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**Analyses of different Biowaste Management
Systems**

Referate to the
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Analyses of different Biowaste Management Systems

Walter Hauer¹

1 Introduction

The content of my lecture is to compare different biowaste management systems. I will concentrate mainly on the problems and duties of a metropolis and talk about the experiences of Vienna, Austria. Even in a single city with the size of Vienna different general set-ups exist so that different small scale solutions are of advantage. Subsequently we will take an excursion into the countryside and refer about experiences in the province of Upper Austria.

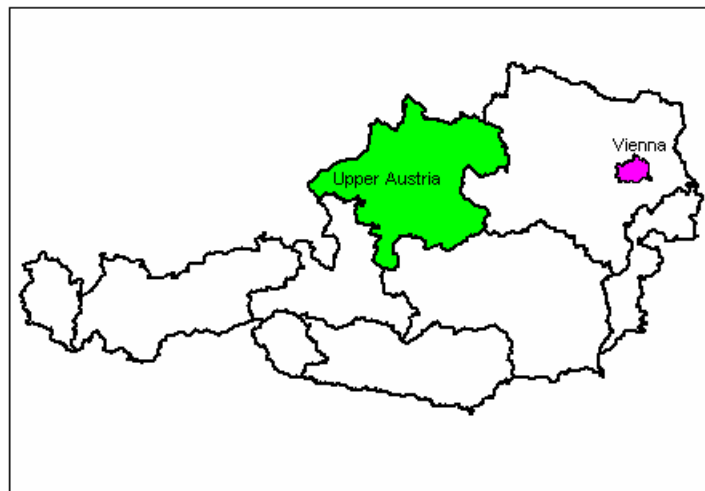


Fig. 1: Austria, Vienna and Upper Austria

2 Structure of Vienna

Almost 90 % of the inhabitants of Vienna living on 12 % of its area. Almost one third of the city area is almost uninhabited. These are mainly areas for traffic, agricultural land, water areas and woods.

	Inhabitants		Area	
	number	%	km ²	%
Urban Areas	1,400.000	87	app 70	18
Suburban Areas	200.000	12	app 80	19
„Uninhabitated“ Gebiete	20.000	1	app 260	63
Vienna Total	1,630.000	100	414	100

Tab. 1: Structure of Vienna

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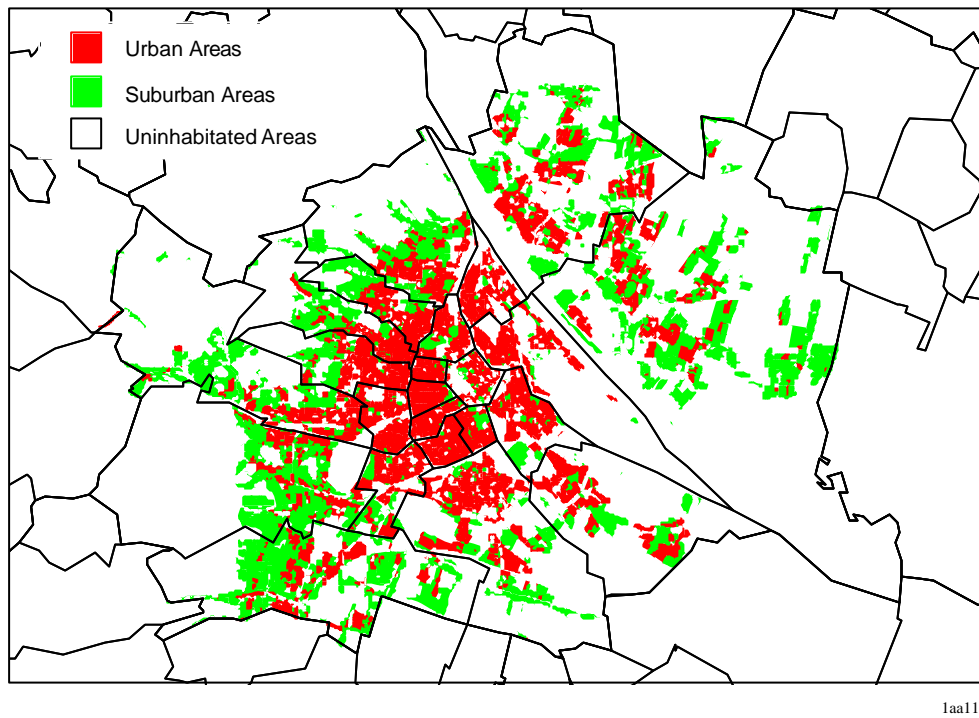


Fig. 2: Structure of Vienna



Fig. 3: Samples for Suburban Areas of Vienna



Fig. 4: Samples for Urban Areas of Vienna

3 Collection of Biowaste in Vienna

In Vienna biowaste is collected in different ways by the municipal authority:

- In suburban areas an extensive collection exists. Each private house is equipped with a container.
- In urban areas collection is mainly done at public collection places.
- Kitchen waste and food remains from restaurants and hotels

4 Sources of biowaste

4.1 From private households

Every year about 70.000 to 80.000 tons of biowaste are collected in Vienna by the community. About three quarters of the total amount recorded, are collected with approx. 12 % of the inhabitants.

	Inhabitants		Area		Collected Biotonne-Material	
	number	%	km ²	%	t/a	kg/inh.a
Urban Areas	1,400.000	87	app 70	18	app 20.000	app 14
Suburban Areas	200.000	12	app 80	19	app 50.000	app 250
unbewohnte Gebiete	20.000	1	app 260	63	app 5.000	
Vienna Total	1,630.000	100	414	100	70.000 – 80.000	app 45

Table 2: Biowaste collected in container

The figures in table 2 rise the question, why in urban areas such small quantities of biowaste are collected while in suburban areas large amounts are collected.

For urban areas intensive investigations were done. These investigations show, that the inhabitants wish to collect biowaste but shudder at the thought of handling it. That's why kitchen waste is only collected at a rate of approx. 20 %. However garden waste is collected at a much higher rate, in urban areas at approx. 50 %, in suburban areas even higher.

The reason for this distinguished behaviour could be clarified in a questioning. The handling of biowaste was considered disgusting. That is not the way with garden waste.

In general, people shudder at the thought of handling kitchen waste. These topics are considered problematic.

- Biowaste container inside the house
- Biowaste collection in the kitchen
- Cleaning of the pre-collection container of households



Fig. 5: Example for Biowaste collected in Urban Areas

4.2 *From Business*

4.2.1 Restaurants and hotels

Especially restaurants are using private disposal companies at a great extend. Smaller restaurants many times use the residual waste container to dispose of kitchen waste and food remains.

Basically it can be concluded, that kitchen waste and food remains are only limited suitable for biowaste collection. On one hand the humidity is very high, on the other hand, the salt content is high as well. Furthermore short collection intervals – possibly daily – must be offered. A frequent cleaning of the containers is also necessary.



Fig. 6: Example of biowaste from restaurants

For businesses the amount of biowaste in hotels, restaurants and the catering trade was investigated. The total amount of kitchen waste and food remains are about 50,000 tons per year.

4.2.2 Landscaping and Gardening

Discards from landscaping and gardening is self processed by composting plants and nurseries at a high rate. Partly it is directly delivered to the composting facilities of the City of Vienna. Because of its size and amount a collection in small containers is not feasible.

5 Composition of collected Biowaste

5.1 Urban areas

The content of non compostable foreign substances in the biowaste container is about 2 % (weight). Observations in houses show, that participating citizens use the biowaste collection contains as they should.

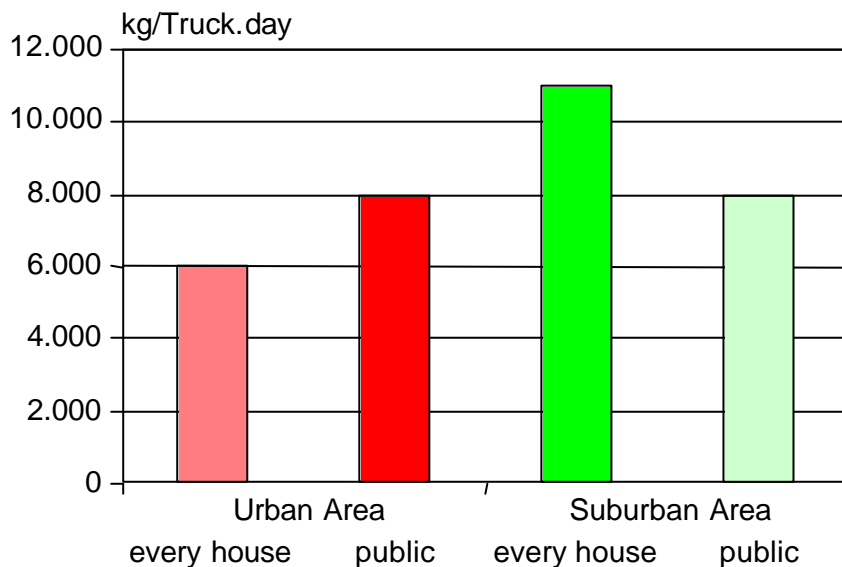
5.2 Suburban areas

In suburban areas with a lot of detached houses collected biowaste has even less foreign substances. The material consists mainly of trimmings of grass, bushes and trees. Also in suburban areas kitchen waste is only collected as biowaste at a small rate.

6 Performance of the collection vehicles

Suburban areas with a high amount of biowaste show the highest daily output of the collection vehicles. In suburban areas with a biowaste container in every detached house the daily output of the collection vehicle is almost twice as high as in urban areas with containers in every house.

Because of this experiences in Vienna, the decision was made to supply in suburban areas a container for every house, while in urban areas containers will be placed in public areas.



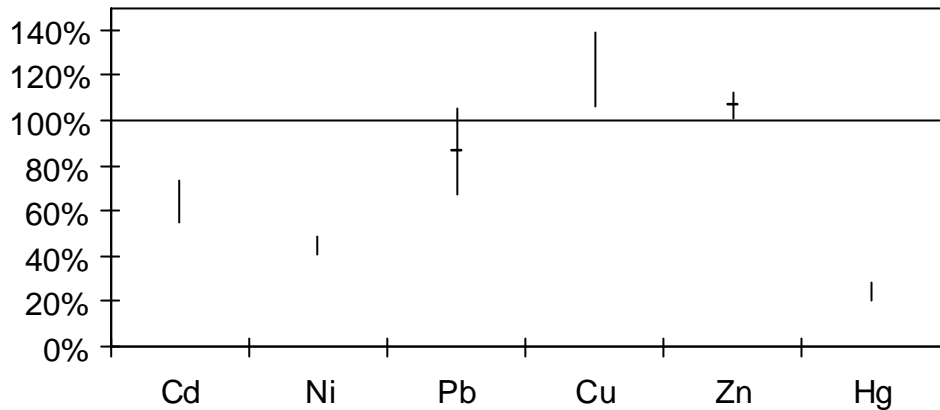
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Fig. 7: Daily amount of Biowaste collected in urban and suburban areas using different collection systems

7 Quality of the compost

7.1 Urban area

Biowaste collected in urban areas has an impurity rate of 2 % and the resulting compost too high rates of copper and zinc.



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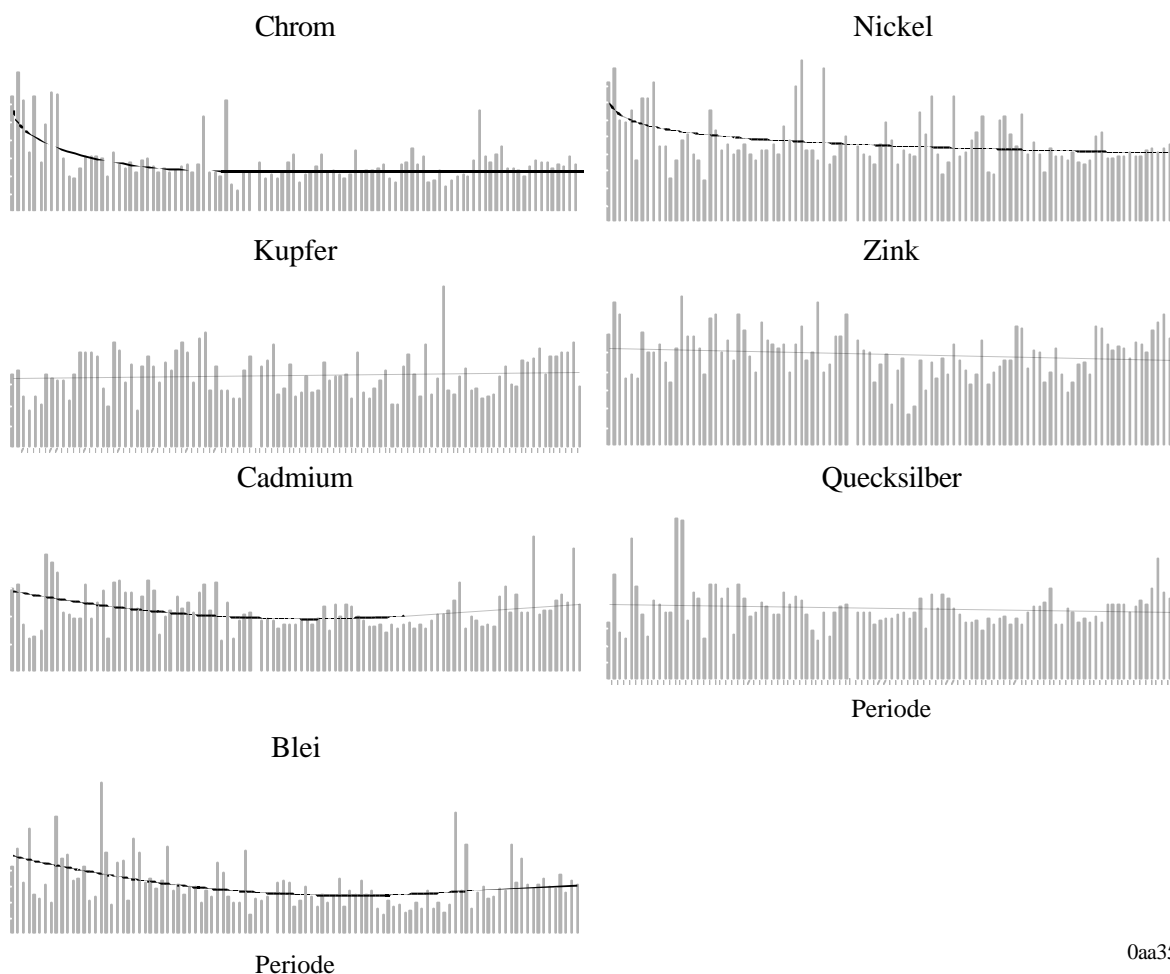
Fig. 8: Heavy metal content of compost from biowaste collected in urban areas compared to the limits of compost class II of ÖNORM S 2200

The heavy metal content was estimated to assess its possible sources.

On account of the high heavy metal content of mainly copper and zinc, it can be taken as granted that these metals already exist in the biowaste. The actual sources of copper and zinc are still unknown. The impurity amount from collection is not enough to explain the high heavy metal contents.

7.2 Suburban areas – detached houses

Biowaste collected in suburban areas has a significant lower heavy metal content. With a thorough quality management during the last eight years the heavy metal content in compost could be reduced dramatically. Further development is watched closely. The sources of heavy metals are researched to keep and even improve the high quality level of collection and processing.



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Fig. 9: Heavy metal content in compost of MA48 during the last 8 years

8 Quality Management

8.1 Selection of specific collection areas

As shown compost from biowaste collected in urban areas has a higher heavy metal content than compost from biowaste of non urban areas. With an intensification of a collection in urban areas and a combined processing with material from suburban areas a decrease in compost quality can be expected. Therefore collection in urban areas is not further intensified.

8.2 Advertising the collection

An important aspect of quality management is public relations. One of the most important hints is the fact that biowaste collection is utilization of biowaste and not disposal. Therefore only easily by consumers recognisable substances are classified as biowaste.

The disposal of foreign substances is disapproved from the very beginning. Basically, compostable materials like paper, paper toiletries and compostable plastics who may result in foreign substances are not advertised, often rejected.

Also materials that may create problems during utilization because of their smell or consistence like food remains, meet and bones.

The advertising of disposable pre-collection bags should be discouraged. It would open the biowaste container for all kinds of residual waste. A perfectly only with biowaste filled plastic bag would be recognised by the next user who is looking in the container as residual waste as he only sees the plastic bag, but not its content. Experiences from the project show, that container with foreign substances invite other citizens not to take it to serious with classifying their substances. As a result the amount of impurities is rising.

Acceptance of urban area collection is only existing, if offensive smell is as low as possible and if there are no maggots visible in the container. That is why there should not be food and meat remains put into the biowaste container.

Observations of the collected amount shows that keeping a long time motivation of the citizens, a constant information about the meaning and the need of a separate collection of biowaste is required.

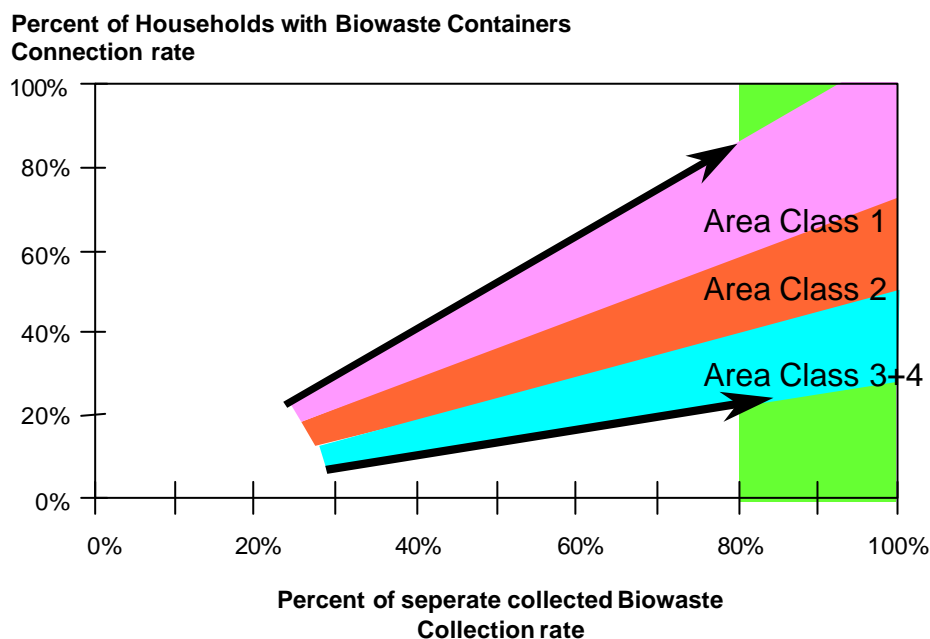
9 Provincial Areas

9.1 Investigations

At a project in Upper Austria biowaste collection systems in urban and different rural areas were investigated. Communities were assigned to four structural classes.

Communities of class 1 can be classified as approximately urban structured communities with intensive business and industrial activities. Communities of class 4 can be classified as approximately rural areas with strong agricultural activities. Communities of class 2 and 3 are in a transition between the two extremes.

The goal of the investigation was to find out how many households have to be equipped with a biowaste container to result in a best possible collection amount at a high collection efficiency, that is low collection cost. The results show that suburban detached house areas of cities have to be equipped with collecting containers at a rate of 80 %. In very rural areas the optimum is a rate of 30%.



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Fig. 10: Relations between connection rate and collection rate of biowaste collection in households

9.2 *Results*

Results show that the connection rate does not contribute to the same collection rate in the differently classified areas. Urban detached house areas need a higher connection rate to achieve a high collection rate than rural areas.

The evaluation of the different collection systems shows, that communities with a high connection rate do not charge extra fees for the biowaste collection. **Therefore it is recommended to include the cost of biowaste collection in the standard waste collection fee and not to charge separately.**

At the same time a minimum frequency for the collection of residual waste has to be established to avoid a move toward disposal of residual waste in the biowaste container.

Experiences show that properties explaining that they wish to compost themselves and unsubscribe from biowaste collection often compost their biowaste only partial. A part of the biowaste, mainly kitchen waste is disposed as residual waste. **When unsubscribe it should be checked, at what extend biowaste is actually composted on the property or if no biowaste is produced on the property.**

At a very extensive development of biowaste collection in urban areas also materials previously remaining on the property – rotting there with or without recovery as compost - will be collected. This concerns mainly discards from gardening and landscaping. Furthermore a move from bring in systems toward collecting systems in biowaste collection are expected.

The collected amount of biowaste is about 200kg/inhabitant and year in detached house areas in suburban areas and 15-20 kg/inhabitant and year in very rural agricultural dominated communities.

10 Literature and Sources

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