



Typology of Operational Models within Informal Waste Management and Recycling Sector

Dr Costas Velis

c.velis@leeds.ac.uk

Co-authors: Heather Purshouse¹, Jacqueline Rutkowski², Emilia Rutkowski³, David Lerpiniere¹

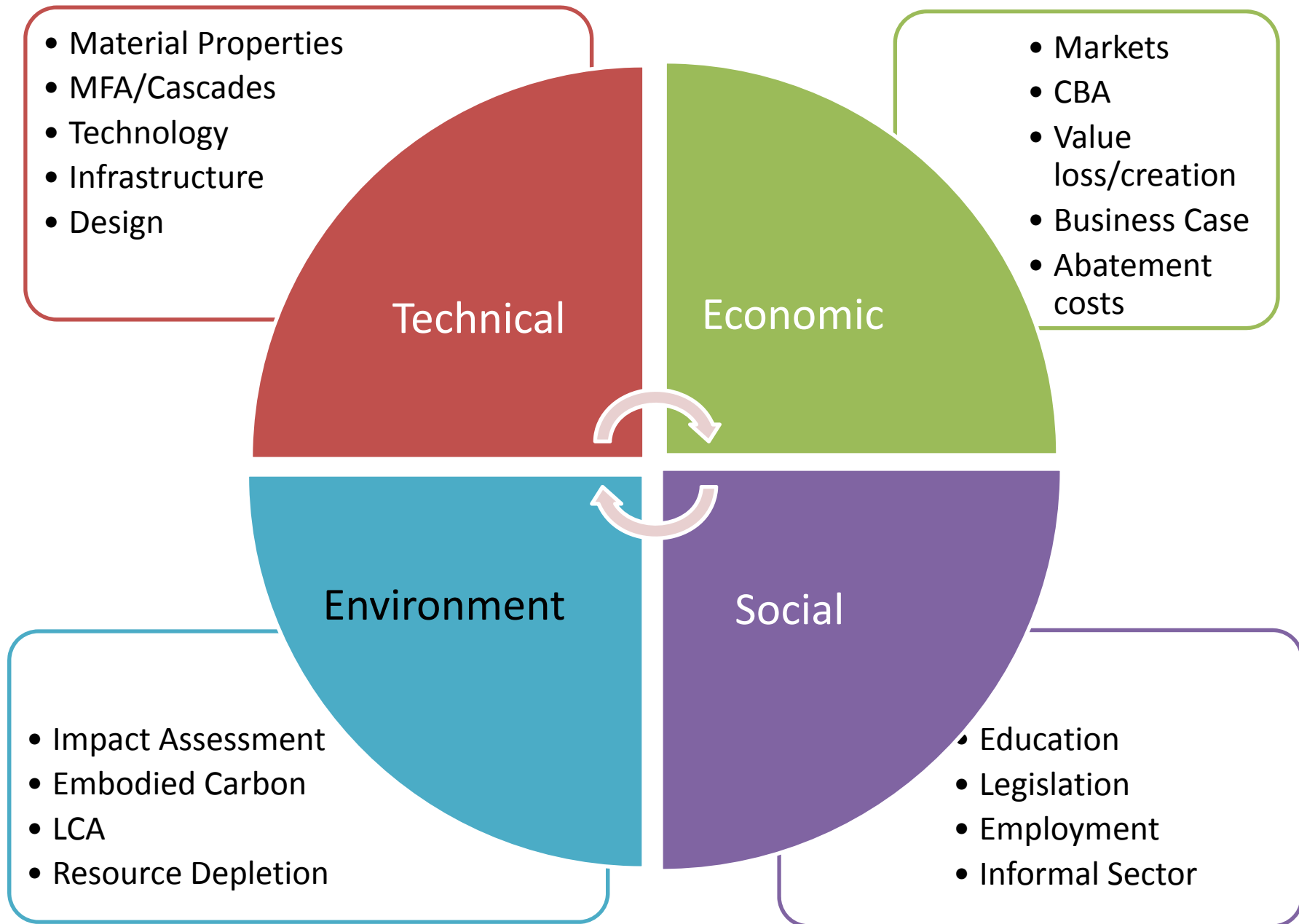
¹ School of Civil Engineering, University of Leeds, Leeds, West Yorkshire, LS2 9JT, UK² SUSTENTAR Institute for Sustainability Studies and Research, Belo Horizonte, Minas Gerais, Brazil

³ FLUXUS Laboratory, School of Civil Engineering, Architecture, and Urban Design, UNICAMP, Campinas, São Paulo, Brazil

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CERRY: Circular Economy & Resource Recovery





Informal Recycling Sector (IRS)

- Solid waste management (SWM) - essential service
- Materials recycling/reuse valuable for environment and society
- Informal sector is diverse and innovative
- Need to understand 'ecosystem' of actors and how they interact



IRS analytical and decision support tools



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Wasteaware Cities Indicators
Benchmarking for Integrated Sustainable Waste Management in Cities

CHALLENGE

- Lack of data to major problems in integrated sustainable waste management in cities both North and South to allow benchmarking, comparison and monitoring of developments over time.
- Criterion is compounded by increasing heterogeneity in waste management systems, and by wider factors.
- Any internationally comparative benchmarking system must be able to handle a wide range of waste management systems, and be robust to this.

AIMS

- Develop and test indicator set for integrated sustainable waste management in cities both North and South to allow benchmarking, comparison and monitoring of developments over time.
- Explicitly consider waste picker contribution to recycling.

WORLD VIEW

Kampala, Uganda
100% recycling rate
100% recycling rate
100% recycling rate

DELIVERABLES

- Indicator set developed based on integrated sustainable waste management (ISWM) framework, and applied to 40 city case studies.
- Academic paper and supporting decision support tool to measure the performance of a city's ISWM system in terms of waste management, and to be used by cities.

CASE STUDY RESULTS

- For each city, a volume of waste to be recycled is calculated, and compared to the city's recycling rate.
- Recycling rates are relatively high, but in some cases are low, and in some cases are low.
- Most comprehensive and inclusive benchmarking system to date.

OUTCOMES

- Adopted by Global Waste Management Outlook and World Urbanization Prospects to give worldwide waste coverage.
- Academic paper, 2015 ISWA Publication Award and CWM 2014-15 James Jackson Medal for major contributions to waste management.
- Most comprehensive and inclusive benchmarking system to date.

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PROJECT FUNDERS

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CONTACT: Dr. Colette Wells
colette.wells@leeds.ac.uk

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CVORR
Complex Value Optimisation for Resource Recovery from Waste

CHALLENGE

- Waste pickers recover value from waste, but to measure this value as a complex variable of environmental, economic, social and technical domains.
- Enable optimal circular economy pathways using whole-systems approach, preventing degradation of value into waste and maximising resource recovery.

AIM

- Produce novel methodology for systems analysis of resource recovery from waste systems.
- Combine micro and macro level measurements with assessment of multi-dimensional flow value.
- Produce toolkit for analysing resource recovery processes and optimisation of value system complex value.

IMPACT

- CVORR multi-dimensional analysis can assess informal recycling sector contribution to the circular economy.
- Help cities, research, policy, industry, academia, and business to understand the value of informal recycling that maximises environmental benefits.
- Enable 'hidden value' currently being trapped in waste systems, exposing true resource recovery and opportunities.

INFORMAL RECYCLING SECTOR PLASTIC WASTE FLOW - CASE STUDY OF BUENOS AIRES

DELIVERABLE

- CVORR framework and toolkit for evidence-based contribution of informal recycling sector to circular economy.
- Key stages in tool application:

CASE STUDY

- Buenos Aires, Argentina
- Over 6,000 tonnes of plastic waste value chain
- Over 6,000 tonnes of plastic waste value chain
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OUTCOMES

- Development of holistic plastic material and value flow model, applicable to all basic economic models in Global South.
- Publication on plastic resource recovery for Global Resource Management Task Force.
- CVORR concept and tool disseminated through ISWA International Knowledge Exchange Workshops.

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EWIT
E-Waste Web-based Implementation Toolkit

CHALLENGE

- Increased volume of electronic and electronic products being waste and as part of a global phenomenon.
- Desire for products to be designed for ease of disassembly and repair, and for ease of recycling.
- Increasing volume of electronic waste, and the need for a global phenomenon.

AIM

- Develop E-waste Implementation Toolkit (EWIT) to identify conditions necessary to implement effective E-waste management systems in urban Africa.
- Establish online Knowledge Base to inform and support stakeholder interventions as communities adapt to the requirements of E-waste management.

PROJECT STRUCTURE

- Formation of international partnership - research authorities from Kenya, South Africa, Uganda and South Africa, together with funding bodies in Africa, Europe, and Asia.
- Supported by specialists from academia, the waste sector, technical institutions, EWIT project partners, knowledge transfer and development locally, national and international.

DELIVERABLES

- EWIT web portal: ewit.leeds.ac.uk
- Free online resource available in English and French.
- 'Wizard' feature provides fast-track introduction to E-waste priority issues, tailored to local context.
- Action Plan for Kenyan E-waste developed.
- Establishment of Kenya's first E-waste recycling collection facility.

CASE STUDY

Kenya, Kenya
Priority and next steps
Establishment of Kenyan E-waste recycling collection facility.

OUTCOMES

- Comprehensive baseline dataset of E-waste management in African metropolitan areas developed.
- Dynamic, free, easy-to-use online portal provided to organisations across Africa.
- Four cities involved in EWIT established Action Plans and will act as flagship projects for E-waste management within Africa.

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SoCo: Solidary Selective Collection and Inclusive Recycling Analysis Tool



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Actor Spreadsheets



Basic information

Material flows

Actor information

Combined material flows

Costs and revenues

Social and environmental

Financial summary

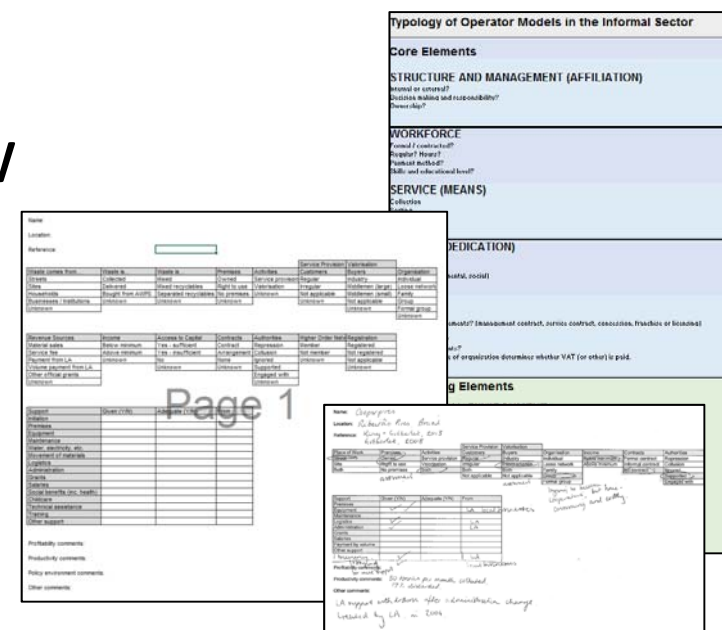
Combined metrics

Master Spreadsheet



Method

- Systematic literature review
- Screening of literature
- Extraction of information
- Analysis



Search Terms	Databases and Websites Searched	Results
Informal recycl* OR waste pick* OR (waste AND informal) AND [Individual Latin American country names] OR Latin America OR Caribbean	Web of Science Scopus ScienceDirect Websites of relevant organisations: WIEGO, GIZ, World Bank, Inter-American Development Bank Google	403 abstracts retrieved from journal databases. 103 sources retrieved after removing irrelevant, duplicated, or inaccessible results. 28 case studies extracted after screening for sufficient detail.

Results – Literature Review



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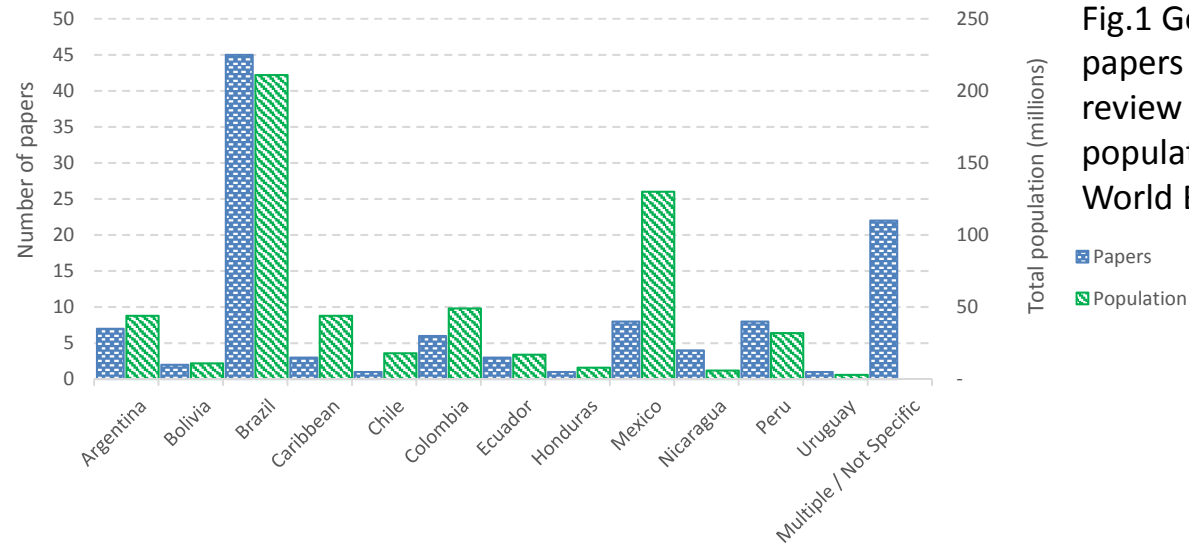


Fig.1 Geographical focus of papers retrieved from literature review and country population; population data taken from the World Bank data base

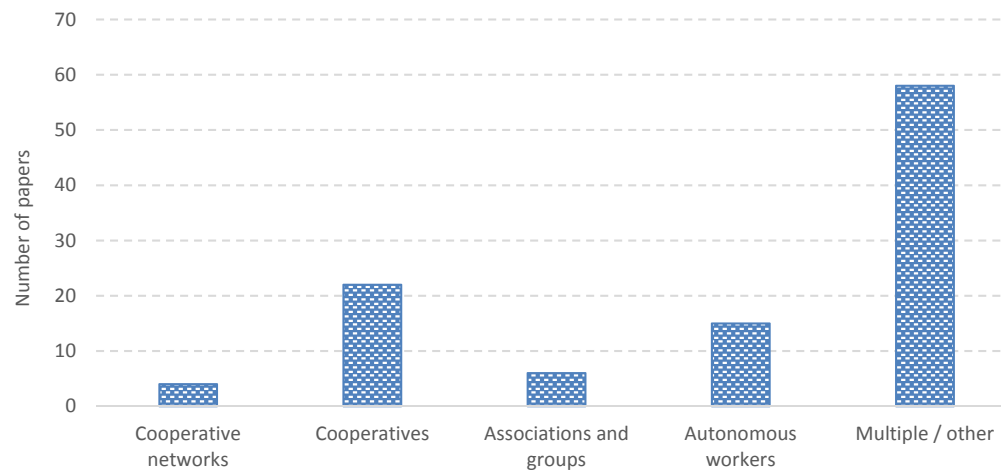


Fig. 2 Organisational models mentioned and discussed in the papers retrieved from literature review

Results - Typology

Primary focus is:	Type	Activities	Primary purpose is:
Removing waste	I	Waste collection service	Service provision
	II	Waste collection service Recyclables are separated	Service provision and valorisation
Collecting recyclables	III	Recyclables collected	Valorisation
	IV	Recyclables collection service Rejects are separated	Service provision and valorisation

Ten common configurations identified from literature review and case studies

Results - Typology



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Type	Configuration	Description	Example
1a		Waste collection service – waste is collected directly from households and disposed (either at a landfill or open dumpsite) by the IWMRS.	Carroceiros, Belo Horizonte, Brazil, prior to intervention [1]
1b		Waste collection service – waste is collected directly from households by the IWMRS and deposited at a transfer station. Waste is then collected and disposed by the LA.	Carroceiros, Belo Horizonte, Brazil [1]

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 Local Authority 
 Private Industry 

- [1] Dias, S.: Recycling in Belo Horizonte , Brazil – An Overview of Inclusive Programming Recycling of Materials from Domestic Waste. WIEGO Policy Br. (Urban Policies) No 3. 1, 1–8 (2011)
- [2] Medina, M.: Border scavenging: A case study of aluminum recycling in Laredo, TX and Nuevo Laredo, Mexico. Resour. Conserv. Recycl. 23, 107–126 (1998). doi:10.1016/S0921-3449(98)00019-6
- [3] Hernandez, O., Rawlins, B., Schwartz, R.: Voluntary recycling in Quito: factors associated with participation in a pilot programme. Environ. Urban. 11, 145–160 (1999). doi:10.1177/095624789901100213
- [4] Campos, M.J.Z., Zapata, P.: Switching Managua on! Connecting informal settlements to the formal city through household waste collection. Environ. Urban. 25, 225–242 (2013). doi:10.1177/0956247812468404
- [5] Scheinberg, A., Simpson, M., Gupta, Y., Anschütz, J., Haenen, I., Tasheva, E., Hecke, J., Soos, R., Bharati, C., Garcia-Cortes, S., Gunsilius, E.: Economic Aspects of the Informal Sector in Solid Waste Management. , Eschborn, Germany (2010)
- [6] Medina, M.: Waste Picker Cooperatives in Developing Countries. WIEGO/Cornell/SEWA Conf. Membership-Based Organ. Poor, Ahmedabad, India, January 2005. 1–36 (2005). doi:10.4324/9780203934074
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- [8] Rutkowski, J.E., Rutkowski, E.W.: Expanding worldwide urban solid waste recycling : The Brazilian social technology in waste pickers inclusion. Waste Manag. Res. 33, (2015).
- [9] King, M.F., Gutberlet, J.: Contribution of cooperative sector recycling to greenhouse gas emissions reduction: A case study of Ribeiro Pires, Brazil. Waste Manag. 33, 2771–2780 (2013). doi:10.1016/j.wasman.2013.07.031
- [10] Gutberlet, J.: Empowering collective recycling initiatives: Video documentation and action research with a recycling co-op in Brazil. Resour. Conserv. Recycl. 52, 659–670 (2008). doi:10.1016/j.resconrec.2007.08.006
- [11] Inter-American Development Bank: Regional policy dialogue 1. <http://brik.iadb.org/handle/iadb/80838>. (2002). Accessed 1 December 2016

Results - Typology



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Type	Configuration	Description	Example
Ila		Waste collection service with recyclables diversion – waste is collected directly from households, recyclables are separated and sold, and remaining waste is disposed (either at a landfill or open dumpsite) by the IWMRS.	Recyclers in Laredo / Nuevo Laredo, USA/Mexico [2]
Ilb		Waste collection service with recyclables diversion – waste is collected directly from households and recyclables separated and sold by the IWMRS. Remaining waste is deposited at a transfer station, and disposed by the LA.	Micro-enterprises, Quito, Ecuador [3] Manos Unidas, Managua, Nicaragua [4]
Ilc		Waste collection service with recyclables diversion – waste is collected directly from households by formal municipal solid waste workers. Recyclables are informally retrieved from the waste during their collection rounds, and are diverted to material buyers.	Medina and Scheinberg et al. [5, 6] discuss the separation of recyclables during municipal solid waste collection rounds

Informal Recycling Sector 
 Local Authority 
 Private Industry 

Results - Typology



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Type	Configuration	Description	Example
IIIa		Recyclables collection - separated recyclables are collected by the IWMRS (picking from the street, collecting directly from households, or picking from landfills), then sorted and sold.	Recyclers in Laredo / Nuevo Laredo, USA/Mexico [2]
IIIb		Recyclables collection - separated recyclables are collected by the IWMRS (picking from the street, collecting directly from households, or picking from landfills) and sold to another informal actor (e.g. cooperative group) who may perform further segregation and aggregation. The recyclables then may be sold directly, or sold through another IWMRS actor (e.g. cooperative network).	Coopesol Leste, Belo Horizonte, Brazil [7] Coopert, Itauna, Brazil [8]

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Results - Typology



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Type	Configuration	Description	Example
IVa		Recyclables collection service – comingled recyclables are collected by the IWMRS directly from households, sorted and sold, and rejected material is disposed.	Cooperpires, Ribeirão Pires, Brazil [9, 10] Coopert, Itauna, Brazil; Cocamar, Natal, Brazil; CooperRegião, Londrina, Brazil [8]
IVb		Recyclables collection service – comingled recyclables are collected by the LA directly from households, delivered to the informal actor, then sorted and sold. Rejected material is collected and disposed by the LA.	Coopesol Leste, Belo Horizonte, Brazil [7]
IVc		Recyclables collection service - comingled recyclables are collected by the LA directly from households, delivered to the IWMRS, then sorted and sold directly to a private company, who might be a reprocessor. Rejected material is collected and disposed by the LA.	Private Company and Recyclers, La Reina, Chile [11]

Informal Recycling Sector
 Local Authority
 Private Industry



Conclusions

- Deficiency of detail in case studies
- Diversity in activities, workforce and employment characteristics, affiliation, motivations, contractual arrangements, commercial and political environments.
- 4 basic operational models and 10 commonly realised configurations identified and elaborated.
- Type IV operational model most common in case studies, with LAs formalising services around this.
- Autonomous recyclers would benefit from more attention in the literature, as they represent greater proportion.

Other IRS tools

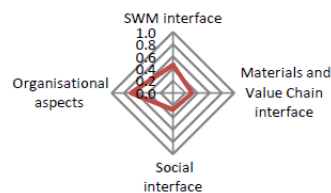


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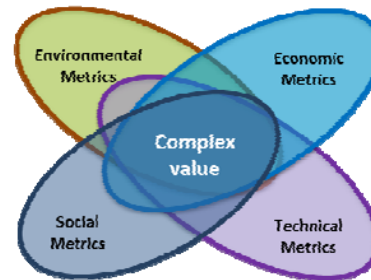
Wilson, D.C. et al. 2015. 'Wasteaware' benchmark indicators for integrated sustainable waste management in cities. *Waste Management*. 35, pp.329-342.

CS2 : Belo Horizonte



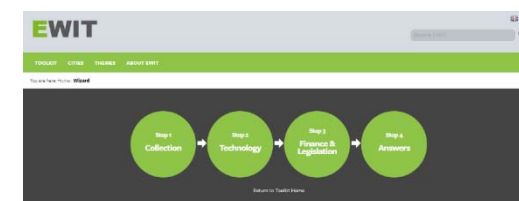
Velis, C.A. et al. 2012. An analytical framework and tool ('InteRa') for integrating the informal recycling sector in waste and resource management systems in developing countries. *Waste Management & Research*. 30(9), pp.43-66.

Solidary Selective Collection of Waste (SoCo) – analysis tool for holistic review of impacts and benefits from informal and formal recycling. British Council / Newton Fund institutional links funding.



Complex Value Optimisation for Resource Recovery from Waste (CVORR) – toolkit for optimising potential to recover value from waste. NERC, ESRC and Defra funded.

EWIT – web portal of expert guidance addressing challenges of e-waste in Africa. EU Horizon 2020 funded.



Funding and Project partners



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INSTITUTIONAL
LINKS



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Costas Velis

c.velis@leeds.ac.uk