Circular Economy trends, developments and innovations in Norway and the Nordics

Conference: ”There is no waste – there are only raw materials”

Organized by: The Polish Agency for Enterprise Development and Innovation Norway, at POLEKO 2022 International Fair in Poznan, October 20th 2022

A leading Scandinavian KNOW-HOW & TECHNOLOGY platform, proven by international recognised END USERS, set in NORWEGIAN and EUROPEAN LEGISLATIVE FRAMEWORK

About Green Business Norway

•A private and independent member based organisation for the Norwegian Cleantech Industry, comprising members offering competence, technology and solutions for the environmental- and renewable energy sector

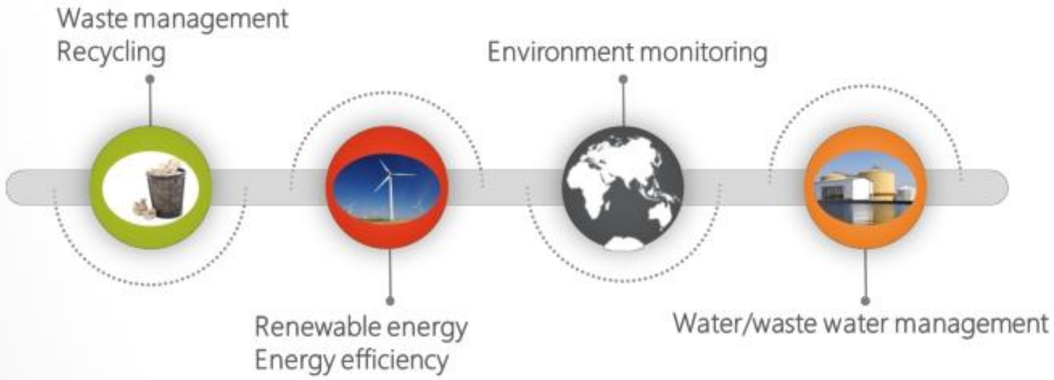
• Several member businesses are receiving global recognition for their technologies and solutions

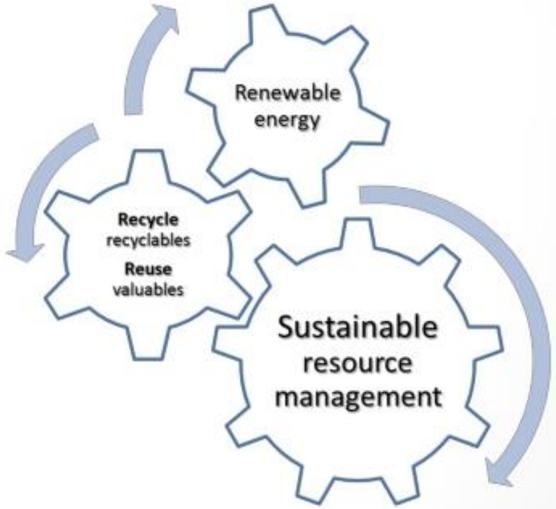
• Operates Business Intelligence Programmes and platforms in key international markets

• Manages Green Business Accelerator, a vehicle for start-ups, entrepreneurs, technology development and market expansion.

•Provides Circular Economy Expertise and Experiences to partners internationally

Circular Economy – Norwegian Cleantech industry makes a difference





FUTURE - Waste Management and the Circular Economy partnership with GBN

The circular symbiosis

CIRCULAR WASTE MANAGEMENT

BASED ON THE SCANDINAVIAN KNOW-HOW AND TECHNOLOGY

New ideas are needed to create Circular Economy based sustainable activates…

Green Business Accelerator

Norwegian Circular Economy roadmap 2030

Waste minimization

market and consumer behaviour/trends

Increased recycling of materials

traceability, brand recycling, new methods

Extended lifetime of products

design maintenance

Balancing disposer financing against increased market downstream revenue

reduction of public fees, smarter collection, recycling/upcycling of materials

Norwegian system

Financing system and legal framework

fees, regulations, requirements, standards etc

Source separation/separation at source

Deposit system

material recovery of PET and cans

Recycling and waste processing infrastructure

How meet 65 % target?

- Obligatory source separation of food waste (min 70 % return rate)
- Curb side collection for more waste categories
- Central sorting of residual waste – supplement to source separation
- PAYT- solutions, RFID and user control (keys, mobiles)
- Improved system for reuse and sorting recycling centres
- Design for reduction, reuse and recycling
- Develop markets (demand) for recycled resources

Source separation with best results

Different bins:

Food waste – up to 80 % return rate

Paper – up to 90 % return rate

Plastic –

- up to 50 % return rate
- Up to 35 % recycling rate

Glass/metal packaging –

- Glass up to 80 % return rate
- Metall up to 50 % return rate

Central sorting best for plastic and metals

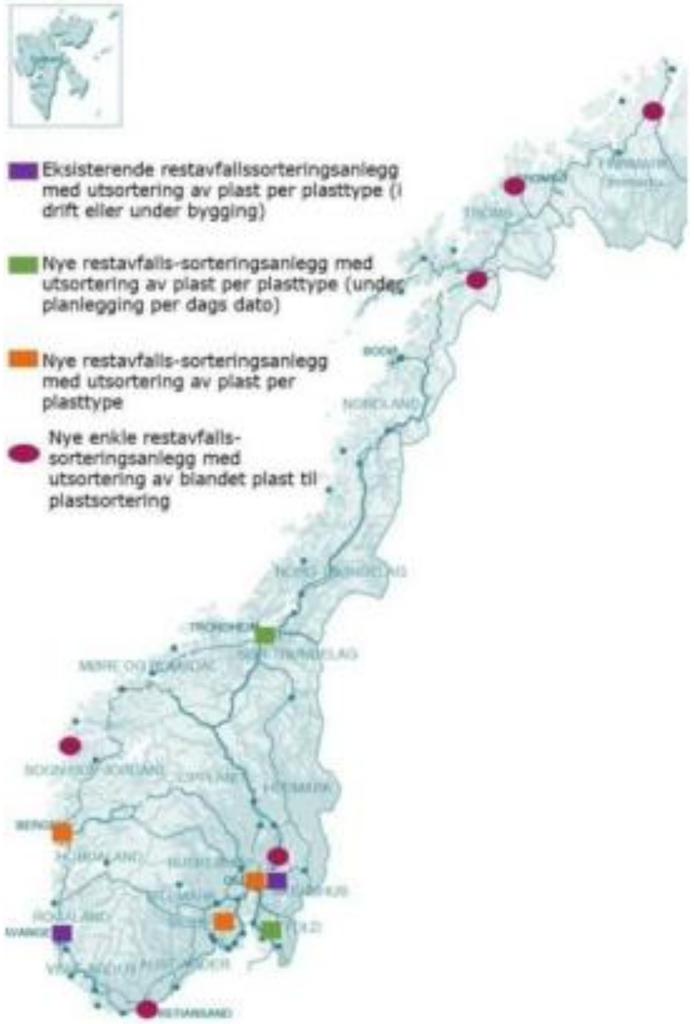
Bins + central sorting

- **Food waste – up to 80 % return**
- **Paper – up to 90 % return**
- **Plastic**
  - 90 % sorted out
  - 60-65 % to recycling
- **Metals**
  - 90 % sorted out and sent to recycling

New national structure central sorting

Plastic household – 70 % have to be sorted out and sent to recycling

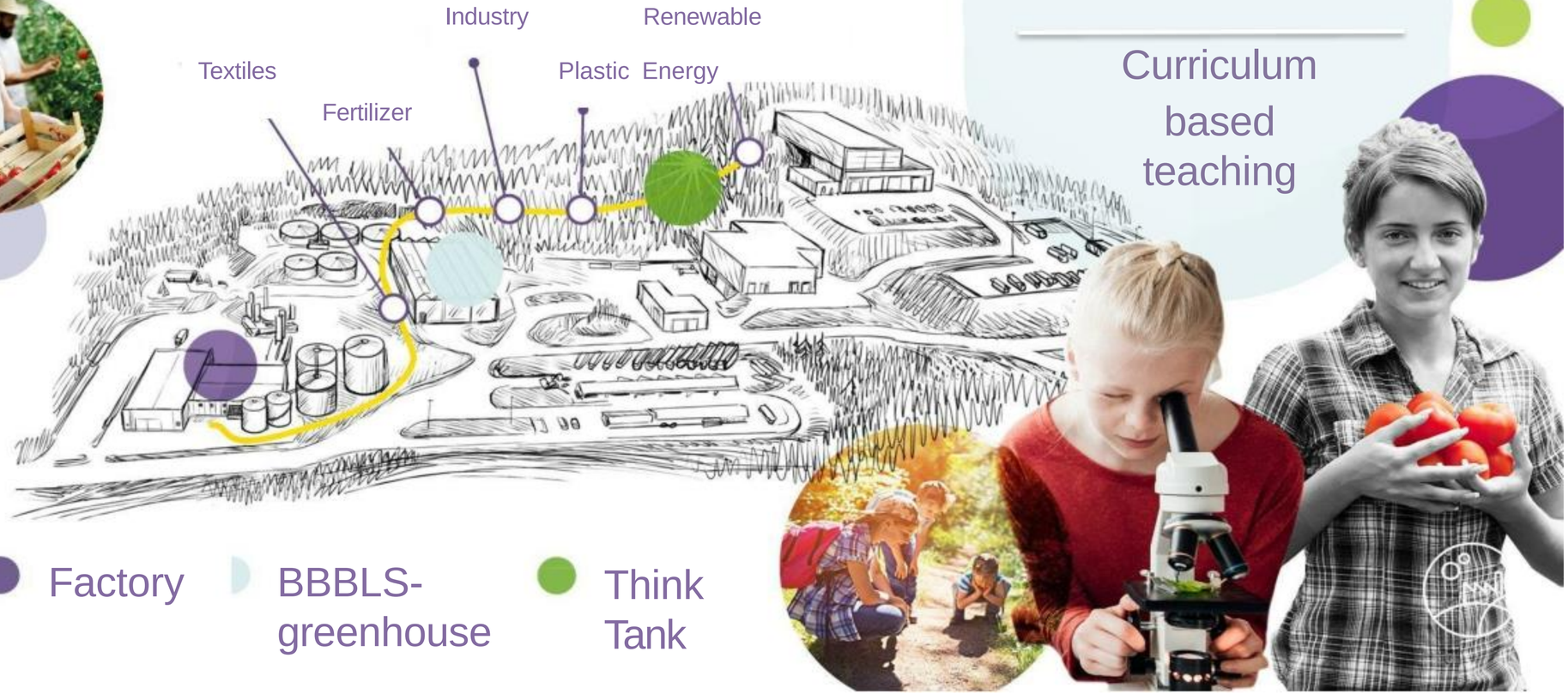
- National plan for central sorting
- Better national infrastructure for recycling
- Intensives to increase demand for recycled material
- Design new products –designed for sorting and recycling and made of recycled material



Flagship projects – REUSE OF BIORESOURCES


Use of circular economy
From food, to waste, to food
Input
› 70 000 ton manure from pigs and cattle
› 60 000 ton food waste from 1.2 million inhabitants
› 15 000 ton food waste from industry
Output
› 150 000 ton biofertilizer for new food production
› 8.2 million Nm³ biomethane
› 250 000 people with a big smile when eating our tomatoes

Knowledge and experience center



10 000 students

Curriculum based teaching

Flagship projects – CENTRAL SORTING

ROAF – inter municipal company

Advanced central automated sorting facility for household waste

Pre-sorting of food waste

Automated sorting of plastic materials Feed in capacity 40 tons pr hr Increased collection and recycling of

plastics pr. person (from 4.5 to 17 kg pr person)

Why building an automated Waste Sorting Plant (WSP)?

A) Because the European Union forces us!

- EU goals:

  In 2025, 55% of all municipal waste has to be material recycled.

  In 2030: 60%.

  In 2035: 65%.

- For packaging, the rate of material recycling must reach 65% in 2025,

  increasing to 70 % until 2030.

  (For plastic packaging: 50% i 2025, 55% i 2030.)

Why building an automated WSP?

B) Because our recycling rate stagnates!

Household waste statistics 2018, IVAR-region

Type of waste:	tons	kg/inhabitant
Bio-waste (kitchen & garden)	27 972	86,9
Garden waste	4 437	13,8
Wood, incl. impregnated	11 567	35,9
Paper/cardboard/carton	14 253	44,3
Metals	4 268	13,3
Glass	3 103	9,6
Plastics	3 142	9,8
Textiles	2 297	7,1
WEEE	3 767	11,7
Hazardous waste	1 413	4,4
Car tires	7	0,0
Plaster plates, gypsum	1 141	3,5
Non-contaminated soil	3 048	9,5
Bricks, tiles , concrete, ceramics	4 097	12,7
Private boats and yachts	11	0,0
Turnover of re-usable things	679	2,1
Asphalt	49	0,2
Residual waste	43 636	135,5

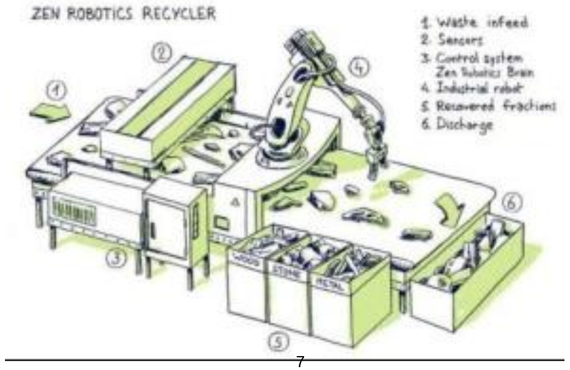
Use of household waste	2014 TOTAL:	2015 128887	2016	2017 Q4	2018
For re-use:	1,8 %	2,0 %	2,1 %	2,4 %	2,3 %
For material recycling:	51,4 %	50,9 %	51,1 %	51,4 %	50,7 %
For incineration/energy recov.:	43,9 %	44,0 %	43,7 %	42,9 %	43,5 %
Directly landfilled:	2,9 %	3,2 %	3,2 %	3,3 %	3,5 %
Share of separated waste:	65,6 %	65,7 %	65,8 %	65,8 %	65,8 %

Why building an automated WSP?

C) Because waste separation at home has reached its limits!

And . . .

D) Because machines are able to separate waste better then you and me!



Calculated output from Forus WSP at input of 50.000 tons residual waste

PP	675		9,2 %
HDPE	478		
PET bottles	197	4 596	
PS	98		
LDPE	3 148		7,6 %
Ferrous metals	1 434		14,2 %
Non-ferrous metals	562	3 795	
Paper, cardbord, carton	1 799		
Mixed plastic - rigid	2 648		69,0 %
		7 089	
Mixed plastic - film	4 441		
Rest > 60 mm	17 535		
		34 520	
Rest < 60 mm	16 984		
Total	*50 000*	*tons*	*100 %*

- 16,8 % of the residual household waste quantity is sorted out for material recycling (plastics, metals, paper).
- Another 14,2% is sorted out («mixed plastics») – from 2022 this is sent to Denmark for sorting (Quantafuel)
- 69% has not been reclaimed (➒o incineration).
- (82% av all plastics in the residual waste have been sorted out. High yield!)

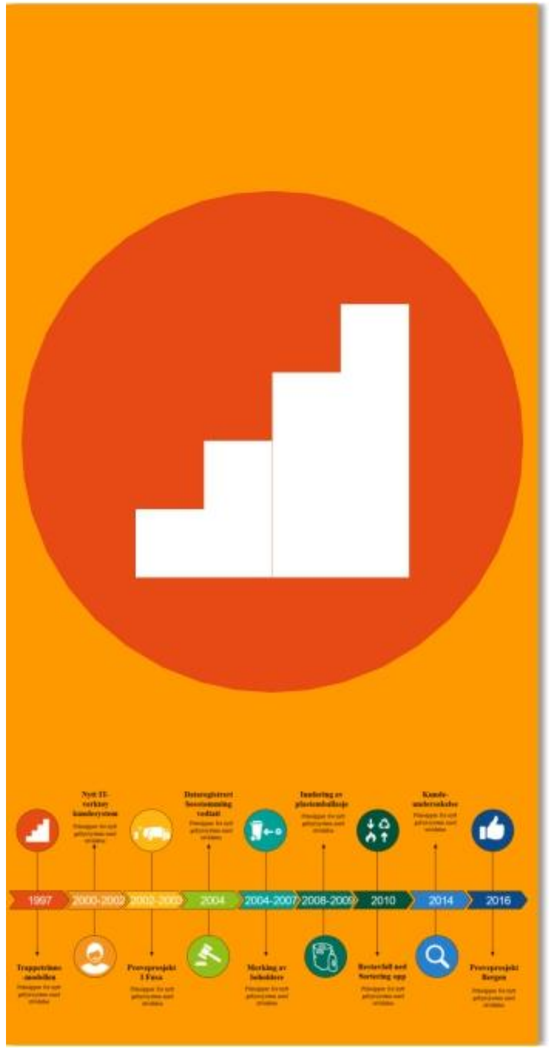
Case example: How clean is the sorted plastics?

PURITIES OF BALED PLASTICS:

• LDPE (film):	96 %
• HDPE:	98 %
• PP:	98 %
• PET:	96 %
• PS:	95 %

NOTE: «Purity» here means the share of objects consisting of the «right» plastic type.

Flagship projects – “Pay As You Throw principle”



Step-by-step model

- **Purpose:** Stimulate increased recycling and reduce residual waste
- **Target:** Unified fees across all 9 municipalities
- **Principle**:
  - Basic fee equal for everyone
  - Residual waste fee estimated from expected amount delivered
- **Criterias for discount**:
  - Sharing a bin
  - Composting / reduced frequency for collection
  - Sharing a bin / reduced frequency for collection
    - Composting
  - Sharing/composting / reduced frequency for collection

Decision to collect data from waste collection

- February 2004 the BIR board decides to collect data from bins
- 140 liter bin becomes the standard
- Plans to label all bins with tags

Project: Labeling all bins

- Between 2004-2007 bins (140L – 660L) in all municipalities are labeled with tags.
- Labeling in Bergen municipality was completed in 2009

New service: Collection of plastic packaging

- In 2008 all municipalities started recycling plastic packaging
- From 2008 a fullscale pilot of the PAYT fee model was started in one municipality
  - The customers have one included bin collection for residual waste per month
  - The customers can empty their bin every week, but pays for each time it is emptied
  - Recyclable fractions are free: paper, plastics etc.
- From 2009 the PAYT was introduced in 8 out of 9 municipalities

Residual waste is reduced – recyclable fractions increase

- The residual waste amount was reduced with 21% in the pilot municipality
- In 2008 the amount residual waste was almost 15 000 tons, in 2010 the amount is reduced 12 300 tons.
- Plastics 2008 – 2010 increase with 330%
- Glas and metal 2008 – 2010 increase with 10%

Customer surveys

- Customer survey from the first pilot
  - Customers have changes their behaviour and are more aware of their waste amounts
  - The incentive to save money has a siginificant impact
  - The customers think it is a fair fee system

Trial period in Bergen

- Bergen municipality decides
  to try a 2-year trial project for the PAYT fee syste,
- Average times a customer empties a bin is reduced
  from 40 to 28 per year over night.
- Residual waste amount is reduced with 8 &
- The paper amount is unchanged
- Amounts of plastics and glas and metall
  packaging is increased.

Modern infrastructure makes the PAYT model possible to apply for more customers

- Data collection when customer opens container
- Allows for customers with different infrastructure to pay by comparable fee systems

Flagship projects – “Incentivised collection and sorting of recyclables”

Smart collection

- Intuitive design
- Self-Sorting based on AI technology
- Low power consumption
- Social incentives driven, disposal of recyclables becomes fun

Cycled SmartBins

SmartBins are physical smart collection points. Each SmartBin have self sorting capabilities, Image recognition technology, AI and a variety of sensors and scales. Our SmartBins are fully integrated with our digital platform and incentive mechanisms

Mobile application

- Customized incentives for recyclables
- Logistic tool for waste collectors
- Personalized recycling profile
- Serves as a wallet to hold, spend or gift Cycled points

Download on the App Store

ANDROID APP ON Google play

Digital platform

Digital platform with mobile applications, connecting the entire ecosystem of disposers, Cycled SmartBins, collectors, award providers and end users.

Flagship projects – “Reuse of materials”

Kretsløpsparken

Customer deliver their reusable objects

Repair

Upcycle

Clean

Sale through second-hand consept stores

professional
professional

- **Objects going out with increased value.**

  Repair and upcycle.

- **Get those who don`t buy second hand today, to choose to buy second hand.**

  Professional presentation

- **Suport circular economy**

  Independent actors should be able to make a living out of it .

New ideas are needed to create Circular Economy based sustainable activates…

Green Business Norway

based on Scandinavian **KNOW-HOW & TECHNOLOGY,** proven by **Norwegian END USERS,** set in **NORWEGIAN LEGISLATIVE FRAMEWORK**

CONFERENCES ▪ SEMINARS ▪ PROJECTS

Conference at Polish Parliament (Sejm), 2015 ▪ Study tours for Eastern European governments & Parliaments representatives, 2014, 2015, 2016, 2017 ▪ Optimization of recyclables' collection, Romania, 2015 ▪ Study on utiliization of food waste,Bulgaria,2015 ▪ Best practices in recycling – Institute of Environment, Poland 2017 ▪ Development of Electromobility in Poland –Institute of Environment, Poland 2017 ▪ Circular Economy best practices, Chinese National Government 2017 ▪ EU Climate KIC Accelerator awards 2018/2019/2020/2021

Appendixes

Some facts about MSW Norway 2019

Household waste

- 427 kg/inhabitant 2,3 mill tons

Commercial waste under MSW

- 2,4 mill tons

Separate beverage deposit system

- 8 kg/inhabitant

Average recycling rate all systems:

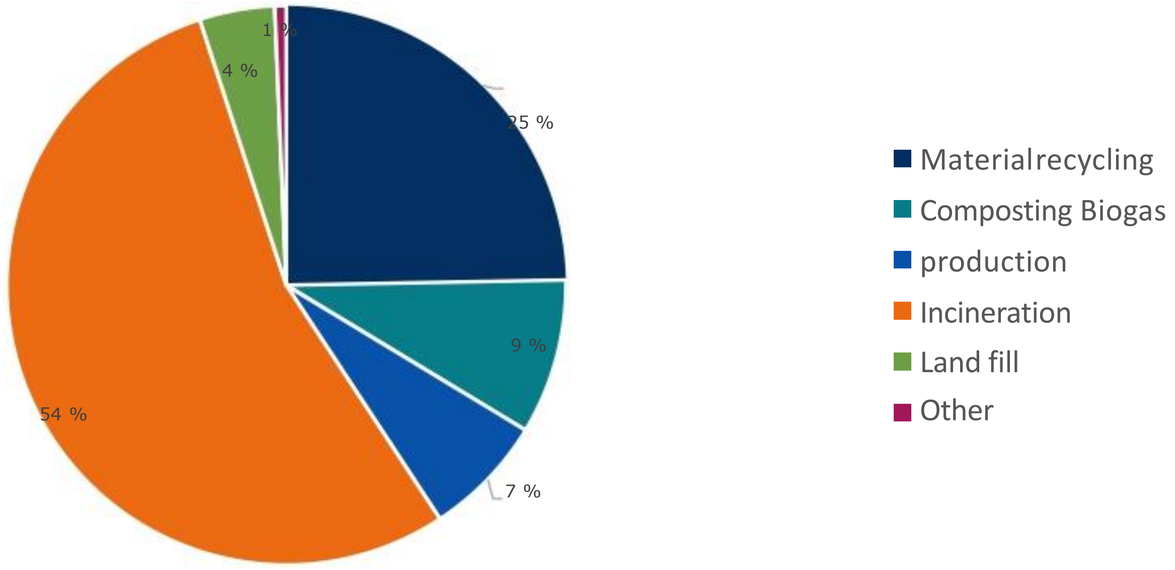
- 38 %

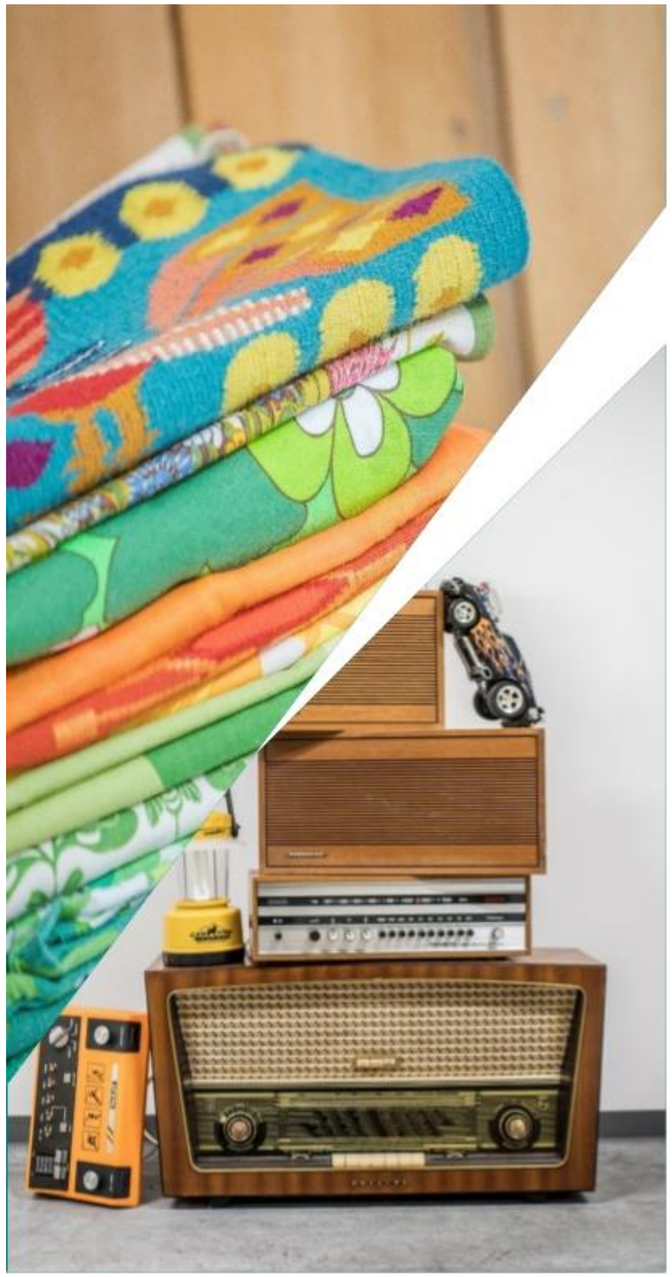
Energy recovery:

- 58 %

- **Landfill**
- 4 %

Household waste – treatment 2019 (SSB)





What concepts?

- What is being delivered at the recycling center?
- What do people want?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Rundstykke kr. 30,-
Matpakke kr. 50,-
Baguett kr. 60/80,-
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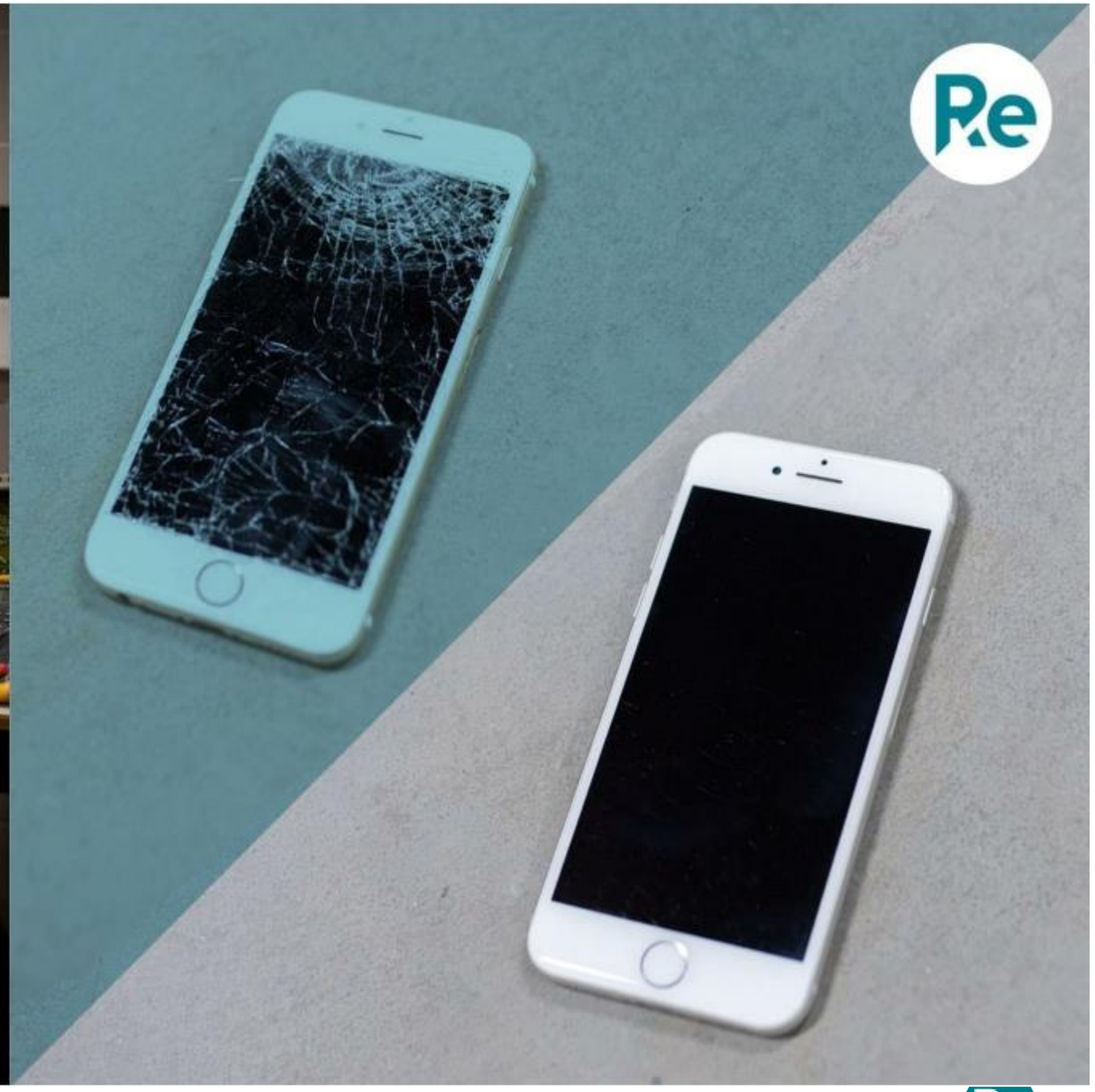


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