



## CITYPORTS subproject Graz

**G**raz – **I**ntegrated **R**everse & **R**ecycling **L**ogistics  
GIR<sup>2</sup>L

Part of the CITYPORTS Project, funded under the  
INTERREG III B CADSES programme

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Austrian Mobility Research



## Partners

Main partner: FGM- Austrian Mobility research

Subcontractor subproject I

### Saubermacher

Austria's biggest private waste disposal enterprise, founded in 1979, with around 1100 employees in 825 municipalities in Styria, Carinthia, Lower Austria and Vienna, Slovenia, Croatia, Hungary, the Czech Republic, Greece and Albania.



Partner subproject II

### City of Graz

operational enterprise Wirtschaftsbetriebe GmbH  
700 employees

Department for domestic waste collection

Ca. 36.000 waste bins in total serviced

2 million bins serviced/depleted per year





## Project Sheet Subprojects



### Dynamic rerouting

- Partner/Subcontractor
  - Saubermacher , Styrias biggest waste collector
- Aims
  - Improve efficiency in terms of  $\text{km}/\text{m}^3$
  - Improve specific fuel consumptions, emissions and wear and tear
- Proceeding
  - On Board devices monitoring driving style and supporting route finding
  - Central optimisation/ merging of trips - Fleet management system

### Strategic routing

- Partner
  - City of Graz, Utility services - waste collecting unit
- Aims
  - Improve efficiency in terms of  $\text{km}/\text{m}^3$  and man hours for the manual loading
  - Optimise indirect impacts on city traffic and neighbourhood
- Proceeding
  - Benchmarking with other Styrian cities
  - Monitoring efficiency
  - Optimising routes and operational scheme



## Approach

- Analysis
  - Data/Benchmarking (km/m<sup>3</sup> or km/t)
  - Functional/organisational requirements
- Development
  - Action model: solutions to Improve collecting efficiency to minimize impacts on traffic & neighbourhoods
  - System specification
- Assessment
  - Cost/Benefits
  - Feasibility
- Planning Implementation
  - Procurement
  - Procurement plan
  - Test plan functional- & integration testing
  - Evaluation plan





## Demonstration Saubermacher Styria

- Motivation

- Analysis shows a potential to further optimize the collection of domestic waste
- Waste collection from point sources (industry) is very costly without optimisation



- Objectives

- General

- Minimize the specific emissions
- Minimize km travelled per collected ton/m<sup>3</sup>

- In Detail

- Improve the quality of the strategic routing
- Allow spontaneous additional jobs
- Monitor the vehicle resp. engine condition







## Project Setup Saubermacher



- **Working Hypothesis**

- Efficient Flexible Services require flexible planning and telematics (ICT) support,
- dynamic rerouting for waste collection from industry may be combined with fixed routes for collecting domestic waste

- **Validation**

- using mini scanners to verify savings

- **Sub Project Setup**

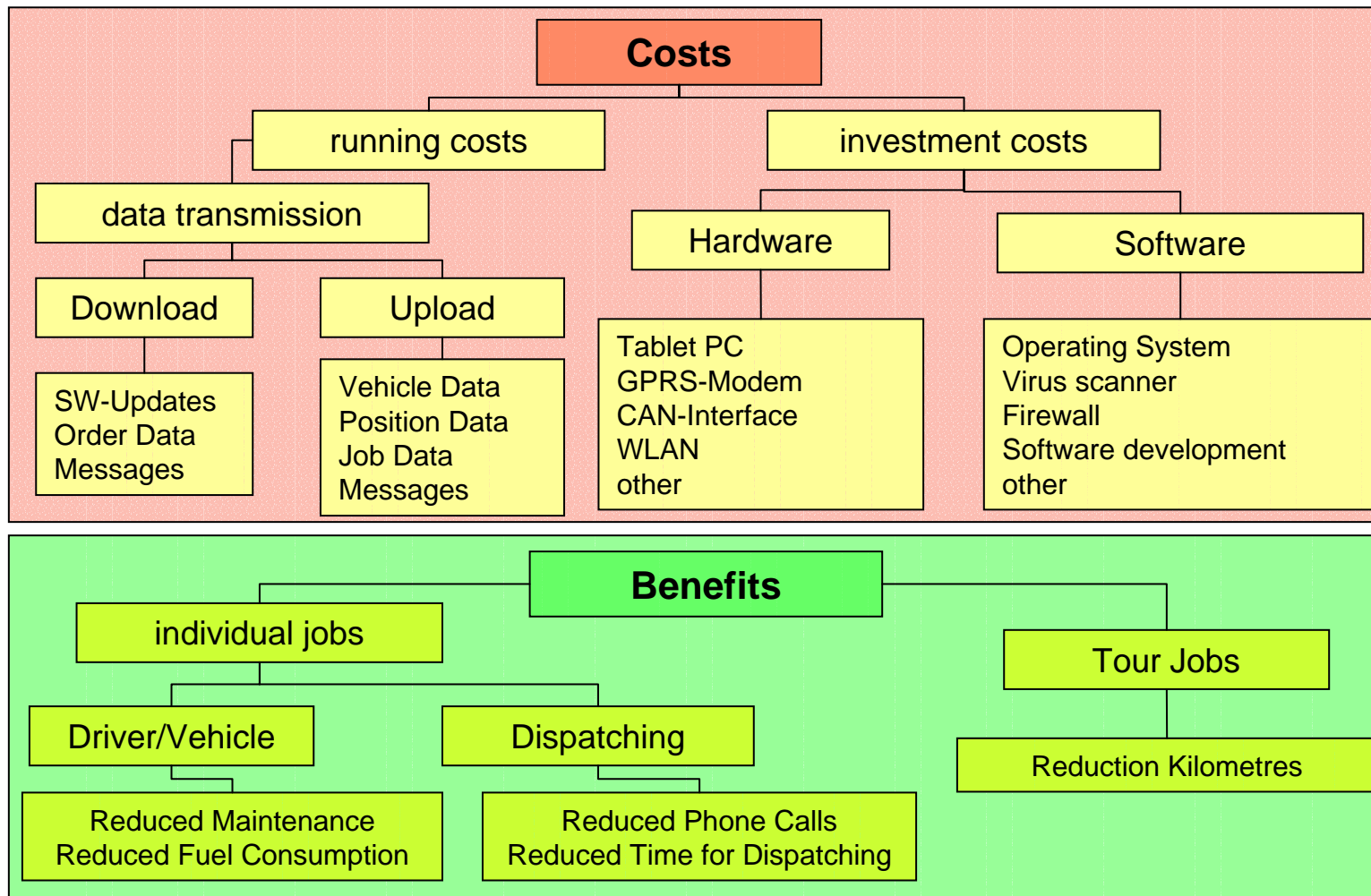
- On Board units – interfaced with the on board systems
- tracking & tracing
- Monitoring of the Driver behaviour

Navigation – Routing and monitoring	Driver and Driving style
Vehicle performance and usage	Accounting e-commerce



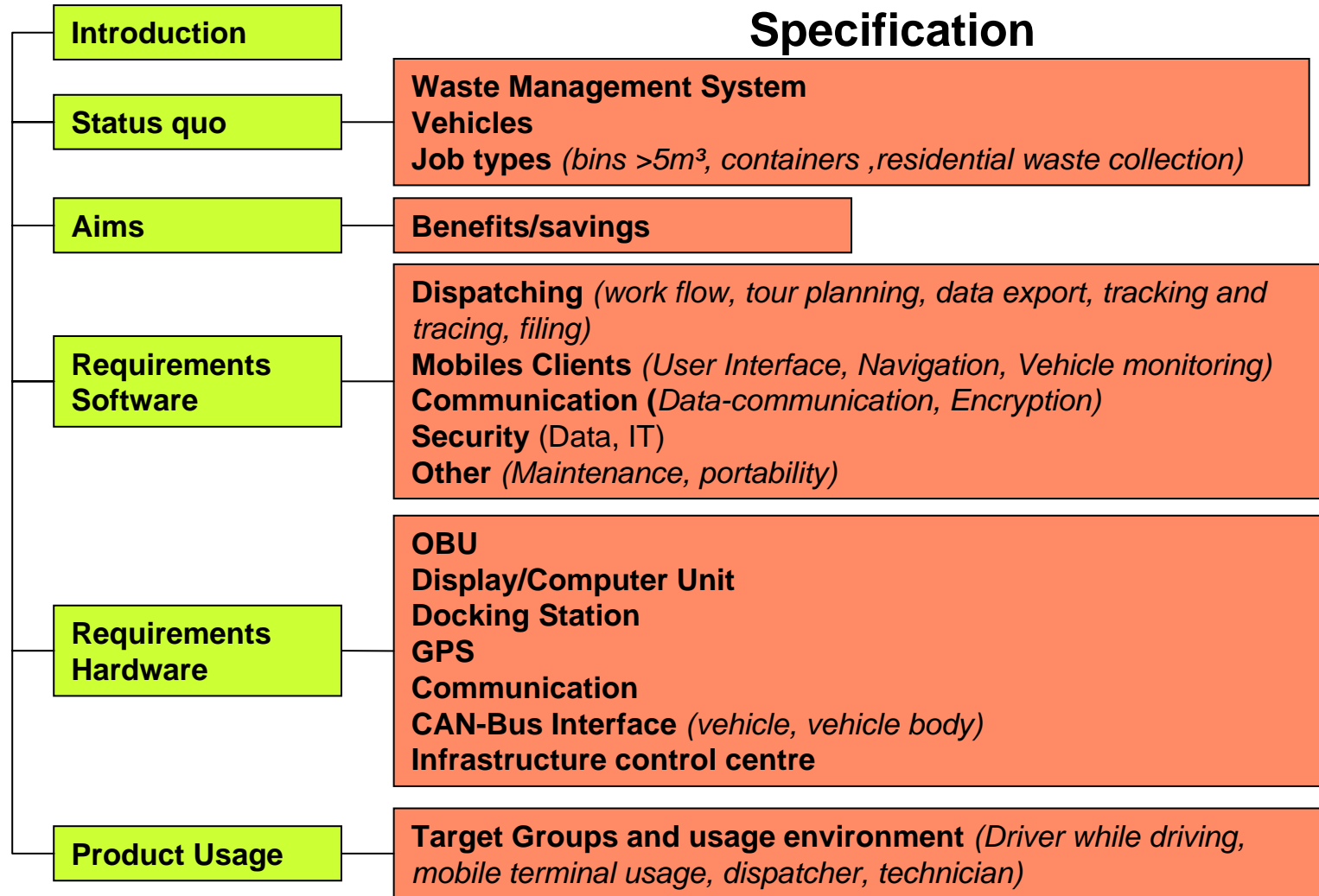


# Graz - Integrated Reverse & Recycling Logistics





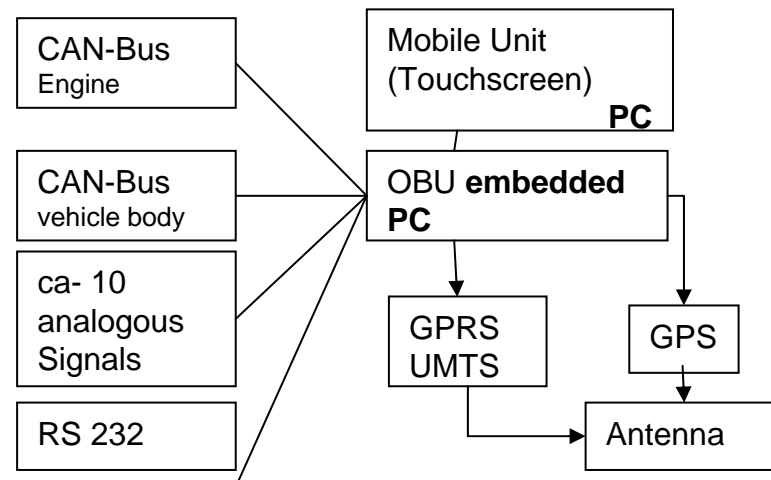
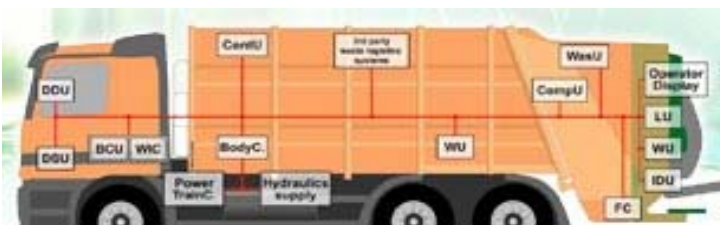
# Graz - Integrated Reverse & Recycling Logistics





## Results Saubermacher

- Enabling of effective services feasible
  - optimised fixed routes, merging of trips
  - navigation aid for drivers
- Basis for eco-controlling available
  - on board units allow for the collection of data
  - service data is used for monitoring the efficiency of the services (km/container or km/m<sup>3</sup>)
  - vehicle operation data is used to monitor the efficiency of the vehicles and the driving style





## Demonstration City of Graz



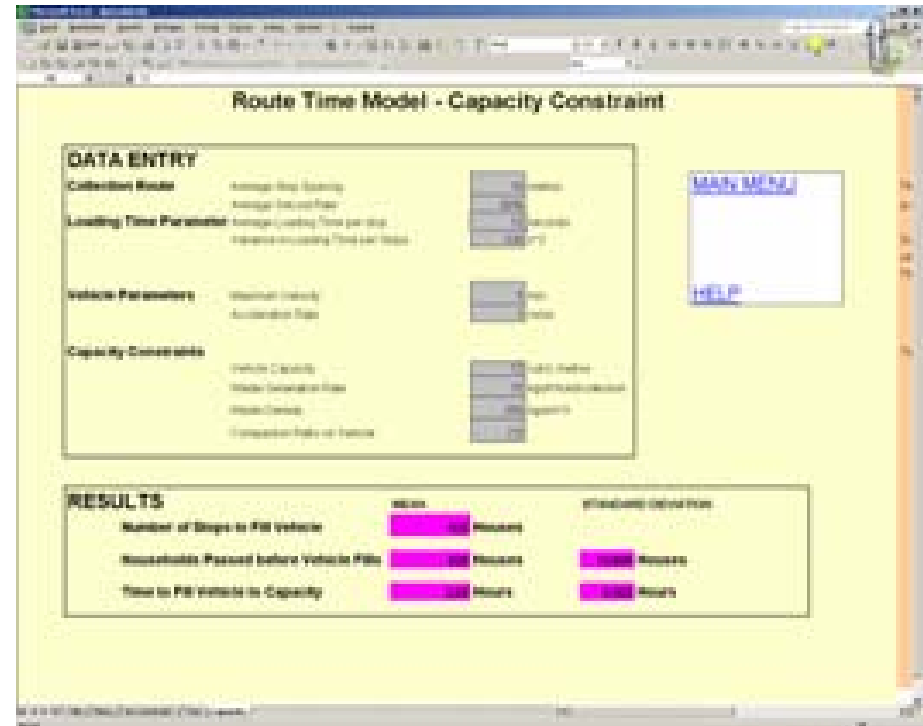
- Objectives
  - Generally
    - Minimize km travelled per collected ton/m<sup>3</sup>
  - In detail
    - Reduce return trips for discharging
    - Minimize side impacts on other traffic/population
- Sub Project Setup
  - Benchmarking
  - redefinition of Strategic routes
  - No On Board Telematics
  - Synergies introduction 3-axle vehicles





## Background Route Optimisation

- Route-Time Model
  - capacity restraints
    - the vehicle has to be discharged if the capacity is not sufficient to hold the volume which could be collected during the working time
  - time restraints
    - The vehicle has to return after the end of the working time even if the capacity of the vehicle has not been depleted.





## Strategic Routing

- reducing unproductive legs

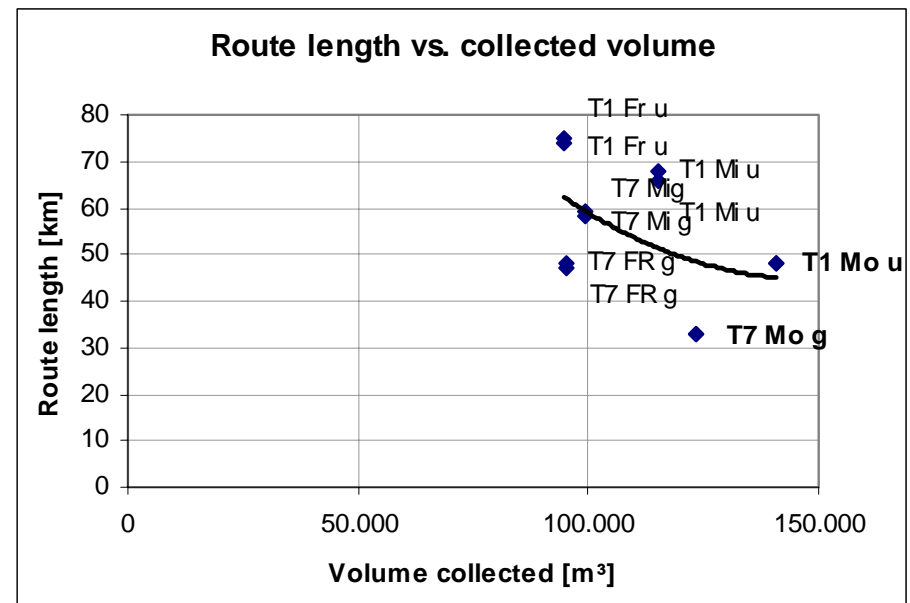
unproductive legs result from a high average distance for the entry points in the service area measured from the discharge/starting point





## Preparing Strategic Route optimisation

- Benchmarking
  - benchmarking from tacho disc and client database feasible
- Logging
  - additional data from GPS added manual data acquisition





## Optimisation

- Route optimisation
  - theoretical potential for optimisation validated
- Vehicle capacity
  - bigger service area per route (time restraint)
  - not possible with steep regions which require small vehicles



+40 stops

- 2.5 km



## General Lessons Learned

- Realistic timeframe
  - business re-engineering takes time
  - waste collection is regulated by law and not easy to change on a region spanning level
- Liberalisation of utilities and public services is a chance but also leads to new fears
- Technology is an enabler of efficiency
  - vehicle capacity/loading and press technology
  - routing/tracking&tracing/monitoring
- Strategy needed to facilitate the implementation
  - Investments into new vehicles to solve the basic logistic problem (multi purpose vehicle) is hampered by reduced city budgets
  - approach has to meet drivers on a level playing field
  - synergies with other policies are needed
    - environmental policies
    - financial policies





Thanks for your Attention!  
Any Questions?

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