Applications of Pay-As-You-Throw in Germany – Saxony and the City of Dresden as Good Practice Examples

Jan Reichenbach
Personal introduction

**Profession:** Dipl.-Ing. (M.Sc.) Dresden University of Technology

**Career history:** since 1998 **INTECUS GmbH**
2001-2006 and again since 08/2009 parallel job assignment at **Institute for Waste Management and Contaminated Site Treatment at Dresden University of Technology** *(FP5-project “PAYT“ and LIFE+ project “HEC-PAYT“)*

**Current position:** **Senior consultant** natural resources and waste management

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**INTECUS GmbH**

**Established:** since 1991 in Dresden

**Management:** Prof. Dr.-Ing. habil h.c. Bilitewski / Grad. Eng. Wagner

**Profile:** Consulting, planning support and research activities with the focus on **Waste and Environmental Management**

**Work record:** more than **400 projects** in about **20 countries**
HEC-PAYT – an ongoing initiative

visit: www.payt.gr
Legislation as the entrance

European Law

Federal Republic of Germany
• Basic Law
  → Federalism, Self-Government of Communities
  → financing public services from charges, rights to impose charges

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Free State of Saxony
• Saxon Waste Management and Soil Protection Act
• Municipal Code of Saxony
• Local Rates Law
Principles of waste charging in Germany

- each person produces waste and thus should be contributing to financing the waste management
- charges must be cost-covering to finance all waste management tasks
- no cross-financing of other community expenses and services shall take place (i.e. surplus revenues returned to citizens in form of charge reductions)
- charges should create incentives for avoidance, utilization or environmental friendly disposal of waste (Saxony with avant-garde, people-friendly legislation → mandatory chargeable minimum as low as 4.6 ltr per capita*week → other federal states >8-16 ltr per capita*week)
PAYT vs. other ways to get waste services paid

- No measurement of the collected waste or no control over the amount of waste paid for at the moment of collection.
- Anonymous supply of waste to collection.
- Individual accountability.
- Identification of waste.
- Measurement or limitation of waste.
- Variable charge which corresponds fairly to the individual contribution to the costs of used waste services.
- No charges on waste collection or waste services invoiced via a fixed fee or paid thru taxes or any other obligatory payment not in correspondence with the generated quantity of waste.

PAYT

Waste Management Legislation and Statutes

Individual accountability

Individual Charging

Identification

Measurement

Unit pricing
Measuring basis in the waste charge models in Germany

Schemes using the actual service as a basis of accounting - 26% (New federal states 58%)

Schemes using the likely amount of service as basis of accounting - 69%

- Entirely service-determined (fixed service)
- Basic fee + service fee (conditionally variable)
- Fixed charge (flat rate)
- Basic fee + variable service fee (ident)
- Basic fee + token-system
- Basic fee + tag-system
- Entirely service-dependent (ident-fully variable)
- Miscellaneous

Source: Einzmann, Turk, Fricke in Müll & Abfall 8/2001
PAYT implementation in Saxony - 2002

Fixed charge (flat rate)
- Bin identification (transponder) system
- Bin identification (barcode) system
- Pre-paid system (tag, token)
- Ident-weighing system
- Bin identification+chamber system
PAYT implementation in Saxony - 2009

Legend:
- electronic bin identification and charge per emptying
- electronic bin identification and charge per weight
- barcode identification and charge per emptying
- pre-paid tag system
- additional user identification systems in housing blocks
Why PAYT? – The city’s view

1. Saving of costs
   *i.e. reducing total waste and amount for final disposal*

2. Award conscious performers

3. Harmonize collection across all spatial structures

<table>
<thead>
<tr>
<th>Dwelling structure</th>
<th>Single house areas</th>
<th>Multi family house areas</th>
<th>Multi family house areas</th>
<th>Multistorey apartment buildings</th>
<th>Dresden total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material fractions</td>
<td>Rate of separate recovery in ’95/’96</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaging</td>
<td>62%</td>
<td>56%</td>
<td>12%</td>
<td>12%*</td>
<td>28%</td>
</tr>
<tr>
<td>Graphical paper</td>
<td>96%</td>
<td>86%</td>
<td>72%</td>
<td>55%</td>
<td>69%</td>
</tr>
<tr>
<td>Mixed paper/board</td>
<td>71%</td>
<td>53%</td>
<td>42%</td>
<td>25%</td>
<td>37%</td>
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<tr>
<td>Glass</td>
<td>80%</td>
<td>44%</td>
<td>33%</td>
<td>33%</td>
<td>40%</td>
</tr>
</tbody>
</table>

4. Increase revenues
   *i.e. making sure all households pay for received services*

5. *Today:* Optimize collection
Why PAYT? – The citizens view

1. Offers to reduce financial burden
   *i.e. Fair charging*

2. Equity of treatment
   expense per unit of generated waste is not the same!

3. Transparent billing
The Dresden experience

- **~500,000 inhabitants**, 85 % MURBs, 15 % single family house dwellings
- Changeover to **bin identification system** (transponder) in 1994/95
- Participation in test series of chamber systems in 1996/1997
- **Charging policy:** degressive system, i.e. price per unit emptied decreases as size of the waste bin goes up
  - (80-ltr. bin: 0.046 EUR/ltr ; 1.100-ltr. container: 0.02EUR/ltr)
- **Charge calculation:** volume-based, two-tiered
  - (Basic fee + Service fee on a per-litre basis, Service fee calculated over the bin size and frequency of pick-ups *[individually variable]* incl. a minimum of one pick-up per bin and quarter

Saxon-wide testing of chamber systems
Dresden charge model

Charges – for what?
• mixed municipal waste (basic fee [number, size of dustbins] + service fee* [emptying])
  *degressive rate pricing model
• biowaste (monthly charge [bin-related flat rate])
• charges for other services on request
  → extra fee for longer dustbin transport distances
  → bulky waste and large household appliances
  → disposal of green waste

and a mandatory minimum of chargeable service
[one emptying per each quarter]
Dresden - technical realization of PAYT

Graphic source: MOBA AG, Dresden
Collection settings to achieve accountability
Reactions to new charging system *(Results from pilot tests)*

Before PAYT introduction

<table>
<thead>
<tr>
<th>Waste arisings and composition in the household prior to collection [kg/(head*a)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recyclables for collection in bring systems* (Paper, Paperboard, Glass) 1340</td>
</tr>
<tr>
<td>Light-weight packaging 30.9</td>
</tr>
<tr>
<td>Organic waste 104.0</td>
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<tr>
<td>Materials of similar type 0.4</td>
</tr>
<tr>
<td>Residual waste 43.9</td>
</tr>
<tr>
<td>Bulky materials</td>
</tr>
</tbody>
</table>

Total quantity: 319.2 kg/(head*a) (without bulky materials)

After PAYT introduction

<table>
<thead>
<tr>
<th>Waste arisings and composition in the household prior to collection [kg/(head*a)]</th>
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<tr>
<td>Organic waste 79.6</td>
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<tr>
<td>Materials of similar type 4.7</td>
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<tr>
<td>Residual waste 37.8</td>
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<tr>
<td>Bulky materials</td>
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</tbody>
</table>

Total quantity: 281.1 kg/(head*a) (without bulky materials)

Résumé: More waste diverted from conventional disposal to recycling
Reactions to new charging system *(Results from pilot tests)*

Collection rates for separate recycling systems in the different city settings

<table>
<thead>
<tr>
<th>Separate collection system</th>
<th>multi-unit residential building</th>
<th>attached building structure</th>
<th>detached buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>situation before PAYT</strong></td>
<td>collectively used containers, flat rate</td>
<td>individual bins, flat r.</td>
<td></td>
</tr>
<tr>
<td>light weight packaging, green dot waste paper</td>
<td>12%</td>
<td>34%</td>
<td>62%</td>
</tr>
<tr>
<td>light weight packaging, green dot</td>
<td>25%</td>
<td>48%</td>
<td>71%</td>
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<tr>
<td><strong>situation after PAYT introduction</strong></td>
<td>collectively used containers, charging per solidarity unit</td>
<td>individual bins, individual charge</td>
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</tr>
<tr>
<td>light weight packaging, green dot</td>
<td>67.5%</td>
<td>67.3%</td>
<td>71.9%</td>
</tr>
<tr>
<td>biodegradable waste (new system)</td>
<td>51.6%</td>
<td>47.8%</td>
<td>46.4%</td>
</tr>
</tbody>
</table>

**Résumé:** *In terms of waste diversion, people start behaving in the same way regardless of the local settings*
Dresden – the system’s pay-off

Over the years adjustments in the charge structure were still necessary to eventually ensure the schemes sustainability!
Does the trend hold?

143 kg per capita residual waste generation in 2008 as compared to 305 kg per capita in 1994 whilst incomes and consumption are on a steady increase!

The level of charges per bin and unit of collected residual waste has remained constant since 2003 and belongs to the lowest in Germany.
Can waste generation indeed be linked to PAYT?

The issue looked at from waste statistics

![Amount of collected residual waste]

- Average Germany in 2002: 170 kg/(E*a)
- State of Saxony in 2003: 137 kg/(E*a)
- Municipalities with PAYT system in place: 90-130 kg/(E*a)
...and by linking application intensity of PAYT and waste generation

Aggregated amounts of municipal waste fractions 2002

- Sachsen
- Hessen
- Baden-Württemberg

[Graph showing waste fractions and their aggregated amounts for 2002]

- Restabfall
- Sperrmüll
- DSD-LVP
- Bio- und Grünabfall

INTECUS - Waste Management and Environment-Integrating Management
Dresden’s SWM performance from the European perspective

MSW in order of increasing intensity of separate collection

Graphic source: L.Schanne; LCA-IWM Project result
People benefit directly

- **Stable charges despite generally rising cost levels**
- **Comparatively low charges**

**Waste charge level for Germany in comparison**

Euro per m² (2008)  
Germany / New federal states / Saxony / Dresden  
0,19 / 0,13 / 0,11 / 0,11

*Source: © Metersverein Dresden und Umgebung e.V. (Stand: Mai 2010)*

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**Average Financial Load 2008**  
(Graphic source: City of Dresden)

<table>
<thead>
<tr>
<th>Service</th>
<th>Cost Level</th>
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<td>per inhabitant</td>
<td>58,80 €/year</td>
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<tr>
<td>per for members family</td>
<td>235,20 €/year</td>
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<tr>
<td>compared with:</td>
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<tr>
<td>electric current</td>
<td>380 €/a</td>
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<tr>
<td>water/waste water</td>
<td>385 €/a</td>
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<tr>
<td>annual ticket for local transport</td>
<td>326 €/year</td>
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<tr>
<td>charges for tv and radio</td>
<td>216 €/year</td>
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<tr>
<td>phone and internet flatrate</td>
<td>360 €/year</td>
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<tr>
<td>daily newspaper</td>
<td>236 €/year</td>
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</table>

**Development of average waste charge in Saxony**

*Graphic source: State of Saxony - SMUL*
Résumé: PAYT helps to achieve critical SWM goals
- but success lives from support!

- PAYT has to be a piece of environmentally oriented policy package
- Success comes from a bundle of measures
  e.g. education/information
  structure redesign
  social acceptance
  intensive, user-friendly separate collection offers

General Data of Dresden, Capital of Dresden
(as of December 2006)

- inhabitants principal/secondary residence: 510,776/9,214
- area: 328.30 km²
- number of dustbin stands: appr. 50,104
- fraction: number of dustbins: dustbin volume:
  mixed municipal waste 71,483 18,955 m³
  biowaste 22,541 3,186 m³
  light packaging (dual systems) 44,184 14,479 m³
  138,208 36,620 m³

- number of depot container stands: 650
  of which underfloor systems: 31
  number of depot containers: 2,850

Graphic source: City of Dresden
Thank you for attention
Approaches for the technical realization of PAYT

PAYT = (accountability to the waste generator thru)

User identification

Bin identification

Individually assigned bin

Collectively assigned bin

Volume based accounting

Weight based accounting

Chamber system (volume chamber)

Chamber system with weighing

Volume based accounting

Weight based accounting

Volume based accounting

Weight based accounting

Ident system

Individually system

Routine system

Pre-paid system

Tag or sticker

Pre-paid bag

Ident-weighing system

Pay-As-You-Throw (PAYT) is a system that ensures accountability to the waste generator through user identification and bin identification. There are two main approaches:

1. Volume based accounting
   - Chamber system (volume chamber)

2. Weight based accounting
   - Chamber system with weighing

For the identification of bins, there are two options:

- Individually assigned bin
- Collectively assigned bin

Each bin system can be further divided into:

- Ident system
  - Individually system
  - Routine system
  - Pre-paid system
    - Tag or sticker
    - Pre-paid bag

This diagram outlines the technical realization of PAYT, focusing on user and bin identification, as well as volume or weight-based accounting methods.