Municipal Waste Management

Austria

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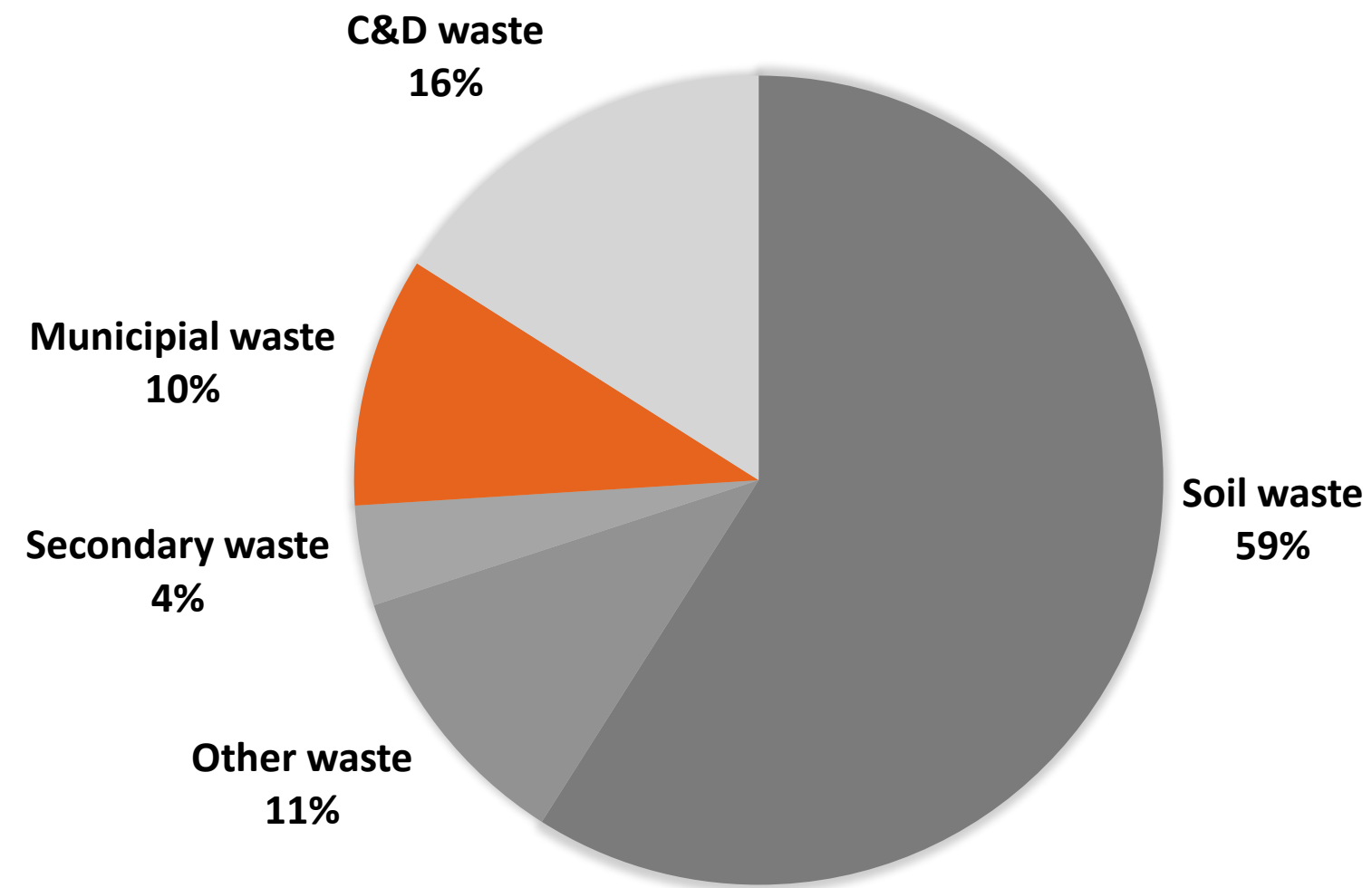**BOKU University**

Content

- Austria

  - Waste generation

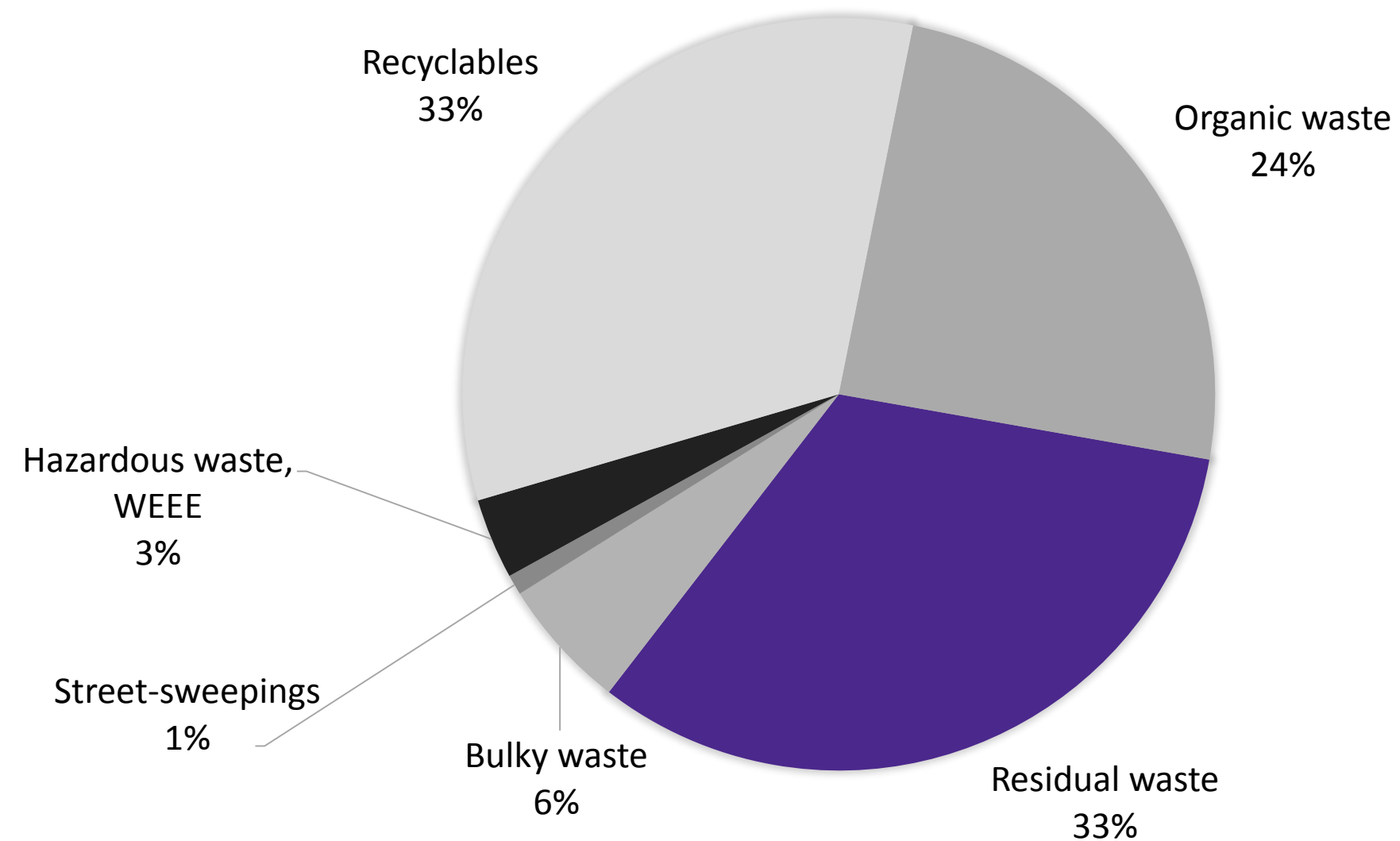 - Waste collection

  - Waste treatment

- EU Goals

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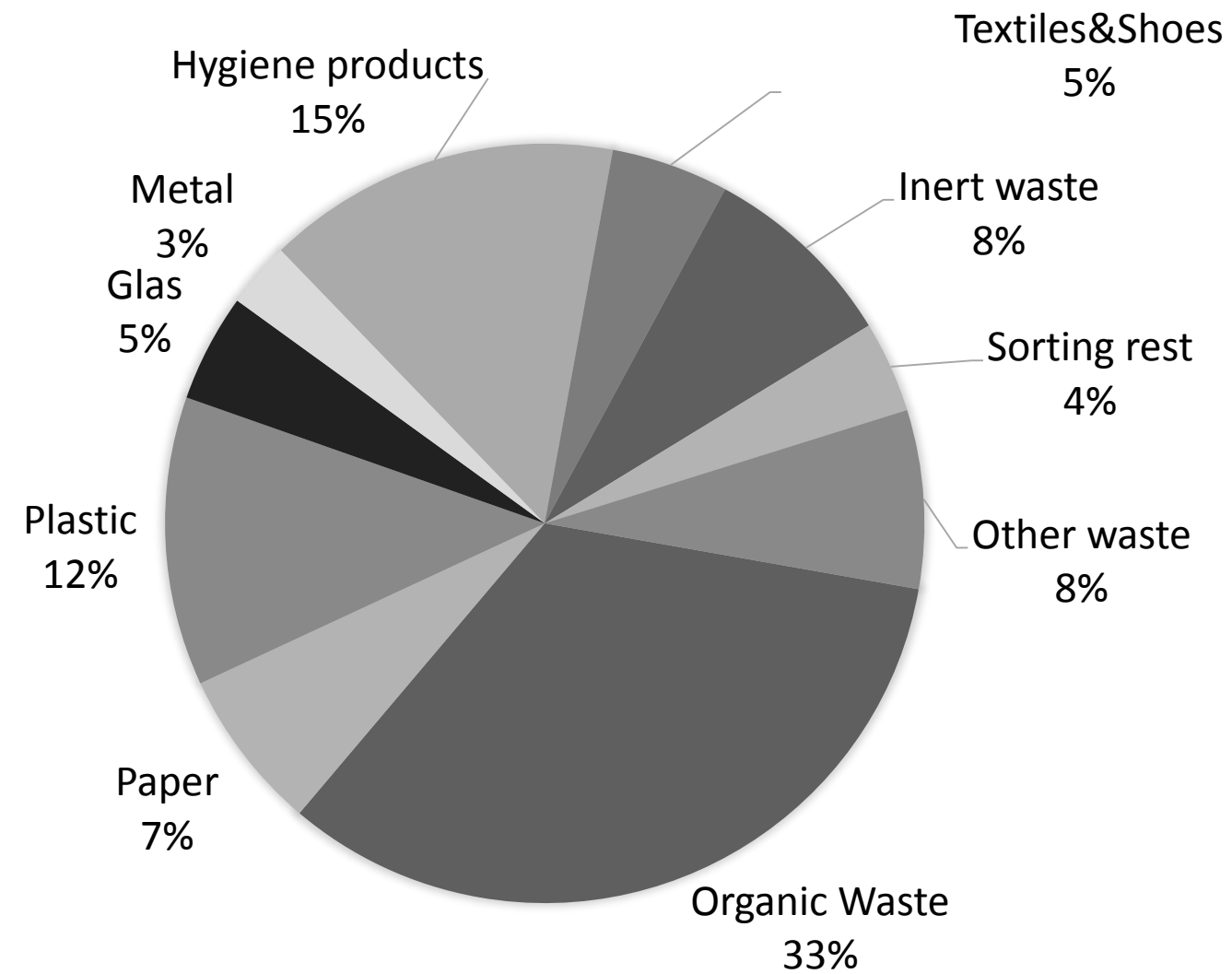# Austria: Waste generation (2022)

TOTAL WASTE: 73. MIO TONS

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Austria: Waste generation (2022)

MUNICIPIAL WASTE: 4,5 MIO TONS

Recyclables 33%
Organic waste 24%
Hazardous waste, WEEE 3%
Street-sweepings 1%
Bulky waste 6%
Residual waste 33%

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Austria: Waste generation (2022)

RESIDUAL WASTE: 1,5 MIO TONS

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Waste collection schemes

Kerbside collection

Recycling (waste) banks

Civic amenity sites

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Waste collection schemes

- **Kerbside collection**

  - Residual

  - Waste Paper
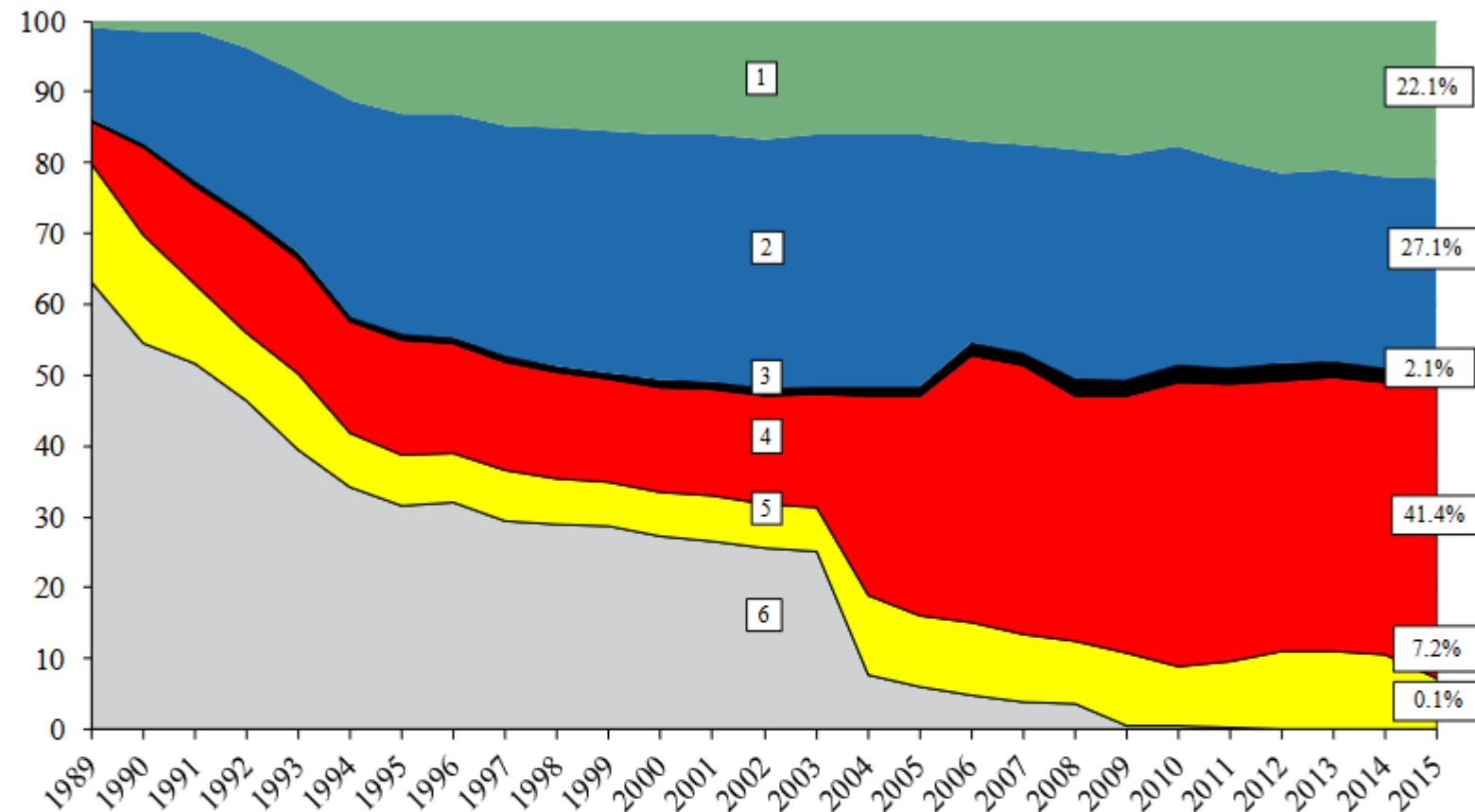
  - Organic Waste

- **Recycling (waste) banks**

  - Packaging waste (Plastic, Metal, Glass, Wood)

  - Textiles

  - Organic Waste

- **Civic amenity sites**

  - Bulky Waste

  - Haz. Houshold waste, WEEE

  - Wood

  - Metals

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Municipial Waste reatment

Caption:

1. Recovery of separately collected biogenic waste and of green waste
2. Recovery of separately collected recoverables
3. Treatment of hazardous household waste and of WEEE collected separately
4. Thermal treatment (waste incineration plant and co-incineration)
5. Biological treatment in (mechanical-biological) treatment plants
6. Landfilling without any pre-treatment
7. Landfilling following pre-treatment
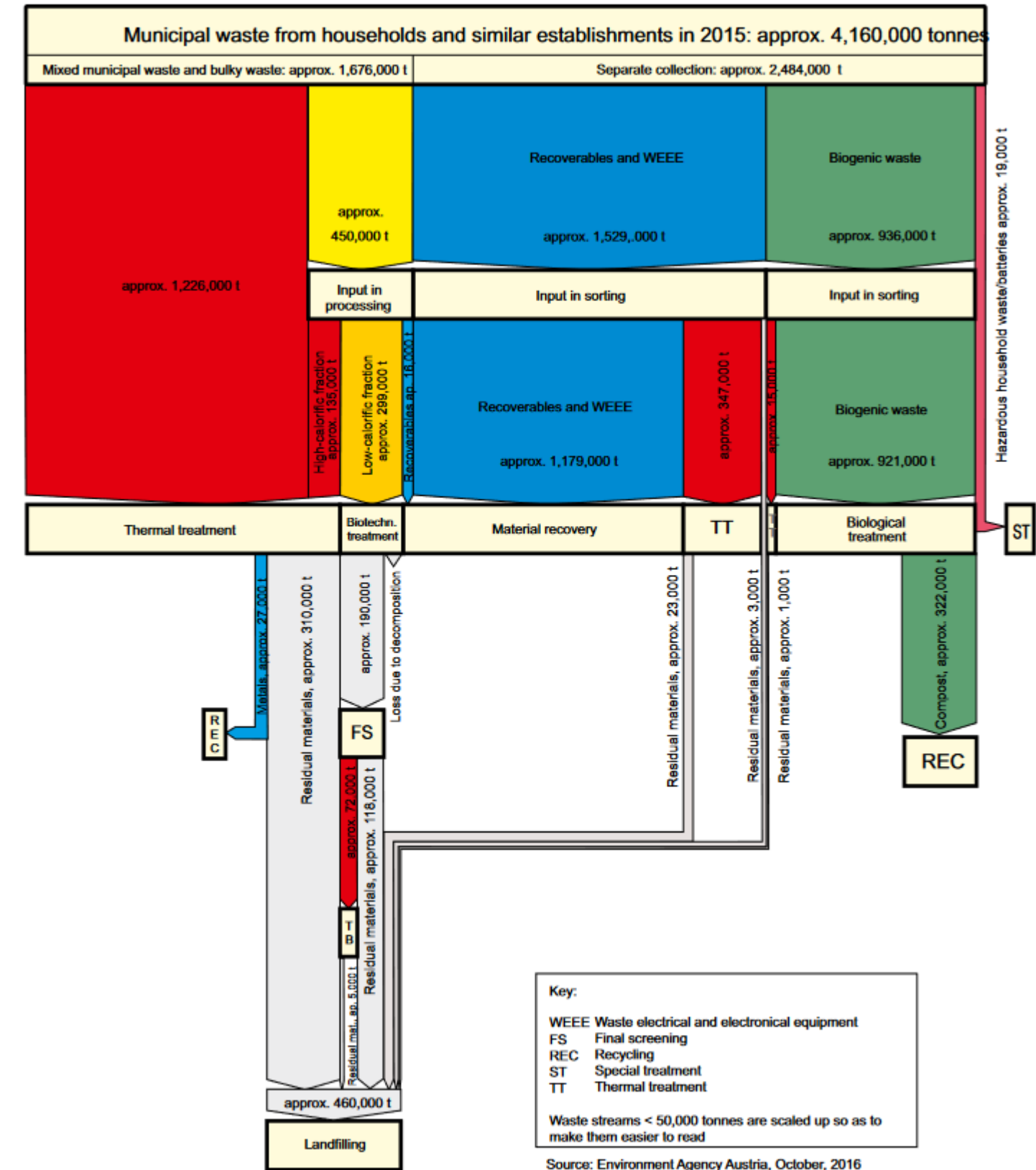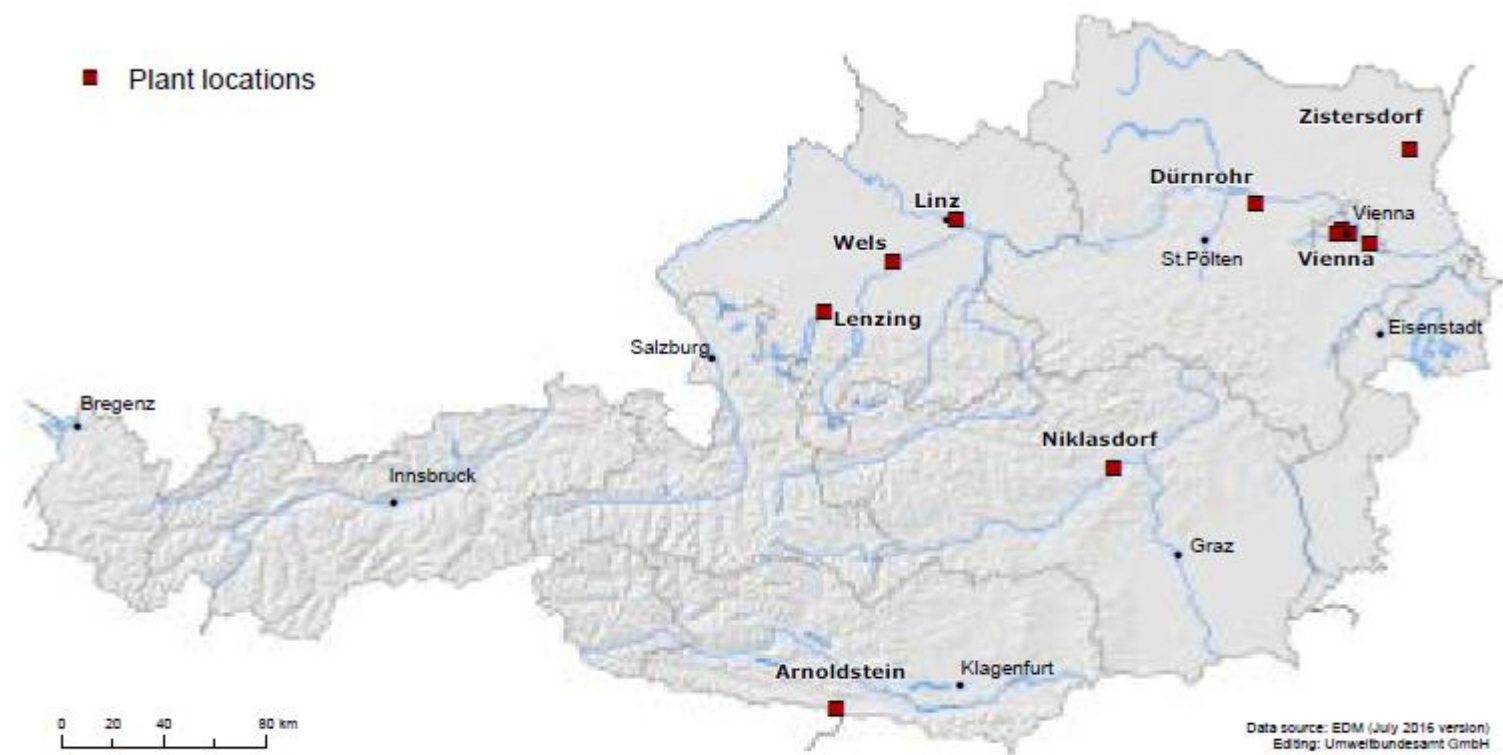
Thermal treatment plants

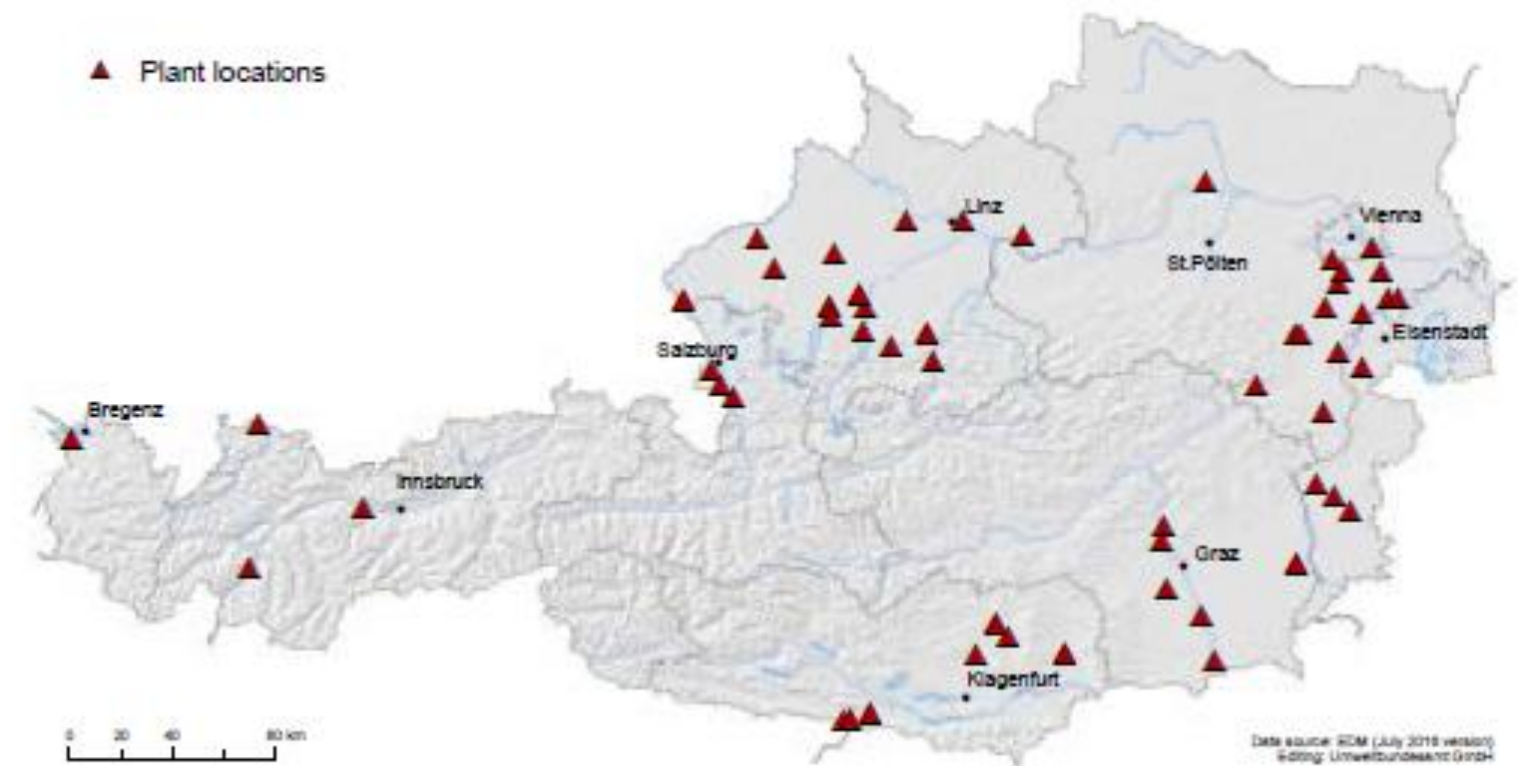Figure 53: Thermal treatment plants for municipal waste in 2015

Figure 55: Thermal treatment plants (excluding thermal treatment plants for municipal waste)
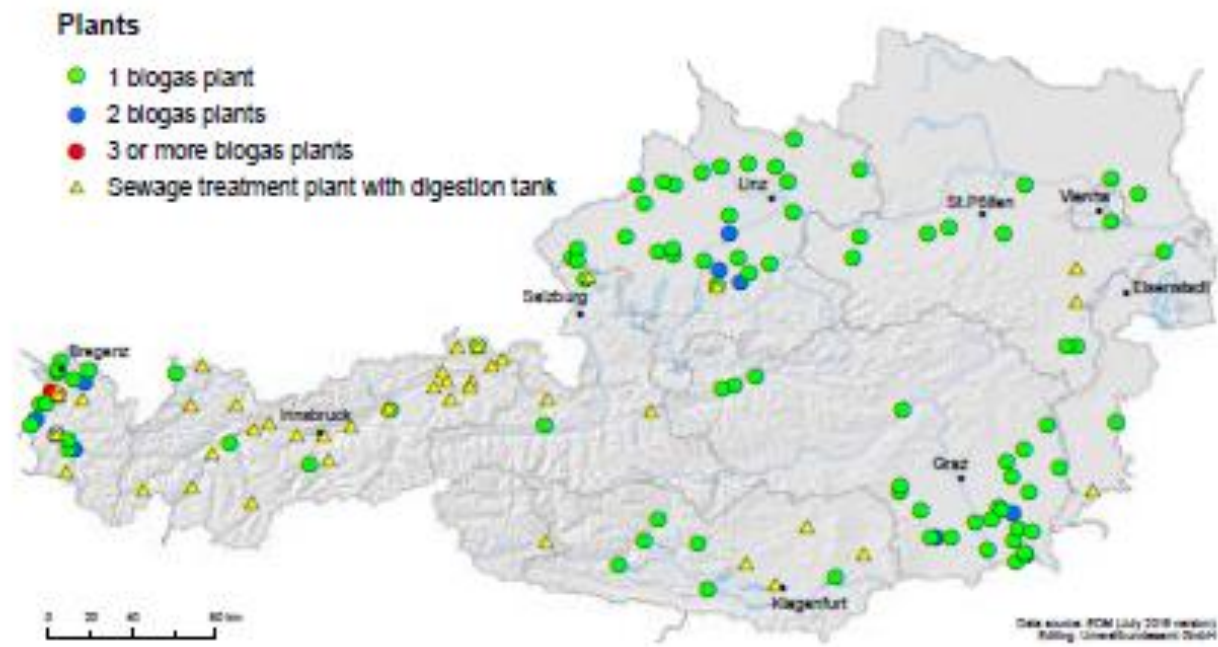
Treatment plants

Figure 60: Biogas plants in 2015

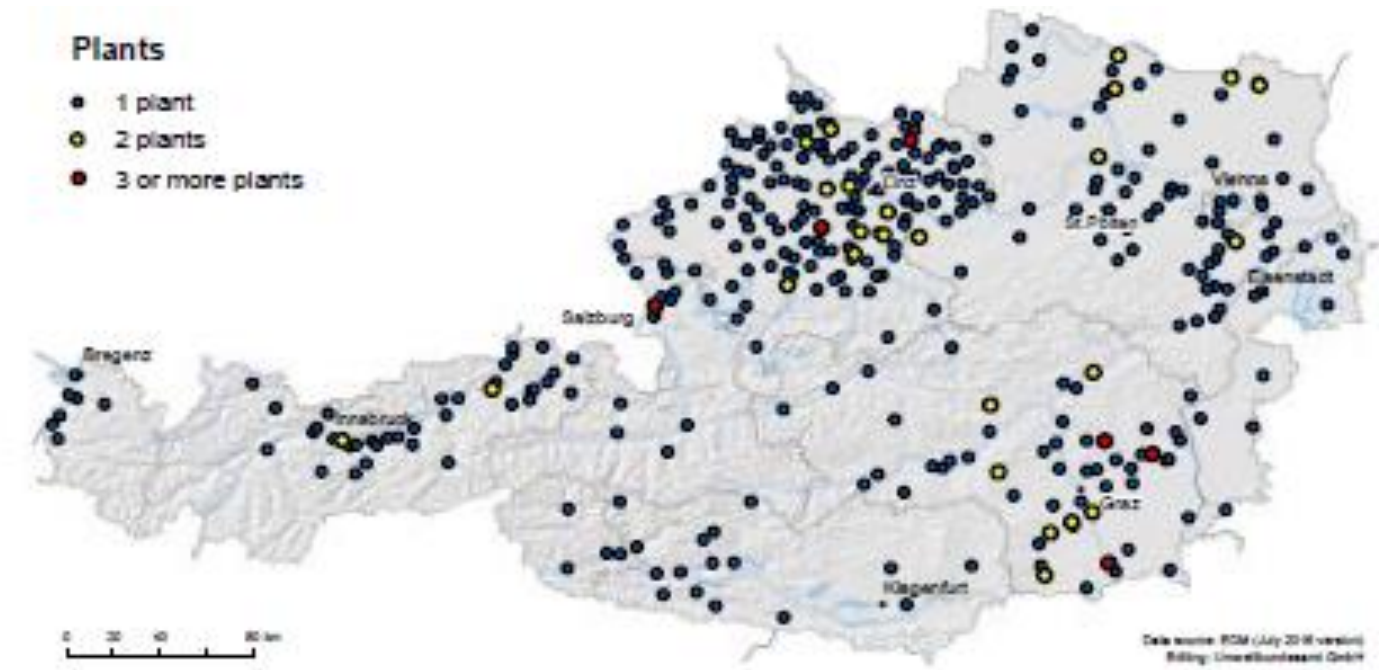Figure 62: Composting plants in 2015

Figure 57: Mechanical-biological treatment plants in 2015
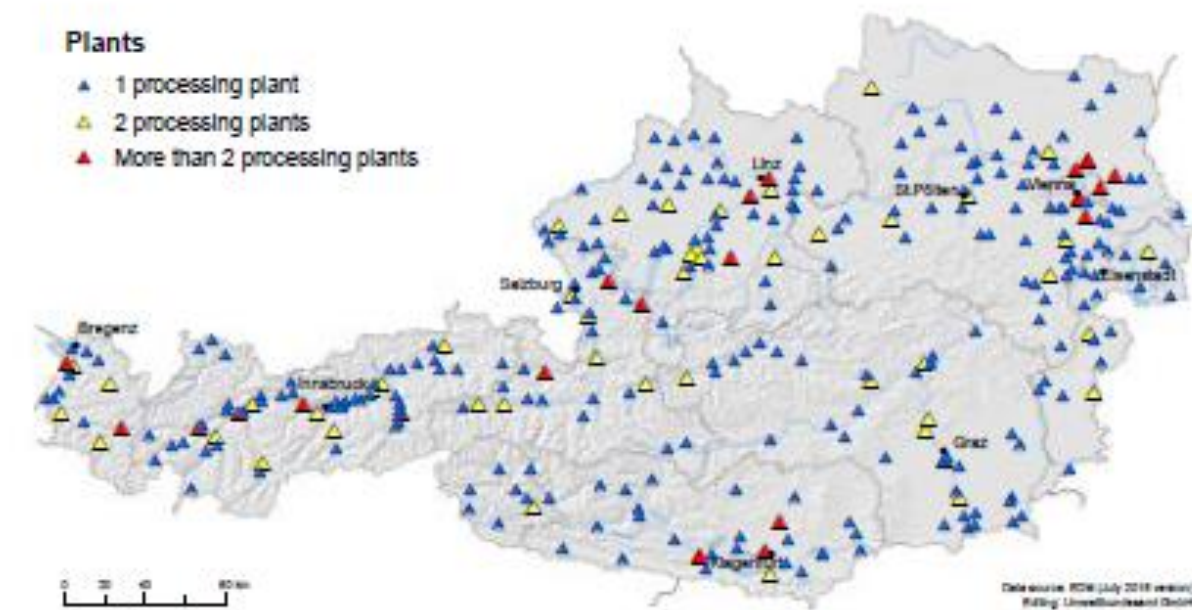
Figure 66: Treatment plants for construction and demolition waste in 2015

EU Waste Hierachy

Source: https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en

EU Waste treatment

Waste treatment by type of recovery and disposal, 2020
(% of total treatment)

EU Municipial Waste Treatment

Municipal waste treatment, EU, 1995-2021
(kg per capita)

Note: estimated by Eurostat.
Source: Eurostat (online data code: env_wasmun)

EU Waste Goals

Key elements of the revised waste proposal include:

- A common EU target for recycling 65% of municipal waste by 2030

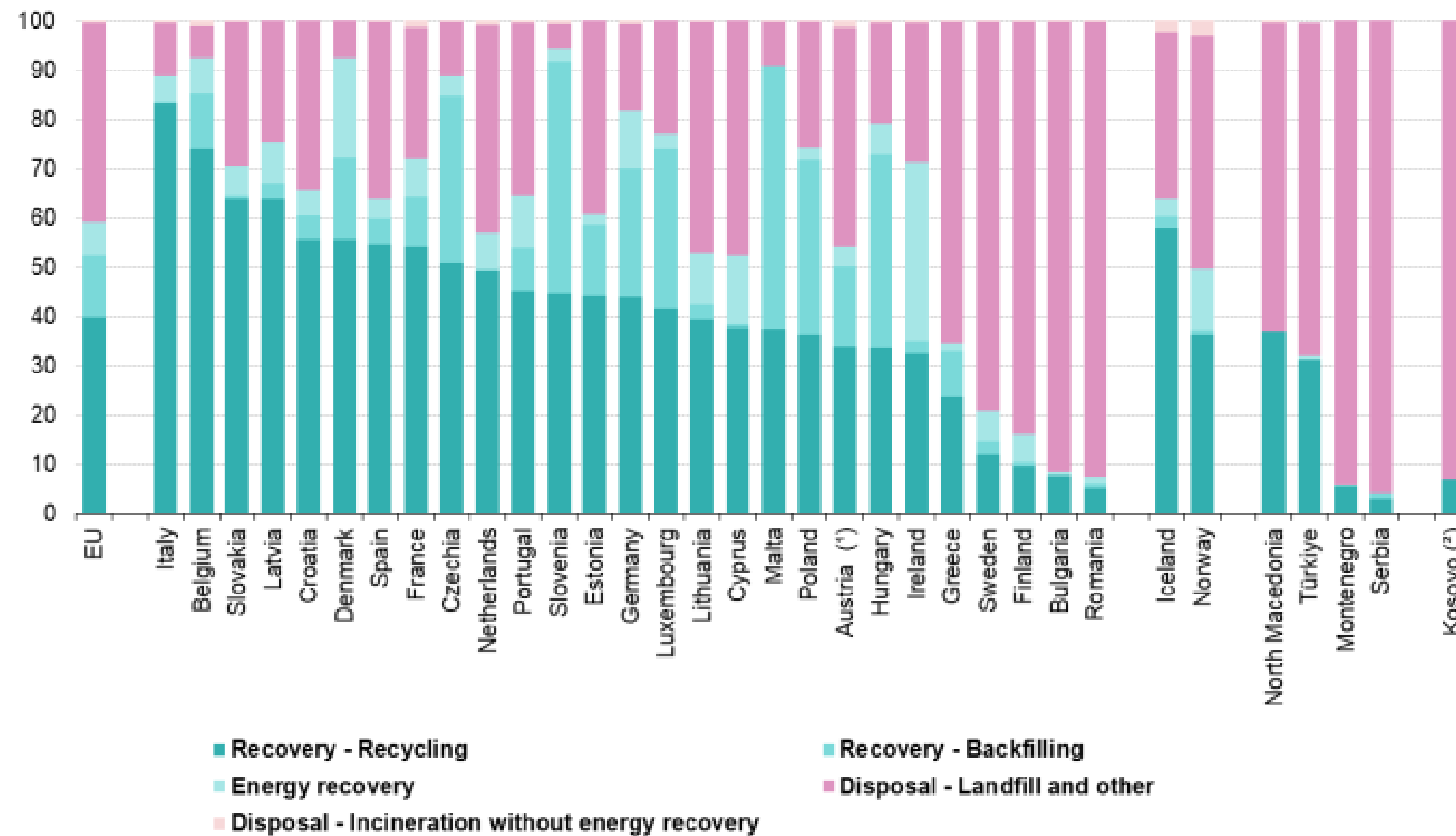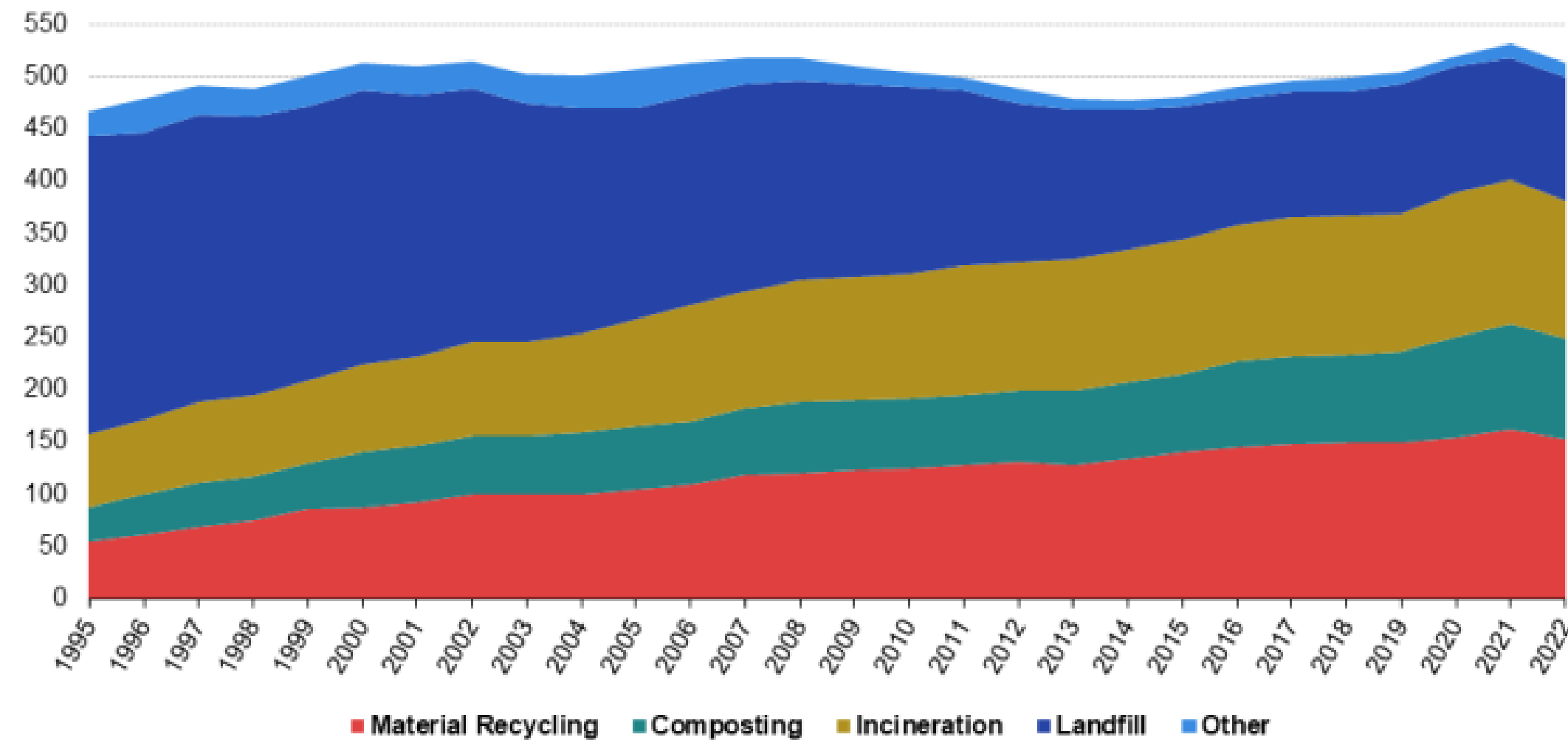- A common EU target for recycling 75% of packaging waste by 2030

- A binding landfill target to reduce landfill to maximum of 10% of municipal waste by 2030

- A ban on landfilling of separately collected waste

- Promotion of economic instruments to discourage landfilling

- Simplified and improved definitions and harmonised calculation methods for recycling rates throughout the EU

- Concrete measures to promote re-use and stimulate industrial symbiosis –turning one industry's by-product into another industry's raw material

- Economic incentives for producers to put greener products on the market and support recovery and recycling schemes (e.g. for packaging, batteries, electric and electronic equipment, vehicles)

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Recycling Quotas

Sorting Analysis

Austria

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What´s behind the numbers?
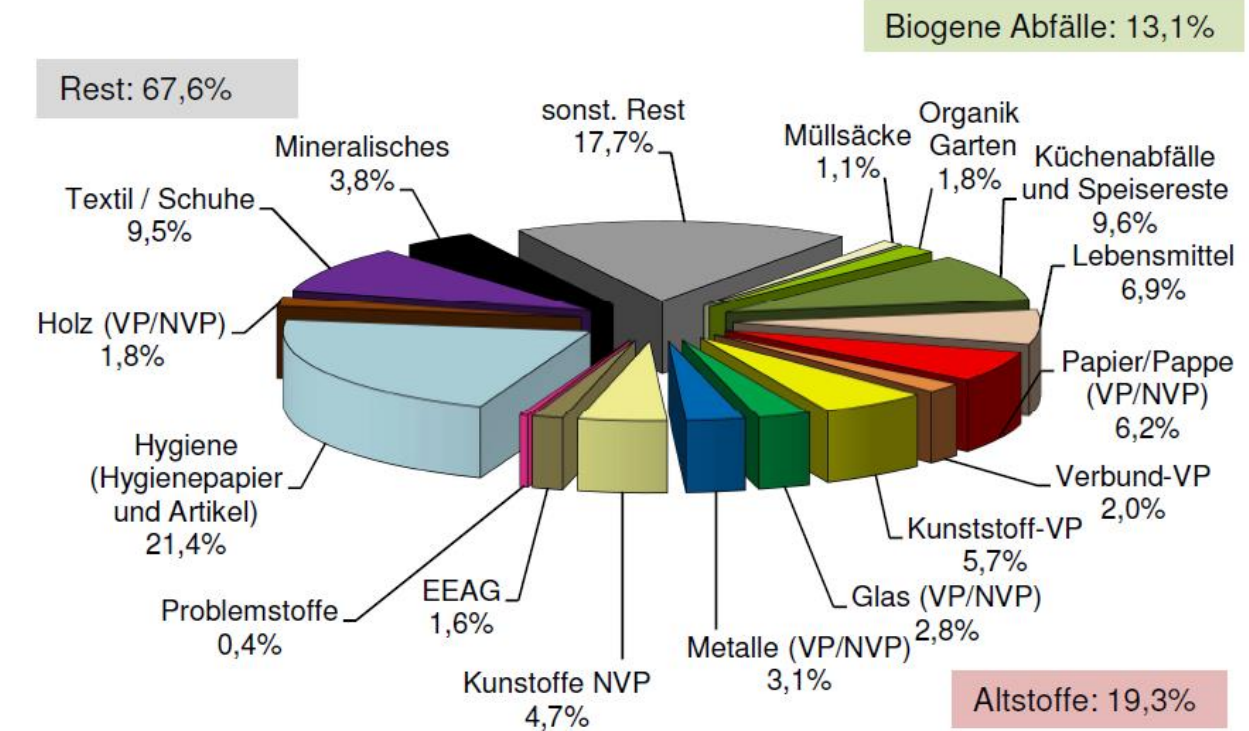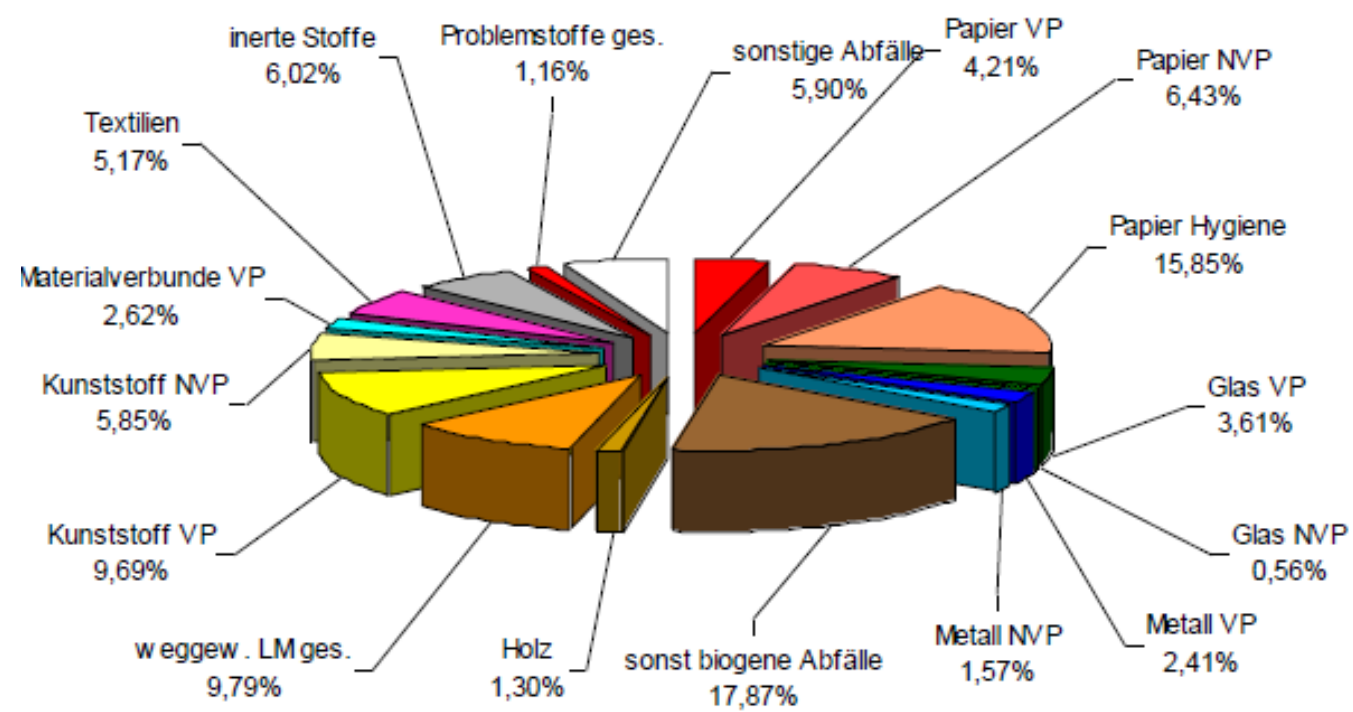
- Sample size and mass?
- Access level?
- Sorting categories?
- Evaluation methods?

From sample taking to evaluation…
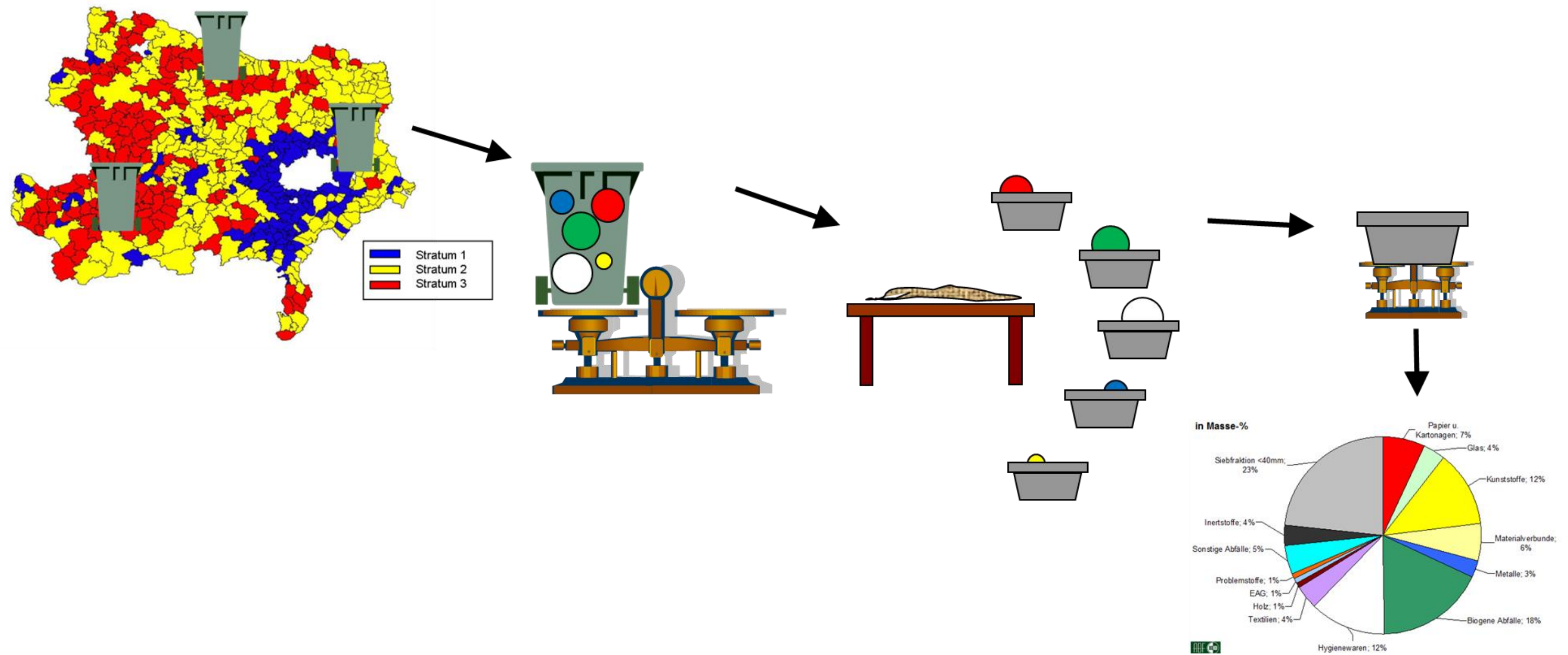
Material & Methods

- **Review** and **statistical analyses** of previous waste sorting analyses (descriptive and compositional data analyses and cross-validation of alternative estimators)

- **Scientific monitoring of a stakeholder dialogue** (continuous documentation and elaboration of workshop results)

- **Standardized guideline** (definition of compulsory and optional regulations for the planning & conduction of residual waste sorting analyses)

- **Sample planning** (determination of sample mass and detailed sampling planning including stratification and multi-stage stratified random sampling)

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Developing a standardized guideline
Analysis of previous waste sorting analyses in Austria

Methodological differences comprised:

- Stratification criteria (use of different strata, categories, cluster)

- Seasonal campaigns (1 – 7 campaigns)

- Sorting fractions/categories (9 – 19 main fractions, 8 – 119 subfractions)

- Access level of sampling (bin, mixed samples of various bins, collection vehicle)

- Sieving (no sieving, sieving 20mm + 40mm, sieving 40mm)

- Statistical analyses

Developing a standardized guideline
Which goals can and should be addressed?

- Precise definition of **research questions** regarding **relevant waste fraction(s)** and **accuracy requirem**ents (e.g. +/- 1%) within a set **regional level** (e.g. district level, federal state level, national level)

- **Definition of relevant fractions:** „light weight packaging" and „food waste" (as subfraction of organics) for Austria

- Potential impact: risk of under- or overestimating total sample mass required

→ **Cost/benefit efficiency**

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Developing a standardized guideline
Socio-economic stratification of parent population

Relation of residual household waste and socio-economic stratification (2014)
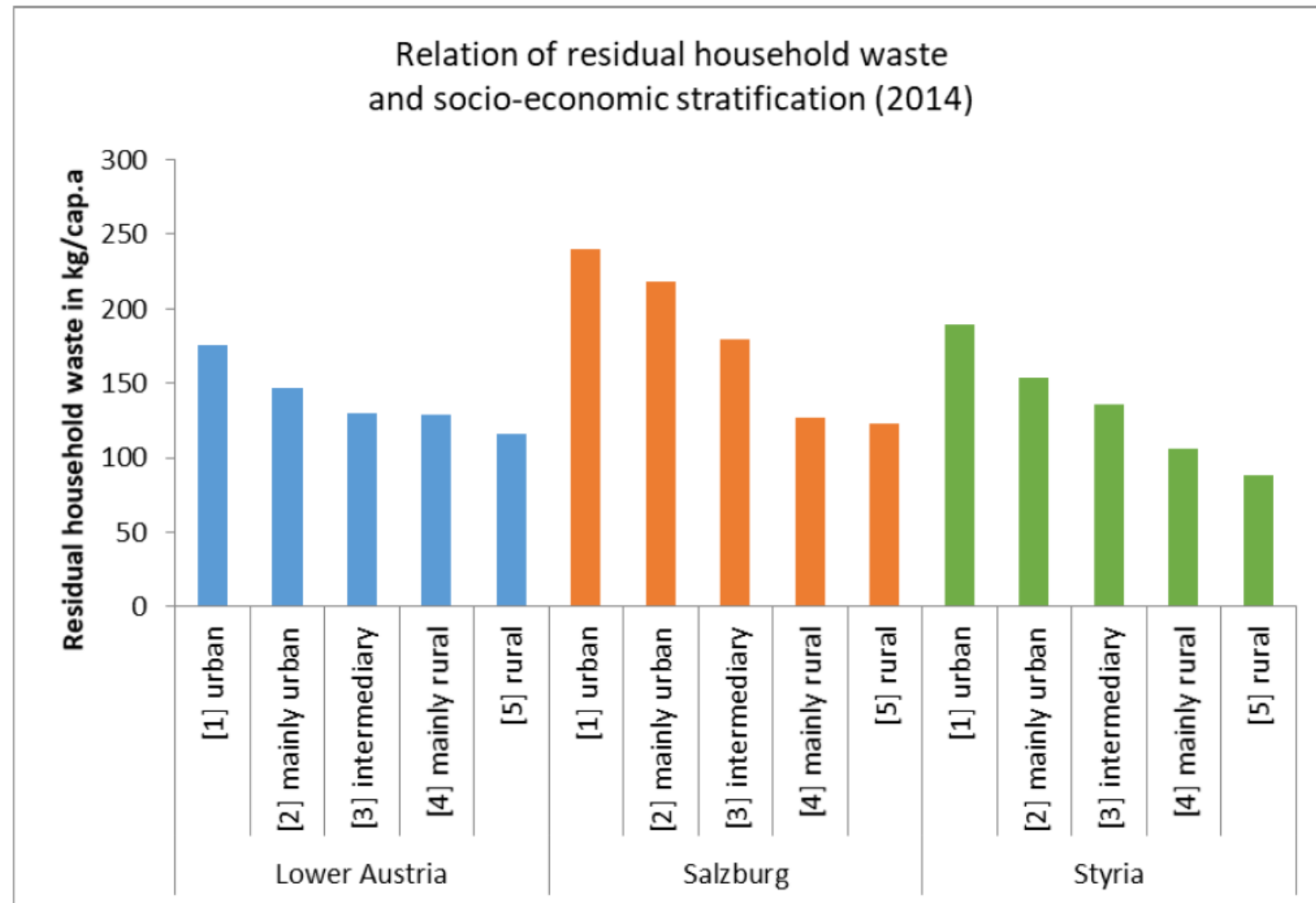
- Development of a nationwide socio-economic stratification factor at municipal level based on the following indicators:

  - **Settlement density** (as settlement area in inhabitants per hectare)

  - **Share of multi-family houses** with more than three flats in all residential buildings (according to apartment census)

  - **Specific commuter balance**, i.e. commuters less outward-bound commuters per inhabitant (according to register-based Labour Market Statistics Austria)

  - **Average household size** (according to register-based Labour Market Statistics Austria)

Developing a standardized guideline
Access level for sample taking

Access level requirements:

- Best possible identification of waste fractions during sorting

- Evaluation of stratification criteria/ influencing factors at household level or property-related (e.g. single-family/ multi-family house)

- Access level - collection bin vs. collection vehicle:
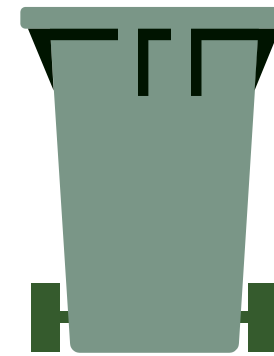
→Assignability at household level & evaluation of further influencing factors

→Homogenisation/ compaction steps make it difficult to classify sorting fractions (e.g. organics)

Standardization seems useful regarding…

- **Standardized socio-economic factors** with proven significance in order to subdivide the parent population best possible

- **Sample taking and sorting procedures** (choice of access level, specification of sorting practice, e.g. regarding the handling of adhesions (particularly at packaging material) or food waste)

- **Sorting catalogue** respectively sorting fractions (clear allocation of all subfractions to main category)

- **Extrapolation of results** (representativity of results with mass-reference, for each strata and regional level)

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Degrees of freedom seem useful regarding...

- Different **examination questions** depending on (political) questions/aims and affordability

- Different levels of **data availability and quality** and preliminary information regarding the investigated area

- **Different waste management structures** respectively extension stages of separate collection systems

- Regions that are strongly characterized by **extraordinary structures** (such as heavy tourism regions)

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Developing a standardized guideline

Topic	Design variations	Potential impact
precise definition of research questions	define relevant waste fraction(s), accuracy requirements and regional level	risk of under- or overestimating total sample mass
stratification by relevant influencing factors	stratification by administrative units (e.g. districts), seasons, socio-demographic and waste-management related factors including number of strata	potential blurring of homogeneous strata by aggregation (e.g. district); limited comparability of strata; over- or underrepresentation of regions due to missing allocation to waste generation
subdivision of parent population	spatial and seasonal distribution of residual waste collection quantity	if the parend population is not subdivided appropriately, random sample taking cannot be ensured aliquot to the respective waste arising
access level of sample taking	internal waste bin; external waste bin; waste collection vehicle	depending on the waste fraction(s) defined as relevant, the choice of certain access levels can lead to not reliable results
sample unit and size	bin volume (e.g. 120l, 240l, 1100l); weight (e.g. 30kg, 50kg, 100kg); number of people that generate waste (e.g. 10 people)	non-comparability of results
heterogeneity of fractions	different statistical approaches for handling dependency of waste fraction composition data	biased results of mean waste fraction composition (using classical statistical analysis)
determination of samples per and within regional unit by stratified random sampling	samples shall be taken aliquot to waste generation within regional unit by random selection	necessary in order to ensure representativity regarding regional scale and also emptied bin volume
sorting of waste fractions	sorting procedure in accordance with standardized sorting catalogue and specifications	non-comparability of results regarding waste fractions
maximum share of not identifiable sorting residues and monitoring of sample mass per sample	determination of maximum share of not identifiable residues (<10%) and monitoring of sample mass per sample befor/after sorting (+/- 3%)	necessary in order to ensure allocation of waste fractions best possible and to rule out major bias during sorting

Developing a standardized guideline

Particularly relevant design options comprised

- Definition of **examination questions**

- Choice of waste management related relevant **stratification criteria**

- Determination of adequate **sample unit and size**

- **Technical questions** in the course of sample taking and sorting

- **Extrapolation of analyses' results** and **adequate evaluation methods** with sufficient consideration of relevant influencing factors

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Developing a standardized guideline
Representativity by stratified random sampling

- Selection of **investigation units** should be:

  - in **proportion** to their residual **waste generation** (within parent population)

  - **by chance**

- **Random selection** should be conducted at **community level** (consistently with regional stratification at community level)

- **Municipalities** should **subsequently be mapped** according to **further crite**ria relevant to waste management (different collection areas, share of small/large containers,..)

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Sorting Analysis - Austria

Sorting Analysis – Austria
Organic Waste

Sorting Analysis – Austria
Paper Waste

Sorting Analysis – Kazakhstan
Mixed Municipal Waste