures used in this presentation come from: The Swedish EPA, Avfall Sverige, Batteriåtervinningen, Envac, El-Kretsen.*
Thank you for your attention!

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