Welcome to the MSW Webinar Series
Part II: Leading examples of MSW Collection Services around the World

THE WEBINAR WILL START SHORTLY
PLEASE MUTE YOUR MICROPHONE AND KEEP YOUR WEBCAM SWITCHED OFF

Mitigating SLCPs from the Municipal Waste Sector
http://waste.ccac-knowledge.net/
MSW Webinar Series
Part 2: Leading examples of MSW Collection Services around the World

Mitigating SLCPs from the Municipal Waste Sector
http://waste.ccac-knowledge.net/
Presenters

- **Rainer Kronberger**
  - Vienna MA48

- **Marta Villa**
  - Urban Ecology Agency of Barcelona

- **Jose Henrique Penido Monteiro**
  - Comlurb

- **Marco Ricci**
  - ISWA

- **Marco Mattiello**
  - CIC – Italian Composting Association

- **Contarina**
3 PRACTICAL CASES
Practical cases: learning by doing

- Contarina “district” Italy
  - management of waste in 50 distinct municipalities
  - population about 554,000
  - range of urban situation (rural areas, sub-urbs, town/hysterical centers)
  - PAYT charges embedded in collection scheme for residual waste

- The City of Vienna
  - single management company for all MSW management
  - population about 1,700,000
  - Optimization of transfer & transport

- The Mega-City of Rio de Janeiro (Brasil)
  - Management of service in a mega-city
  - Population 6,2000,000
  - The basic need of a service in a set of differentiated urban, social and economic conditions
Practical cases: common topics

- The service provider: Public or Private
- Collection of MSW in high-density/urbanized areas
- Minimization of transport and traffic
- Collection of MSW by mechanized or labor-intensive crews
- Cost and funding: possible application of PAYT charges
- The role of disposal plants and recycling (focus organic recycling)
Common questions for the speakers

- Q1) MSW management: Why public, why private service or mixed in your opinion?
- Q2) Which plants you think need to be owned/realised by the public (f.ex. only the disposal plants like landfills, MBT, incinerators....)
- Q3) Command and control: what information need to be exchanged with your local authority/City/Municipality? And with which frequencies? Control system, need of technology
- Q4) Cost of your service of MSW management (including collection, transport, disposal and recycling) compared to average living cost in your country?
- Q5) What is the budget spent on communication and sensibilisation initiatives?
- Q6) Do you involve "Disadvantaged" or disabled people and for what services; what is the role of informal workers in your area/sector and how do you cooperate.
- Q7) What is the role of labor intensive services in your MSW management scheme?
BASIC CONCEPTS (SEE FORMER WEBINAR)
What is MSW Management

- Collection of separate MSW waste streams;
- Service provided to: households, commercial activities, market-places, other;
- Service for guarantying hygienic condition and road-access: street-sweeping, cleaning of open spaces (including market-places); (sometimes) maintenance of green areas; (sometimes) snow-sweeping
- The MSW composition “drives” the priority and design of collection schemes
MSW different composition- affect the collection services

- Different composition depending on the country and evolution tendency of the composition: initially more biowaste flows and as the country evolves, WEES, CDW, plastics and other fractions increases.

Bolivia

Mexico

Mumbai
MSW analysis

- Look at the integrated MSW management approach, not at a single waste-stream only
  - Example: start selective collection is not just adding new routes but redistributing and rethinking the whole service

- Collection schemes may influence the amount of waste managed inside the MSW stream
  - Example: large road container VS door to door
  - Example: intensive (Excessive!) collection of green waste

- Use the correct parameters for assessing performances:
  - Kg/person/day
  - Kg/day/crew
  - Kg/hh/year
The two collection schemes in place in Lombardy

- Modello di raccolta Cassonetti
- Porta a porta

Collection scheme:
- Road containers
- Kerbside
Achievable separate collection rates

- Kerbside collection & PAYT charges
- Kerbside collection for food-, residual waste and packaging waste
- Roac container collection & some kerbside collection
- Roac container collection incl. food waste
- Road container collection
PARAMETERS FOR ECONOMICAL ASSESSMENT
MSW economical analysis

- Cost of collection as €/kg
  - Related to treatment of waste
  - Suitable for comparing different collection models
  - Distorted by absolute amounts

- Cost of collection as €/inhab
  - Reflects the cost-fee relation
  - Suitable for comparing performances in different municipalities
  - Distorted by tourism and transitory population (large cities!)

- Cost of collection as €/day
  - Used for assessing the cost of collection crews
  - Suitable for evaluation different design of collection schemes
  - Distorted by changes in labour-cost
POSSIBLE SCHEMES FOR MSW COLLECTION
Collection of MSW can be done ....

- On ground
  - Road Containers
  - Door to Door
- Underground
  (containers & pneumatic)
- At Municipal Collection centers
- Mobile points
- On demand
Main characteristics

- On ground
  - Road Containers: easy logistic, low responsibility of waste-producers
  - Door to Door: complex logistics; high results
- Underground
  - Large investments for (additional infrastructure); simple logistic
  - High costs
- At Municipal Collection centers
  - Large number of separate collection (30 waste streams and more)
  - Lowest collection cost
  - Far from waste producers
- Mobile points
  - Limited volume
  - Next to waste producers
  - On specific calendar dates or meeting points
- On demand
  - For bulky and Green Waste
HISTORICAL CENTERS: SPECIFIC NEEDS AND ADAPTATION OF COLLECTION SERVICES
Historical Centers: specific needs

- High population density 3000-8000 (inhab/skm) (depending on the city, some old city centers have low density, specially colonial city centers in Latin-America)
- Volumes for separating waste at home are limited
- Road-systems narrow (limited space for installing bins and containers)
- Large presence of restaurants, shops, offices
- Pedestrian zones
- Need for frequent street-sweeping
- Usually a mix of population typology: old people, immigration, young people with different income (high income; students…)
Example: Treviso (Italy\Contarina)

- District Capital of Treviso Province (about 100,000 pop)
- Heavy daily presence of workers and students
- Intensive DtD collection (and PAYT)

→ Reduce the volume of collection tools (buckets, bins, bags)
→ Rise collection frequencies
→ Continuous monitoring of the Service (GPS and Web-platform)
Example: Treviso (Italy\Contarina)
Example Quito (Ecuador)
Example Quito (Ecuador)

- Population in the Historical City Center: 48,953 (decreasing)
- 100 inhabit/ha (max. 300 inhabit/ha)
- Income average: 510 USD
- People with basic studies: 37%
- Main uses: commercial and services, residents moving to other neighbourhoods of the city, specially the ones with most economical possibilities. Just starting to change.
- Historical City Center- Colonial Buildings /Urbanism to be preserved and valued

- Background:
  - waste collected in mixed bags in the street,
  - high quantity of informal recyclers (specially, collecting plastics)
  - Low capacity of selection and recycling in the country
- 60 underground containers points.
- 3 containers of 1.300 L: 2 for mixed, 1 for “recyclables”.
- 2 trucks for mixed-bach loading containers +1 uploading for recyclables
- Starting with road containers (only mixed) in other parts of the city (side loading containers), also one pilot with DtD collection (mixed; recyclables).
- Other public recycling points in malls, public buildings, libraries, etc.
- Starting biowaste collection in main markets
SMOT project for Old City Centers and Medinas

www.smotproject.eu

The project has detected 4 main strategies and are doing pilots in the partners countries:

– Public&private waste chambera,
– Containers site “beautifying”,
– Door to Door,
– Underground containers.
Historical Centers: lesson learned

- Intensive Separate collection can be introduced effectively
- Specific need due to constrains in road-design
- Attention to commercial waste, usually a high % of the total amount of generation
- Priority to keep a high visual quality of the streets, so … Hide waste as much as possible:
  - Door to Door, most suitable and effective to introduce selective collection.
  - Underground containers, pneumatic system. High investment, maintenance, sometimes collapsed.
  - “Waste chambers”. High investment, more time for collection than road containers.
  - Containers site “beautifying” (wood fence, …)
PAYT AND PLANNING COLLECTION SCHEMES
Integrated MSW management

- Collection service
- Info & Communication
- EPR schemes
- Treatment Plants (availability)
- Waste charges
- Political willingness
Integrated MSW management

- Collection service
- Info & Communication
- Waste charges
- EPR schemes
- Treatment Plants (availability)
- Political willingness
PAYT and collection schemes: lesson learned

- PAYT = clear link between service/waste and cost
- Waste charged influence the behaviors of the waste-producers
  - Illegal disposal, littering
  + Reduction in MSW production

- **PAYT charge to be included in designing the collection scheme**
  - Example 1: residual waste collection without PAYT: 1/week
  - Example 2: residual waste collection with PAYT: 1/3 weeks

- Carefull:
  - You need to effectively collect most recyclables
  - You need a waste counter installed (easy with Door to Door)
  - You risk reduction of incomes (waste-tourism)
PAYT and collection schemes: lesson learned

- CONTARINA:
  - An average family (4 persons) delivers residual waste 1/6 months!!!!

- VIENNA
  - Charge for residual waste (depending on emptying interval & bin size);
    therefore: smaller bins → lower charge

- ARGENTONA:
  - DtD to DtD+PAYT: Reduction in the first year around 9-17% of some waste streams.
COLLECTION CREWS
Cost of collection crews

- Low-tech vehicles $\rightarrow$ low cost
- Sometimes combine so much systems and vehicles could be less efficient (rear, side loading, bilateral, up-loading, …)
- Labor intensive scheme can be cost-competitive
- Combine different vehicles
- Use local logistics
Local logistics: other means for waste collection
PRIVATE OR PUBLIC?
## Comparison: private vs public operators

<table>
<thead>
<tr>
<th></th>
<th>Strong points</th>
<th>Week points</th>
</tr>
</thead>
</table>
| **Direct management** | - More control of the service  
- More control of the staff  
- More capacity of reaction  
- More agility for applying service modifications and directives transmission | - More economic charge on the staff budget line  
- Necessity of staff and equipment management  
- Less capacity of investment or borrowing  
- Less capacity of replacing staff or equipment in case of incidences, or starting the service (until equips arrival) |
| **public operator**  |                                                                                 |                                                                              |
|                      | - Less economic charge on the budget because of staff externalisation  
- More efficient/simple economic management  
- More capacity of investment or borrowing (especially for small municipalities) | - Use of technical resources for service definition, payment and monitoring  
- Less capacity for controlling the service, results and incidences  
- Less agility for applying service modifications and directives transmission  
- Less capacity of reaction |
| **Indirect management** |                                                                                 |                                                                              |
| **private operator**  |                                                                                 |                                                                              |
THE INFORMAL SECTOR
The informal sector

- Relevant role in a lot of countries where there are millions of people living from waste selection.

- Also in Europe the economical crisis has increased the number of people looking for recyclables in the residual or stealing from the selective collection (e.g. paper)

- Need to include them in the selective schemes:
  - Establish an ordered scheme, with a clear timetable, kind of materials, etc.
  - Give an opportunity to be part of the formal job market
  - Recognize them and improve job conditions and social status.
The informal sector

In latinamerica there is the Iniciativa Regional para el Reciclaje Inclusivo who works to improve social and economical conditions for recyclers and include them into the formal sector.

http://reciclajeinclusivo.org/

Highlights of study made in 15 countries (Mexico, El Salvador, Panama, Colombia, Ecuador, Peru, Bolivia, Nicaragua, Haiti, Costa Rica, Brazil, Paraguay, Uruguay, Argentina and Chile):

- informal recyclers are key factor for recycling industry → inclusive development, dignify profession and improve social status.
- Great disparity in the regional legal framework.
- Lack of training (relevant disadvantage in front of other sectors)
- Weakness of the recycling market (recycling industries)

In some experiences, resistance/opposition of the informal sector to be formal (control, calendar, …)
Example: Quito

COLLECTION MADE BY TRAINED INFORMAL RECYCLERS

- Puntos Limpios
- Other specific collections (vereda)

SELECTION

- CEGAM, center where recyclers can receive training, and made the separation and selection of recyclables in good work conditions and sell together the materials to industry with best prices and conditions.
- Material from their own collection and from recyclables container.
3 PRACTICAL CASES
CONTARINA’S EXPERIENCE
(ITALY)
MR. MARCO MATTIELLO
Our location

Square Kms: 1,300
Municipalities: 50
Inhabitants: ~554,000
Users: ~260,000
Employees: 621
Annual turnover: ~80 M. €
Forecasted for 2014
Different territories and characteristics

Urban centers  Suburbs  Historical centers  Remote Areas or Outlying Areas
‘Green jobs’ means growth

Employees in Contarina

Employment rate in Italy

(ISTAT)
‘Green jobs’ means growth
‘Green jobs’ means growth
Curbside collection initiation in Treviso

Contarina Staff

Total costs (management + disposal)
Waste management system
Conceptual model

This conceptual model was developed by Contarina S.p.A. Responsibility is shown in the centre, a key component promoted and supported throughout the model.
Curbside collection

Each user has its own bins
Curbside collection

Types of bins

<table>
<thead>
<tr>
<th>Standard</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic waste</td>
<td>Residual waste</td>
</tr>
<tr>
<td>Paper</td>
<td>Glass, plastic, cans</td>
</tr>
<tr>
<td>Green</td>
<td></td>
</tr>
</tbody>
</table>

STANDARD
(lower populated areas)

COMPlex
URBAN AREAS
(historical centers and highly populated areas)
Small bins and bags reserved for users with limited space.
Curbside collection
Different curbside collection for each type of waste matter

<table>
<thead>
<tr>
<th>REGULARITY OF COLLECTION</th>
<th>COMPLEX URBAN AREAS</th>
<th>STANDARD Medium and low populated areas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>historical centers and highly populated areas</td>
<td></td>
</tr>
<tr>
<td>RESIDUAL</td>
<td>2 /week</td>
<td>1 /week</td>
</tr>
<tr>
<td>ORGANIC</td>
<td>3 /week</td>
<td>2 /week</td>
</tr>
<tr>
<td>PAPER</td>
<td>2 /week</td>
<td>1 /2week</td>
</tr>
<tr>
<td>Glass, Plastic and Cans (Priula)</td>
<td>3 /week</td>
<td>2 /week</td>
</tr>
<tr>
<td>GREEN</td>
<td>1 /week</td>
<td>1 /week</td>
</tr>
</tbody>
</table>
EcoBus and EcoStop

Services created for Treviso historical center
The lorries
Appropriate vehicles to carry out curbside collection services

Chassis
- Right-side drive
- Automatic Transmission
- Easy entering and exiting system for driver by placing seat closer to ground level

Equipment
- Automatic bin hooking system
- Simplification of the activation controls
- Bins emptying controls placed on the right side
- Bins tipped from the side
- Integrated technology to facilitate the emptying of small bins

Every operator works safely
The waste produced by each user is detected by a transponder, an electronic device installed in the municipal waste bins. The variable fee increases with the number of times the residual waste bin is emptied.
### PAYT fee

**Fixed Fee**

- Based on the number of household members

**Variable Fee**

- Based on the number of residual waste bin removals
  - 30% for home composting
  - + fixed quota for garden waste

**DOMESTIC USERS**

**NON-DOMESTIC USERS**

- Amount related to the class of the user area and volume of supplied bins
- Based on the number of residual waste bin removals
  + fixed quota for garden waste
Average Residual Waste Based on Emptying

- 2013: Blue line, with points (1, 3.01), (2, 3.85), (3, 4.69), (4, 5.16), (5, 6.13), (6, 7.02)
- 2012: Red line, with points (1, 3.63), (2, 4.76), (3, 5.86), (4, 6.58), (5, 7.91), (6, 9.03)
- 2011: Green line, with points (1, 3.90), (2, 5.18), (3, 6.47), (4, 7.39), (5, 8.77), (6, 10.24)
The fee
Comparison of national data

Green Book 2014, Federambiente
Comparison of national data

Andamento della tariffa Priula rispetto all’andamento medio delle tariffe dei rifiuti in Italia

*Andamento della Tariffa in Priula (esclusi IVA e tributo provinciale)*
Additional Elements of the Model

Control
- Notification Stickers
- Environmental Vigilance

Communication
- Magazines
- EcoDesks
- Websites
- EcoCalendars
- Events
- Environmental Education

The information system
- Creation of a Single Database
- Digital Mapping
- Georeferencing Users
- Creation of Geographical Network
- Lorry Tracking
I controlli
Environmental Vigilance

Notification stickers: used in case of wrong assignment.
This helps the user better understand how to separate waste.

Vigilant Environmentalists work in cooperation with the Municipal Police and apply fines.

2013 Data
- 6,000 checks and controls
- 320 irregularities found
The information system
The information system

- Creation of a single database
- Digital mapping
- Creation of a Geographical Network
- Lorries equipped with GPS
- Lorries tracking
- Georeferencing users
Real-time lorries geolocation

Display on mobile phones on available to all users
Real-time lorries geolocation

Display from operations center
Real-time lorries geolocation
Prevention, treatment and recycling
The integrated waste management system starts from the design of objects and packaging, in consideration of the entire life cycle, with the goal to be sustainable in all its phases.
Residual waste treatment
Present and future developments

33% Biological treatment
67% Separation

Sorting

100%

Waste 67%
SRF 33%

Incineration / Landfill

Loss through process 8%
Innovative projects 12,5%

REDESIGN 33%

Recycling 33%

Old Plant

12,5%
Organic and green waste

NATURAL RESOURCES and MATERIALS

PRODUCTION

DISTRIBUTION

RECYCLING

The collected organic waste is brought to composting plants such as the plant owned by Contarina

QUALITY COMPOST

TRASH

Home composting Aerated bins

EAT

Fight food waste

BUY
Disposable absorbent products recycling project
Future development

- Drum separation
- Pressurized steam sterilization

Partner: AFATERSpA

1000 kg
Absorbent products for personal care
Bulky waste
Reuse project – Centro Mobile del Riuso

Appliances, furniture, clothes

Solidary Market
Caritas tarvisina
The percentage of recycling in the municipalities managed by Contarina

SOURCE
dati Contarina Giugno 2014, Rapporto Rifiuti ISPRA 2014 (dati 2013 Italia); Relazione Rifiuti Urbani ARPAV (dati 2013 Veneto)
Production of Municipal Waste Managed by Contarina (kg/inhabitant/year)

SOURCE
dati Contarina 2014 (Media annuale aggiornata a Giugno), Rapporto Rifiuti ISPRA 2014 (dati 2013 Italia); Relazione Rifiuti Urbani ARPAV (dati 2013 Veneto)
The production of municipal residual and bulky waste managed by Contarina (kg*inhabitant/year)

SOURCE
- dati Contarina 2014 (Media annuale aggiornata a Giugno),
- Rapporto Rifiuti ISPRA 2014 (dati 2013 Italia); Relazione Rifiuti Urbani ARPAV (dati 2013 Veneto)
Future goals

80% less of residual waste by 2022

50 kg/inh.*yr (2014)

10 kg/inh.*yr (2022)
Future goals

96,7% of recycled waste

85% by 2014

96,7% by 2022
VIENNA’s Experience (Austria)

Waste Collection in Vienna

DI Rainer KRONBERGER
Vienna:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vienna (capital of Austria)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Area</strong></td>
<td>[km²]</td>
<td>415</td>
</tr>
<tr>
<td><strong>Inhabitants</strong></td>
<td></td>
<td>1,731,236</td>
</tr>
<tr>
<td><strong>Population Density</strong></td>
<td>[Inh/km²]</td>
<td>4,172</td>
</tr>
<tr>
<td><strong>Number of houses</strong></td>
<td></td>
<td>168,167</td>
</tr>
<tr>
<td><strong>Number of households</strong></td>
<td></td>
<td>862,700</td>
</tr>
</tbody>
</table>
MSW in Vienna: 1,0 Mio. t/a

waste collected by MD 48 (2013): 1,037,000 tons
MSW in Vienna: 1912 - 2013

- recyclables, biowaste, haz. waste
- residues from sorting
- residual waste
- waste incineration
separate collection in Vienna: 1985 - 2013

- haz. waste
- end of life vehicles
- bio waste
- other recyclables
- wood
- plastics
- metals
- glass
- paper, cardboard
Approaches in waste management

- separate collection of recyclables
- thermal treatment of residual waste with energy recovery
Waste Collection
Organisation of waste collection

In general:

Waste collection in the household sector is a public affair!

⇒ The municipality should organise the collection of all MSW in the household sector:

Collection of
- residual waste, - biowaste, - packaging, - other recyclables,… as “one-stop-shop“
(from peoples view)

However:

principle of producer responsibility: producers are responsible for packaging waste!

role of municipality???
Organisation of waste collection

Residual waste, biowaste, paper, other recyclables

municipality

Packaging

PROs*

!!! Coordination required !!!

implementation

one stop shop

* Producer Responsibility Organisation
## Collection Schemes in Vienna

<table>
<thead>
<tr>
<th>Waste Category</th>
<th>Collection Schemes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>backyard collection</td>
</tr>
<tr>
<td></td>
<td>(pick up system)</td>
</tr>
<tr>
<td>residual waste</td>
<td>XXX</td>
</tr>
<tr>
<td>organics</td>
<td>XXX</td>
</tr>
<tr>
<td>paper</td>
<td>XX</td>
</tr>
<tr>
<td>glass</td>
<td>X</td>
</tr>
<tr>
<td>metal</td>
<td>X</td>
</tr>
<tr>
<td>plastics</td>
<td>X</td>
</tr>
<tr>
<td>other recyclables</td>
<td>XXX</td>
</tr>
<tr>
<td>WEEE</td>
<td>XXX</td>
</tr>
<tr>
<td>hazardous waste</td>
<td>XXX</td>
</tr>
</tbody>
</table>
Residual Waste

- Containers from 120 l up to 2.2 m³
- full service

- Difficulty:
  in old houses containers often situated in the basement (stairs)

=> new buildings must have dedicated areas for waste containers near the street on street level

299 kg/inh.

56%
Waste Glass

- since 1977
- separate containers for clear and coloured glass
- collection truck with two-chamber compartments
- since 2004: hook-lift containers (3 m³) (lower noise emission, reduced collection costs)

16 kg/inh.

3%
Paper & Cardboard

71 kg/inh.

- since 1986
- containers in use:
  - 240 l: old buildings (space, stairs)
  - 770 l: new buildings, kerbside collection

13%
Bio Waste

43 kg/inh.

- since 1987
- containers in use:
  - 240 l: houses (with garden)
  - 770 l: kerbside collection
  - only **green waste**, no food waste!
  - => composting, anaerobic digestion

- since 2007 additionally collection of **kitchen waste**/
  **food waste**
  (120 l)
  - => anaerobic digestion
Bio Waste

What is collected?

Biowaste collection:

from households
    (composting or anaerobic digestion)
    – Only green garden waste
    – Only vegetable kitchen waste
    – No food scraps, no meat, no dairy products
    – Of course no residual waste

Objective: production of high quality compost!

Distinction between composting / anaerobic digestion only with respect to location:

    inner districts (wet material): => anaerobic digestion
    outer districts (dry material): => composting
Bio Waste
What is collected?

Kitchen waste collection:
from restaurants, large canteens, etc.

(anaerobic digestion)

– Food scraps (“pig feed”)

– No kitchen waste from private households
  
  Kitchen waste from private households is collected in residual waste bins.

– Of course no residual waste
Metal Waste

- since 1988
- combined collection of packaging and scrap metal
- Containers in use: 770 l
- metals collected with residual waste separated after incineration (equiv. 8.0 kg/ inh.a)
Plastic Waste

4 kg/inh.

0.7%

- since 1988
  - high share of impurities (~ 40%), low recycling rates

- since 2005 new collection system:
  - only plastic bottles:
    - Gaining best material for recycling
    - Reduce impurities

- 8,000 containers were replaced by so-called “Kermit” containers (770 l)

Results:
- Share of impurities < 10%
“Bulky” Recyclables/ Other Waste

collection via 19 recycling centers

- since 1988
- opening hours:
  Mo – Sa; 7:00 – 18:00
  (1 recycling center opens on sundays)
- free of charge
Collection Vehicles

- total number of collection vehicles: 294
- daily on duty: 256
- reserve: 38
Maintenance/Repair of collection vehicles

Own garage with professional motor-mechanics:

• Maintenance schedule for each vehicle (in accordance with the vehicle company)
  => special maintenance after 6, 12, 24 months,…

• Repair

• Vehicles are sold after approx. 10 years
  - Repair cost too high
  - Off times too long
Involvement of disabled or disadvantaged workers

A big waste management company (such as MA 48) has several possibilities to employ disabled or disadvantaged workers:

- Employment in „side-activities“:
  - washing of containers
  - container logistics
  - inspection/supervision

- Collection of „light fractions“, such as plastics

- Street cleaning
Waste treatment
Treatment of residual waste

ca. 650,000 t/a

residual waste, bulky waste etc.

incineration plant Flötzersteig

incineration plant Spittelau

incineration plant Pfaffena

fluidized bed incinerator 4

mechanical treatment

storage

approx. 200,000 t/a

residuals from incineration (ashes/slags)

treatment of slags with separation of metals

approx. 240,000 t/a

stabilized ash-/slag concrete

landfill site Rautenweg
Waste to Energy district heating:

pipeline length: 1,100 km

flats: 330,000 (of 863,000)

major customers: 6,400

district heat: 5,500 GWh/a

~30 % by incineration of waste and sewage sludge
Treatment of Biowaste

**biowaste** (outer districts)

115,000 t/a → composting plant (since 1991) → high quality compost (A+)

organic agriculture

offer to take at recycling centers free of charge

potting soil (free of peat)

**kitchen waste, biowaste** (inner districts)

17,000 t/a → AD plant (since 2007) → 11,200 MWh/a → district heating
Waste treatment plants

• situated in Vienna

• operated by the City of Vienna

=> high level of **self-sufficiency** and **short distances**

- Landfill site Rautenweg
- Incineration plants
- Waste logistic center (incl. bale storage)
- Fermentation plant
- Waste treatment plant (ABA)
- Composting plant
Q&A
RIO DE JANEIRO’S EXPERIENCE (BRASIL)
MR. JOSE HENRIQUE PENIDO MONTEIRO, COMLURB
A big challenge:
The universalization of the collection service in Rio

The City: a mosaic of many different regions in many points of view:

- urbanistic; social; topographic; arquitectural

Total Area: 122.456,07 ha / 1.224,56 km²
Areas above 100 m height: 273 km²
Beaches extension (oceanic and internal): 106,4 km
Lakes and lagoons: 17,6 km²

Population (IBGE 2010): 6.320.446
Households (IBGE 2010): 2.146.340
Number of People per Household (IBGE 2010): 2,94
Planning Areas: 5
Neighborhoods: 161

Tropical Climate
Average annual temperature: 23,7 °C
COMLURB
Rio’s Municipal Waste Management Company

- 22,500 employees
- Annual budget: US$ 600 millions

Services under its responsibility:
- Household collection and street cleansing (10,000t/day)
- Collection on islands of the Jacarepagua lagoon
- Free collection of bulk goods and household debris
- Collection and street cleansing in low-income communities with special equipment
- Transfer and final disposal of waste
- Treatment: composting and RDF production
Services under COMLURB’s responsibility but not related to regular waste management services

• Cleaning and disinfection of 5 main hospitals of the municipal network
• Final disposal of hospital waste from the municipal public network (incineration and autoclave)
• Internal and external cleaning of 1,051 municipal schools
• Meal preparation for 350 municipal public schools
• Cleaning of the water surface of lakes and lagoons
• Cleaning of 58 km of beaches
• Trimming of 600,000 public trees
• Maintenance of the 1,200 public squares and parks
• Cleaning of public buildings (City Hall)
• Vectors Control (rodents and African snail)
• Manufacture of sweepers, tools and urban equipment (toys, slides, seesaws, comfort station, etc.)
Different sources of waste means specifics collection systems

- Household Waste
- Street Cleansing Waste
- Hospital Waste (public and private)
- Trimming Waste (public and private)
- Curb side collection for recyclables
- Free collection for household debris and bulk materials
- Collection in Low Income Communities – 3 m3 side dumping containers

✓ Commercial and non hazardous Industrial Waste (big generators)
✓ Organic Waste in Selected Generators for Composting
✓ C&D Waste from small civil works (households)
✓ C&D Waste from big civil works and condos construction
HOW COMLURB HIRES THE COLLECTION SERVICES?

- RENTAL OF ALL EQUIPMENT IN SEVEN DIFFERENT CONTRACTS (5 YEARS TERM) ACCORDING TO A PREVIOUS DETAILED PLANNING

- EACH CONTRACT HAS ALL THE NECESSARY EQUIPMENT FOR A CERTAIN REGION AND MAY INCLUDE DIFFERENT SIZES OF COMPACTORS, DUMPSTER TRUCKS, ETC.

- THE COST OF EACH EQUIPMENT INCLUDES THE COMBUSTIBLE, DRIVER, MAINTENANCE AND SPARE EQUIPMENT

- WORKERS (COLLECTORS) BELONG TO COMLURB
## Equipment Table

<table>
<thead>
<tr>
<th>PHOTO</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
<th>CONTRACTED</th>
<th>Unit Monthly Cost (US$)</th>
<th>Monthly Cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Supporting Equipment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image1.png" alt="P10" /></td>
<td>P10</td>
<td>Single Box Dumpster</td>
<td>5</td>
<td>5.323,47</td>
<td>53.234,68</td>
</tr>
<tr>
<td><img src="image2.png" alt="P10A" /></td>
<td>P10A</td>
<td>Double Dumpster</td>
<td>35</td>
<td>5.643,85</td>
<td>395.069,57</td>
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<tr>
<td><img src="image3.png" alt="P28" /></td>
<td>P28</td>
<td>Recyclables Collector</td>
<td>3</td>
<td>5.466,57</td>
<td>32.799,45</td>
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<tr>
<td><img src="image4.png" alt="P29" /></td>
<td>P29</td>
<td>Collectors for Underground Containers</td>
<td>2</td>
<td>6.794,33</td>
<td>27.177,31</td>
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<tr>
<td></td>
<td></td>
<td><strong>Dumpster Equipment</strong></td>
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<td></td>
</tr>
<tr>
<td><img src="image5.png" alt="P26" /></td>
<td>P26</td>
<td>Satellite Dumpster 3m³</td>
<td>66</td>
<td>3.192,79</td>
<td>421.447,91</td>
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<tr>
<td></td>
<td></td>
<td><strong>Compactors</strong></td>
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<tr>
<td><img src="image6.png" alt="P5A" /></td>
<td>P5A</td>
<td>Compactor 10m³</td>
<td>41</td>
<td>6.252,16</td>
<td>512.676,91</td>
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<tr>
<td><img src="image7.png" alt="P6" /></td>
<td>P6</td>
<td>Compactor 15m³</td>
<td>91</td>
<td>8.583,87</td>
<td>1.562.264,77</td>
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<tr>
<td><img src="image8.png" alt="P7" /></td>
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<td>Compactor 19m³</td>
<td>97</td>
<td>9.169,43</td>
<td>1.778.869,38</td>
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<tr>
<td><img src="image9.png" alt="P25" /></td>
<td>P25</td>
<td>Super Compactor 19m³</td>
<td>24</td>
<td>9.307,57</td>
<td>446.763,17</td>
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<td><strong>Other Equipment</strong></td>
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<tr>
<td><img src="image10.png" alt="P15A" /></td>
<td>P15A</td>
<td>Tractor Compactor 4x2 Traction</td>
<td>20</td>
<td>5.024,26</td>
<td>200.970,21</td>
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</table>

**Total Quantity of Equipment:** 384

**Total Monthly Cost:** 5,431,273,36
DIFFERENT EQUIPMENT FOR SPECIFIC SERVICES
Regular household waste collection
6,000 t/day  ~US$ 40.00/t
UNDERGROUND CONTAINERS
Street cleansing waste collection
Curb side collection for recyclables:
60 neighborhoods - 1200 t/month
Curb side collection for recyclables X MT
A quick comment
Household collection in islands
9 t/day
FREE COLLECTION FOR HOUSEHOLD DEBRIS AND BULK MATERIALS
Collection in low income communities
Collection in low income communities
Collection in low income communities
Collection in low income communities
3 m³ side containers
HOSPITAL WASTE COLLECTION
WASTE FLEET CONTROL SYSTEM
Objectives

✓ Evaluate the operational performance of the COMLURB activity;

✓ Serve as a planning tool of services aimed at increasing productivity, resource optimization and quality improvement;

✓ Control the execution of planned services, based on records obtained online the three main variables of a system of waste collection: time, distance and weight;

✓ Reduce human intervention in the process of validation of Daily Operations Report (BDO);

✓ Access online information for vehicle positioning and weights derived from landfills and of transfer stations;
**Functonalities Offered by System**

- Tracking and monitoring of vehicles through a cartographic base;

- Automation of Daily Operations Report, enabling the validation process of the documents by operating offices;

- Management reports that assist the managers in making decisions, always aiming at the optimization of resources;

- Alert system to identify vehicles traveling outside the municipality of Rio de Janeiro;

- Control the milestones of the operating cycle;
How does the tracking work?
Milestones controlled by the System

- Garagem
- Estação de Transferência
- Aterro
- Garagem

- Saída
- Saída
- Término
- Saída
- Término
- Saída / Baixa
- Saída / Baixa
- Entrada

- Entrada
- Início
- Entrada
- Início
- Entrada
- Entrada

- Displacement
- Management Office
- In Service
- Transit
- Dumping Sites
Opening Screen – For the Operating Manager

Companhia Municipal de Limpeza Urbana

Apresentações por Gerência - OG18G - 12/2008

Controle de Produção - Pesagens - 12/2008

Número de Apresentações | 37 | 34 | 38 | 33 | 26 | 25 | 2

Número de Apresentações com Acidentes | 0 | 0 | 0 | 0 | 0 | 0 | 0

Número de Carros Utilizados | 19 | 20 | 18 | 19 | 0 | 0 | 0

Km por apresentação | 93,48 | 84,39 | 78,15 | 74,89 | 0 | 0 | 0

Peso por Apresentação (Ton) | 17,05 | 10,27 | 13,87 | 12,19 | 0 | 0 | 0

Peso / Carro (Ton) | 27,92 | 16,94 | 20,81 | 17,32 | 0 | 0 | 0

Km / Carro | 152,53 | 139,25 | 117,32 | 106,42 | 0 | 0 | 0
**BDO (Daily Operating Report) Complete**

### Número BDO: 12002091208
- Empresa: Stralu
- Prefixo: Q36
- Tipo Bem: Compactador
- Sub Tipo Bem: P7

### Gerência:
- SG13M
- Roteiro: 12002
- Garagem: 3

### PAY:
- Serviço: Roteiro Domiciliar
- Turno: 1º Turno
- Inicio: 07:00
- Fim: 18:20

### KM Percorrido:
- 97

### Contrato:
- 019/2008
- Faturar: Sim
- Considerar H-E: Sim
- Apresentação Extra: Normal

### Veículo Reservado:
- Não

### Garagem:
- SALES Garagem: 12:00:00
- Chegada Garagem: 18:00:00

### Status:
- Aprovado
- Atestado por: LUIZ CLAUDIO

### Evento BDO:
- Atendimento no vazado
- Congestionamento
- Defeito na Bob cat
- Fall na balança
- Outros

### Ocorrência BDO:

### Peso BDO:

<table>
<thead>
<tr>
<th>Data Recebida</th>
<th>Peso Recebido</th>
<th>Data Chegada</th>
<th>Peso Chegada</th>
<th>Data Saída</th>
<th>Peso Saída</th>
<th>Peso Líquido</th>
<th>Vazadouro</th>
<th>Gerência Produção</th>
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<td>08/12/2008</td>
<td>23630</td>
<td>08/12/2008</td>
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<td>13660</td>
<td>10970</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>08/12/2008</td>
<td>17:30:00</td>
<td>19500</td>
<td>8720</td>
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### Resumo BDO:

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<th>Fruta</th>
<th>Início</th>
<th>Fim</th>
<th>Km</th>
<th>Duração</th>
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<td>Q36</td>
<td>08/12/2008 07:00:00</td>
<td>05/12/2008 07:10:00</td>
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<td>00:10:00</td>
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<tr>
<td>Em Transito</td>
<td>Q36</td>
<td>05/12/2008 07:14:00</td>
<td>05/12/2008 07:26:00</td>
<td>3</td>
<td>00:12:00</td>
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<tr>
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<td>Q36</td>
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<td>05/12/2008 11:33:00</td>
<td>5</td>
<td>00:21:00</td>
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<tr>
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<td>05/12/2008 11:57:00</td>
<td>05/12/2008 12:31:00</td>
<td>4</td>
<td>00:34:00</td>
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<td>Em Transito</td>
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<td>05/12/2008 13:12:00</td>
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<tr>
<td>Em Servigo</td>
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<td>05/12/2008 15:58:00</td>
<td>4</td>
<td>02:46:00</td>
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<tr>
<td>Em Transito</td>
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<td>05/12/2008 18:41:00</td>
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<td>02:31:00</td>
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<td>Em Transito</td>
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<td>00:26:00</td>
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### Leituras do Scanner:

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<tr>
<th>Tipo Informação</th>
<th>Informação</th>
<th>Data</th>
<th>Referência</th>
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<tbody>
<tr>
<td>MOTORISTA</td>
<td>ANDRE LUIZ B DE FIGUEIREDO - CIFRA - 000466</td>
<td>05/12/2008 07:03:00</td>
<td>SG13M, SG13C, Rio de Janeiro - RJ</td>
</tr>
<tr>
<td>ROTEIRO</td>
<td>13002 - 13003</td>
<td>05/12/2008 07:04:17</td>
<td>SG13M, SG13C, Rio de Janeiro - RJ</td>
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### Tripulante BDO:

<table>
<thead>
<tr>
<th>Nome</th>
<th>Gerência de Lotação</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>VEICULOS (OU TIPOS DE VEICULOS)</td>
<td>Q37*</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>PREFIXO</td>
<td>KVT 3237</td>
</tr>
<tr>
<td>PLAÇA</td>
<td>56</td>
</tr>
<tr>
<td>EVENTOS</td>
<td>87</td>
</tr>
<tr>
<td>APRESENTAÇÕES</td>
<td>3107</td>
</tr>
<tr>
<td>VAZAMENTOS</td>
<td>2908</td>
</tr>
<tr>
<td>KM MANUAL</td>
<td>758 / 26.07%</td>
</tr>
<tr>
<td>KM PERCORRIDOS</td>
<td>275 / 9,46%</td>
</tr>
<tr>
<td>EM SERVIÇO</td>
<td>1743 / 59,94%</td>
</tr>
<tr>
<td>ESTAÇÃO DE VAZAMENTO</td>
<td>118 / 4,06%</td>
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<tr>
<td>DESLOCAMENTO</td>
<td>14 / 0,48%</td>
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<tr>
<td>TEMPOS</td>
<td>428:17:00</td>
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<td>EM SERVIÇO</td>
<td>294:00:00 / 68,65%</td>
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<td>ESTAÇÃO DE VAZAMENTO</td>
<td>39:00:00 / 9,11%</td>
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<td>DESLOCAMENTO</td>
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<tr>
<td>GERENCIA</td>
<td>25:18:00 / 5,91%</td>
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<tr>
<td>TRANSITO</td>
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<tr>
<td>PESO</td>
<td>841,23 t</td>
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<td>PREFIXO</td>
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<td>---------</td>
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<td>PLACA</td>
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<td>EVENTOS</td>
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### ÍNDICADORES

#### KM MÉDIOS

<table>
<thead>
<tr>
<th>P/ APRESENTACAO</th>
<th>51,93 km</th>
<th>39,91 km</th>
<th>54,91 km</th>
<th>30,87 km</th>
<th>54,31 km</th>
<th>17,11 km</th>
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<tbody>
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<tr>
<td>NA GERENCIA</td>
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<td>P/ APRESENTACAO</td>
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<td>04:52:23 h</td>
<td>05:21:58 h</td>
<td>04:45:10 h</td>
<td>04:25:46 h</td>
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#### KM EM SERVIÇO

<table>
<thead>
<tr>
<th>P/ APRESENTACAO</th>
<th>13,54 Km</th>
<th>1,00 Km</th>
<th>12,98 Km</th>
<th>7,45 Km</th>
<th>11,06 Km</th>
<th>3,80 Km</th>
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<tbody>
<tr>
<td>TEMPO EM SERVIÇO</td>
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<tr>
<td>P/ APRESENTACAO</td>
<td>05:15:00 h</td>
<td>00:34:18 h</td>
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#### PESOS MÉDIOS

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<tr>
<th>P/ HORA EM SERVIÇO</th>
<th>2,06 t/h</th>
<th>24,65 t/h</th>
<th>3,34 t/h</th>
<th>3,27 t/h</th>
<th>3,53 t/h</th>
<th>3,31 t/h</th>
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<tbody>
<tr>
<td>P/ KM EM SERVIÇO</td>
<td>1,11 t/km</td>
<td>14,09 t/km</td>
<td>1,25 t/km</td>
<td>2,36 t/km</td>
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<tr>
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<td>15,02 t</td>
<td>14,09 t</td>
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<td>17,56 t</td>
<td>16,80 t</td>
<td>14,67 t</td>
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<tr>
<td>APROVEITAMENTO CAP.</td>
<td>84,08%</td>
<td>86,59%</td>
<td>85,82%</td>
<td>82,60%</td>
<td>81,32%</td>
<td>89,94%</td>
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<tr>
<td>VIAGENS C/ EXCESSO PESO</td>
<td>28</td>
<td>28</td>
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<td>33</td>
<td>24</td>
<td>30</td>
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<tr>
<td>VEL. MÉDIA DE SERVIÇO</td>
<td>2,58 km/h</td>
<td>1,75 km/h</td>
<td>2,66 km/h</td>
<td>1,39 km/h</td>
<td>2,33 km/h</td>
<td>0,86 km/h</td>
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### GRÁFICOS

<table>
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<tr>
<th>KM PERCORRIDOS</th>
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<tbody>
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<td>Link</td>
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<td>Link</td>
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<td>Link</td>
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<tr>
<td>APROVEITAMENTO/DIA</td>
<td>Link</td>
<td>Link</td>
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### IMPRESSÃO
### Relatório Analítico BDO - Viagens - Pag. 1 de 16 (458 registros)

<table>
<thead>
<tr>
<th>BDO</th>
<th>Código de Serviço</th>
<th>Capacidade do Veículo (t)</th>
<th>Viagens</th>
<th>Guarnição</th>
<th>Período</th>
<th>Dia da Semana</th>
<th>Serv. Km (km)</th>
<th>Serv. Peso (t)</th>
<th>Serv. Temp (hrs)</th>
<th>Ton/Hora em Serv. (t/h)</th>
<th>Serv. Peso (t/km)</th>
<th>Ap. U. Viaj</th>
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<tbody>
<tr>
<td>10D130111006</td>
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## Relatórios Fornecidos pelo Sistema

### FOLHA RESUMO DE MEDIÇÃO

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### Relatório de desempenho por contrato e período

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### Busca em Controle da Produção de Viaturas e Equipamentos

- **Tipo de Bem:** Compactador
- **SubTipo:** P7
- **Prefixo:** Todos
- **Gerência:** SG10R
- **Contrato:** Selecione
- **Turno:** 1º Turno
- **Scanner:** Todos
- **Apresentação:** De: 01/11/2008 Até: 30/11/2008
- **Status:** Aprovado
- **Faturar:** Sim

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WHAT’S NEXT?
EMISSIONS REDUCTION AND FLEET OPTIMIZATION MEASURES
(In collaboration with C40)

➢ Alternative Fuels (10% minimum renewable fuels)
  ✓ Biodiesel
  ✓ Sugar Cane Diesel
  ✓ Ethanol
  ✓ Natural Gas

➢ Non Power Train Measures
  ✓ Euro V compliance
  ✓ Hybrid Hydraulic
  ✓ Eco-driving
  ✓ Green Tires
  ✓ Routes Optimization (weight on time and fleet control)
For more information on Environment and Solid Waste Management:

http://www.rio.rj.gov.br/web/comlurb
/www.web-resol.org
Q&A
Links to our organisations

- City of Vienna (MA48) [https://www.wien.gv.at/umwelt/ma48/](https://www.wien.gv.at/umwelt/ma48/)
- CIC- Italian Composting and Biogas Consortium [www.compost.it](http://www.compost.it)
- Contarina [http://www.contarina.it/](http://www.contarina.it/)
- ISWA : [www.iswa.org](http://www.iswa.org)
- SCOW Project [www.scow-biowaste.eu](http://www.scow-biowaste.eu)
- Urban Ecology Agency of Barcelona: [www.bcnecologia.net](http://www.bcnecologia.net)
- Waste Agency of Catalonia: ARC [www.arc-cat.net](http://www.arc-cat.net)
Many thanks!!

For any further information please contact the speakers:

- Marco Ricci:  
  ricci@compost.it

- Marta Villa  
  vila@bcnecologia.net

- Rainer Kronberger  
  rainer.kronberger@wien.gv.at

- Jose Henrique Penido Monteiro  
  jpenido@web-resol.org

- Marco Mattiella  
  marco.mattiello@contarina.it; progetti@contarina.it
Please kindly provide your feedback on the webinar by filling in the very brief questionnaire

https://www.surveymonkey.com/s/PWDBBZ2