

Technological solutions for data communication in pay-as-you-throw (PAYT) waste tariffs

C. Dias-Ferreira^{1,2}, R. C. Madureira³, A. Branha¹, R. L. Aguiar⁴, J. P. Barraca⁴

⁽¹⁾ Research Center on Natural Resources, Environment and Society (CERNAS), Polytechnic Institute of Coimbra, Portugal ⁽²⁾ Universidade Aberta, Lisbon, Portugal

⁽³⁾ Research Unit on Governance, Competitiveness and Public Policies (GOVCOPP), University of Aveiro, Portugal

⁽⁴⁾ Telecommunications Institute (IT), University of Aveiro, Portugal

Introduction

Waste collection is complex and costly, requiring elaborate logistics. Technology is a great ally to achieve both optimization and transparency on the handling of municipal solid waste. A smart waste management requires interconnection among heterogeneous devices and teams: the population, the local authorities, the service providers and the country governments. This work describes the technical approaches and field solution for smart waste management for PAYT (Pay-as-you-throw) systems.

Technical approaches

The technological approaches to implement smart waste management systems associated to PAYT tariffs - from the waste deposition by the user to issuing the invoice - can be divided into 3 modules:





Type of communication network	Max speed rate	Battery lifetime	Range	Capital costs	Operation al costs
Cellular					
2G (EDGE)	200 kbps	++	++	Low 1 SIM card per container	<u>High</u> monthly fee for each SIM card
3G (HSDPA)	21 Mbps	+	+		
4G (LTE Advanced)	150 Mbps	-	+		
IoT LoraWAN	0,25 -5,4 kbps	++++	++++	High requires network infrastructure	Low no monthly fee
SigFox	800 bps	++++	++++	Low only individual transmitters	Medium annual fee



User interface

Data Module

Authentication

Module

Log Module





Acknowledgements

The authors would like to express appreciation for the financial support of the LIFE programme of the European Union (LIFEPAYT - LIFE15ENV/PT/000609) and FCT – Portuguese Foundation for Science and Technology (CERNAS - UID/AMB/00681/2013).



