



## Informal / inclusive recycling in the Global South: 10 challenging ideas

**Dr Costas Velis**

ORIS Workshop 2016: Urban Waste Problem or Solution?

Belo Horizonte, Brazil

06 July 2016



University of Leeds: Cross- disciplinary  
teams and expertise



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## **CERRY: Circular Economy & Resource Recovery**



Part of University Theme on  
**Cities, Sustainable Societies and Infrastructure**



## Partially misleading terminology

**Definition** from a 2006 GTZ study (Wehenpohl *et al.* 2007; Scheinberg *et al.* 2010):

*‘the informal solid waste sector refers to individuals or enterprises who are involved in recycling and waste management activities but are not sponsored, financed, recognised or allowed by the formal solid waste authorities, or who operate in violation of or in competition with formal authorities’.*



**e.g. Completely uncontrolled autonomous activities at dumpsites**

**e.g. Legal and tax-paying formal organisations (co-operatives, associations)**

# ISWA Workshop in Buenos Aires 2011



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# ISWA acknowledged the role and realities of inclusive recycling



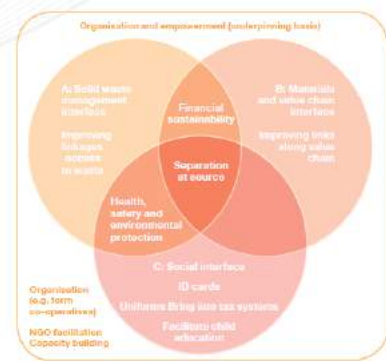
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## The Informal Recycling Sector



<b>The issue</b>	It is estimated that some 20 million people around the world depend for their livelihood on informal recycling from municipal solid wastes (Linzer and Lange, 2013) – of the same order as the total employment in the formal waste industry. Working conditions are often unsafe and unhygienic, and child labour is commonplace. The main driver is poverty. So this is a broader development issue that has to be properly addressed, not just one for the solid waste management (SWM) sector.
<b>The challenge for the waste sector</b>	In many developing countries, the informal recycling sector achieves notable recycling rates. If this activity were suddenly to cease, then waste quantities requiring collection, treatment and disposal by the formal city system would increase, which could in turn further strain budgets that often are already inadequate to extend collection coverage to unserved communities to protect public health, and to eliminate uncontrolled disposal to protect the environment.  However, poor working conditions, child labour and uncontrolled dumping of residual wastes are neither environmentally nor socially acceptable and undermine the position of the formal, legitimate waste industry. Therefore, a sustainable approach to address the present situation has to be developed and pursued.
<b>The way forward</b>	Despite the considerable challenges, the transformation of a city's informal sector to a formalised part of the overall solid waste management system is in everyone's interests. The recyclers can then work under cleaner conditions, earn a better livelihood and educate their children. Recycling rates can potentially increase and in addition, the transition can facilitate environmental control, reducing littering and dumping of residual wastes as well as bring the 'informal' sector into the legal and tax systems.

<b>International activities</b>	Many international agencies and NGOs have been active in promoting the inclusion of the informal sector within formal solid waste management systems. GIZ funded a seminal 3-year sector development programme (Gunsilius et al., 2011) – the International Finance Corporation and Inter-American Development Bank are also active – the informal recycling sector has been prioritised in new joint EU-African research and innovation agenda on waste management. Global brand owners are also active, on both packaging waste and waste electrical and electronic equipment (WEEE). Active international NGOs include the Bill and Melinda Gates and Clinton Foundations; the local NGO Christian was presented with the prestigious Human Rights Special Merit Prize of the French Republic, by the French Ambassador on 26 March 2014, for its success in giving a voice to the poorest of the poor, India's waste pickers and kabaris.
<b>Task Force Activity and Outputs</b>	The ISWA Task Force convened an International workshop in Buenos Aires in June 2011, bringing together the formal and informal sectors in waste management, NGOs and other stakeholders. This led to a seminal paper which integrated background scientific and social science research with the work initiated in Buenos Aires. It introduced both a systematic framework – or 'typology' – for: identifying and analysing possible interventions to promote the transition of the informal recycling sector to a formal part of a city's SWM system, and a simple tool – 'InfoH' – for use in selecting a balanced set of interventions (Wells et al., 2012). The aim of the framework (see Figure 1) is to allow the design of a specific set of interventions tailored to the local situation.



**Figure 1 – Analytical framework:** This shows the systematic analytical framework developed by the Task Force to aid the design of initiatives to facilitate transition into a formal part of an integrated SWM system in a specific city. Potential interventions are allocated to four categories: the underpinning organisational aspects and three primary interfaces. Some of the interventions, which span several categories, are among those highlighted in Table 4 below as key challenges.

The informal recycling sector is active in many developing country cities and is a stakeholder group in SWM. Despite the considerable challenges involved (see Table 4 below), dialogue between the formal and informal sectors, and transition to a formalised recycling activity within a city's SWM system, is to the advantage of both, allowing step-by-step improvements in, inter alia, living and working conditions, livelihoods and recycling rates, and the levels of environmental control. Such integration will facilitate the transition from an unacceptable situation to the goal of a fully formalised waste management system.

Figure adapted from Wells et al. 2012, where a full typology of interventions is presented.

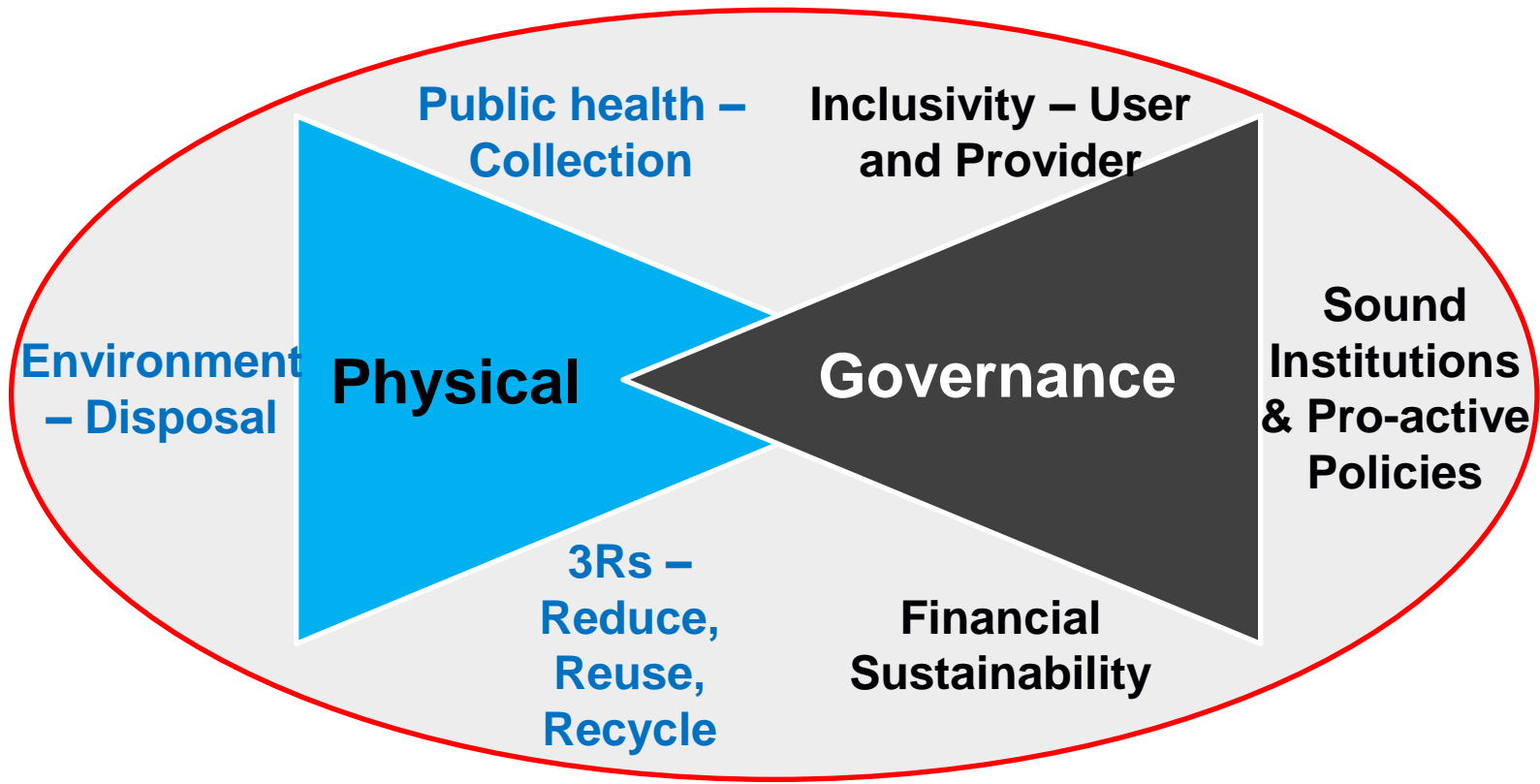
Key Challenges	Messages / Proposed Solutions
<b>Organisation, capacity building and finance</b>	The informal sector needs to be encouraged and facilitated to organise themselves – e.g. into co-operatives, microenterprises or other legal entities – enabling them to engage responsibly with municipalities and other stakeholders. The facilitation role of local NGOs is often important, as is capacity building and making available access to affordable micro-finance.
<b>Facilitating social acceptability</b>	A key component of many successful schemes has been the issuing of identification cards (and uniforms) to the people doing the recycling; ready identification facilitates access to communities. Some countries have also allowed people to register 'waste picking' as their official employment (e.g. Brazil), which brings them inside the law and the tax system.
<b>Safe working conditions</b>	A key concern is the unhygienic and unsafe working conditions of much current informal recycling. Safe and dignified working conditions need to be promoted.
<b>Implementing separation at source</b>	Separation for recycling should increasingly take place at source rather than mixed waste, which would immediately help to address the current issues of workers' health and hygiene. Incentive waste buyers are active in many countries, which is a system that can be further built on and expanded. Source separation will increase both the quality of recycled materials and recycling rates, thus diverting wastes from landfill and improving livelihoods of the recyclers.
<b>Elimination of child labour</b>	Child labour needs to be addressed, by working with informal recyclers to ensure that children go to school, and that recycling activities by children under the legal age of adulthood in the country are reduced and eliminated.
<b>Environmental control</b>	Environmental concerns need to be addressed, with littering around sorting points and illegal dumping of non-recyclable residues being controlled and environmental standards for the sorting and processing of recyclable wastes and for the subsequent reprocessing of recyclates being raised.
<b>Waste picking at landfills</b>	Waste picking at the working face of a modern landfill is unacceptable, as is deliberately setting fire to the waste to recover metals.
<b>Improving data for waste planning</b>	In order for a city to plan for improvements to the SWM system, the authorities need to understand all the waste flows, including both the formal SWM system under their control and the informal recycling system – which will be facilitated by a transition to formalisation.

Table 4: Particular challenges and proposed solutions for integrating the informal recycling sector

# Integrated Sustainable Waste Management Framework



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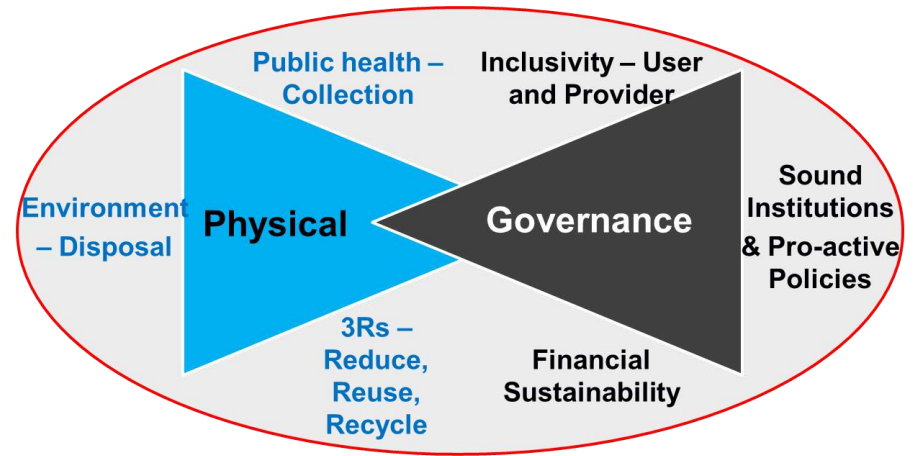
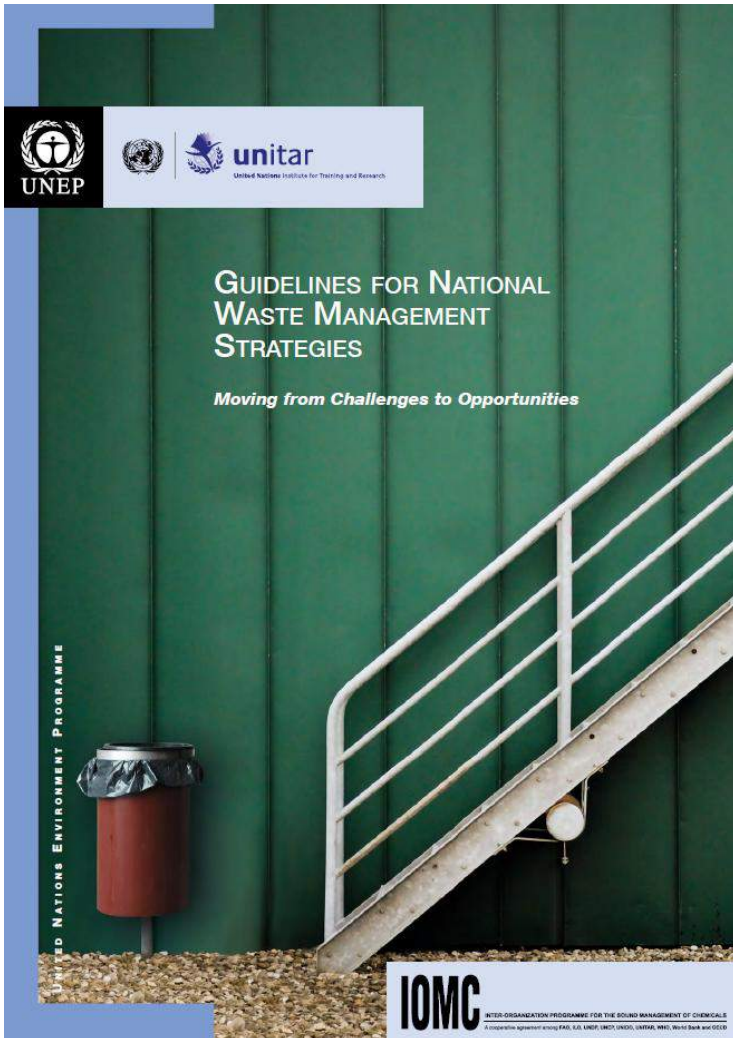


Source: Wilson et al., 2012

# UNEP: National Waste Management Strategies



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# 'Wasteaware' ISWM benchmark indicators



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## Coverage:

- Both physical and governance aspects

## Indicators comprise:

- 4 quantitative + 8 composite qualitative

## Global applicability:

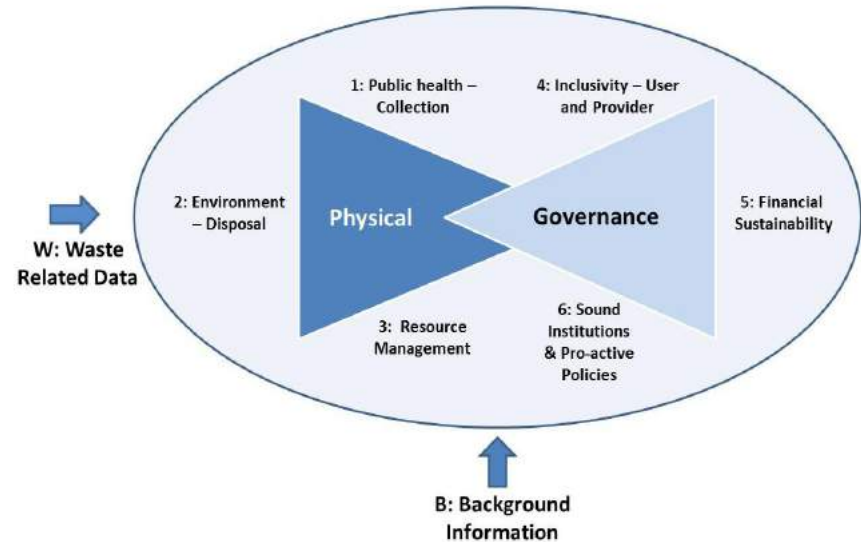
- Both 'South' & 'North'

## Visualise relative performance:

- Using 'Traffic lights' system

## Ready to use:

- Tested in 39 cities in all 6 inhabited continents



## Background R&D

- Based on ISWM
- Many person-years of development since 2009
- Builds on work for UN-Habitat and GIZ



# Physical indicators: an example



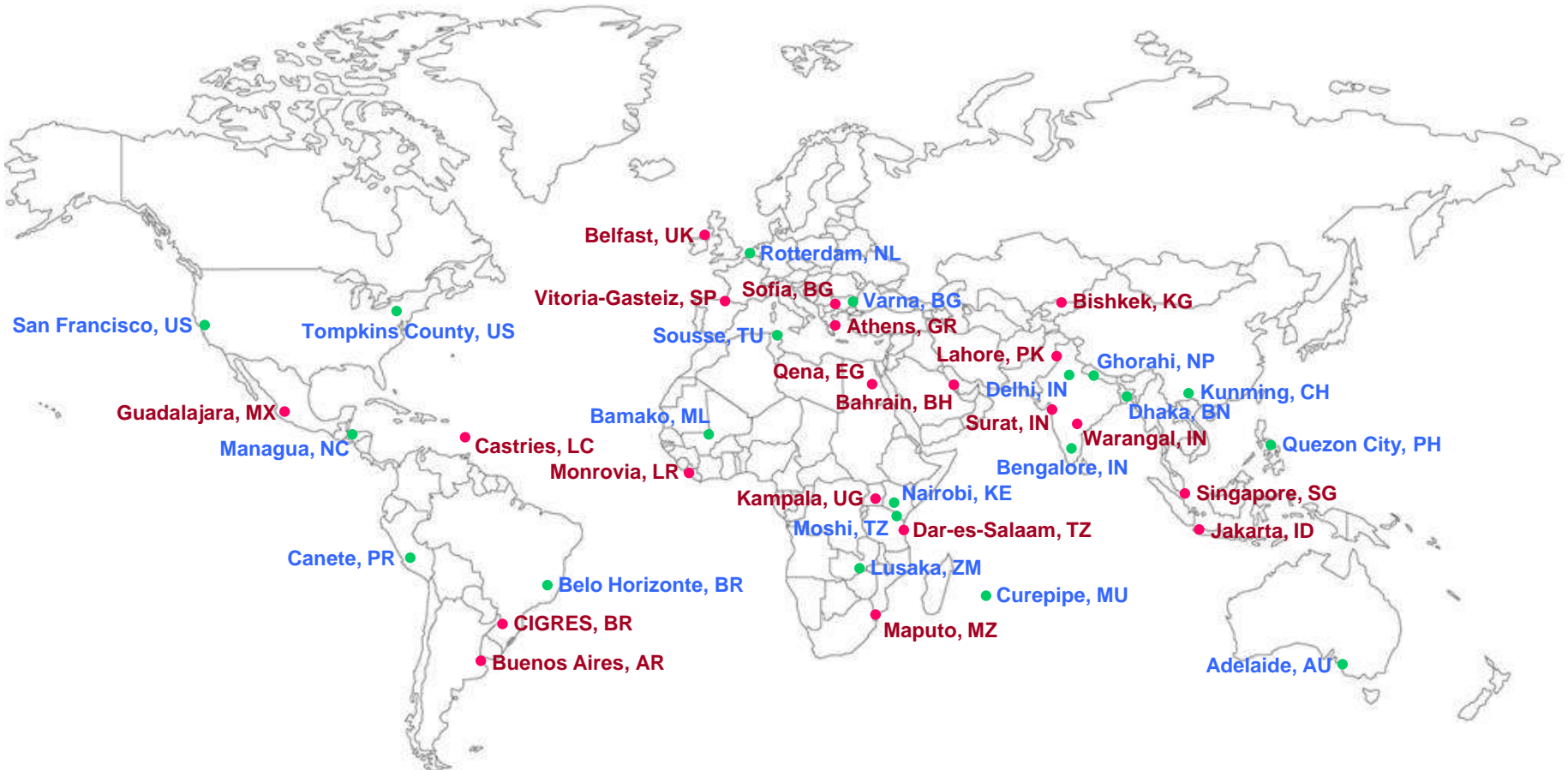
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No.	Category	Indicator	Results
1	Public health – Waste collection	Collection coverage	82%
1Q		Quality of waste collection service	M/H
2	Environmental control – waste treatment and disposal	Controlled disposal	0%
2Q		Environmental quality of waste treatment and disposal	L/M
3	3Rs – reduce, reuse and recycling	Recycling rate	< 5%
3Q		Quality of 3Rs provision	L/M

# 'Wasteaware' city indicators: state of the art



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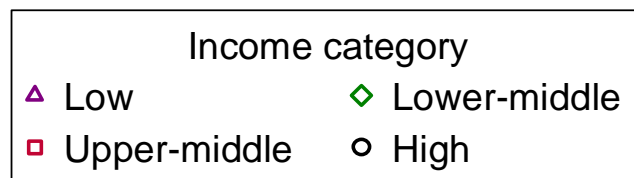
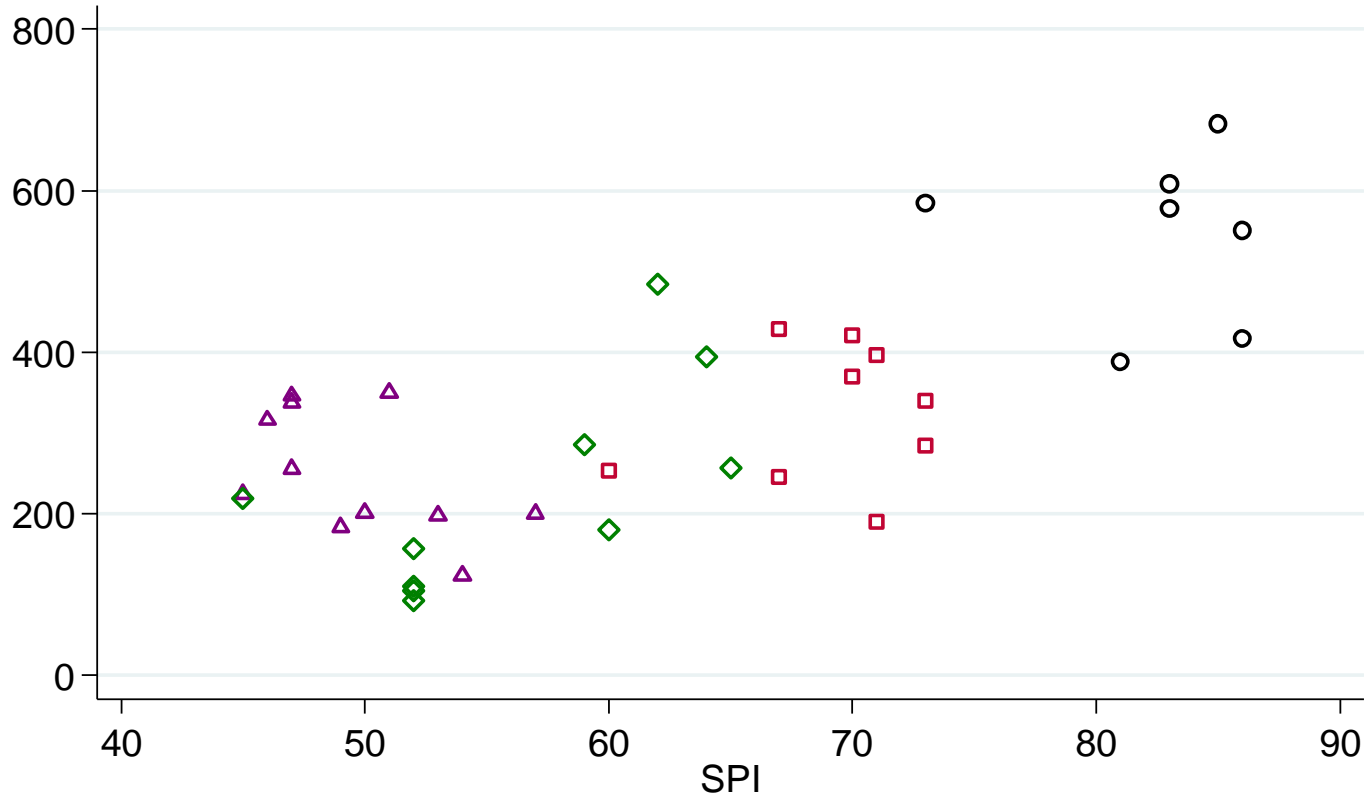


Original 20 cities    Expansion to 40 cities

# Wasteaware: Waste Generation and Social Progress Index (SPI)



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Source: Fargier et al.,  
Unpublished

# Global waste management outlook – Editorial Team



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# Global waste management outlook



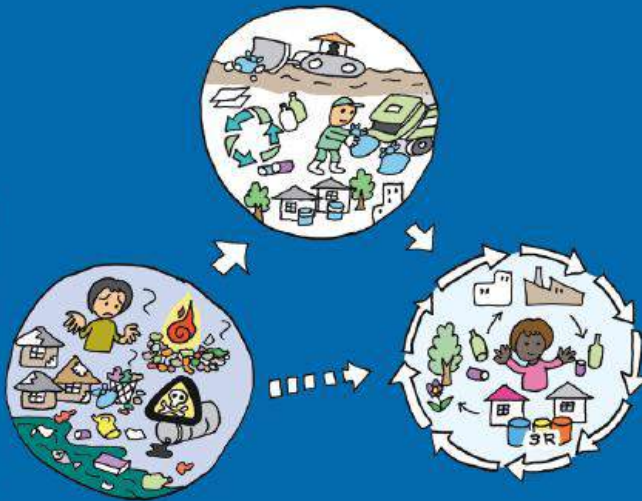
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ISWA

## Global Waste Management Outlook

Summary for Decision-Makers



### Global Waste Management Outlook (GWMO)

WASTE – STILL A GLOBAL CHALLENGE IN THE 21st CENTURY

The GWMO at a glance

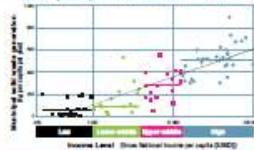


Waste heap

7-10 billion tonnes of solid waste from urban households, commerce, industry and construction

Worldwide quantities increasing

Waste per capita increases with income level



Around the world

- Population continues to grow
- Migration from rural to urban areas
- Waste per person increases as consumption rises

Lower-income cities in Africa and Asia will double their solid waste generation within 15-20 years

#### Solid waste management is an essential service

Cost of inaction

Public health impacts of uncollected waste

- Gastrointestinal and respiratory infections, particularly in children
- Blocked drains aggravate floods and spread infectious diseases

Environmental impacts of open dumping and burning

- Severe land pollution and freshwater, groundwater and sea pollution
- Local air pollution and greenhouse gas emissions

Cost of inaction to society exceeds the financial cost of proper waste management by a factor of 5-10

- Health impacts
- Lost productivity
- Flood damage
- Damage to businesses and tourism



Controlling waste

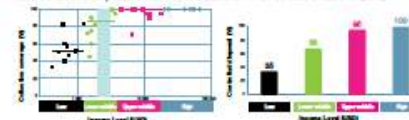
Public health priority

- Extend municipal solid waste collection to 100% of the urban population

Environmental priority

- Achieve 100% controlled disposal
- Eliminate open dumping and burning

Many developing countries have made good progress on collection coverage and controlled disposal since 1990. Data shown for selected cities in 2012

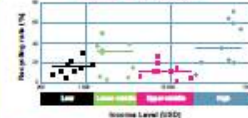


2 to 3 billion people lack access to basic waste services

#### From waste to resource management

Reverse, Reuse and Recycle

Recycling rate by income level



Developing countries often have good recycling rates due to the informal sector

Developed countries have rebuilt rates in the past 20-30 years from a low base

3Rs (reduce, reuse, recycle) cut the investment needed in sound treatment and disposal facilities



Waste prevention is key

Cities in developing countries are already struggling to cope with waste – and quantities of waste are expected to grow

Prevention of the 1.3 billion tonnes of food waste generated per annum, enough to feed all the undernourished people in the world twice over, could save 9% of total worldwide greenhouse gas emissions

Decouple growth in waste from economic growth

Preventing waste is estimated to save business worldwide hundreds of billions of dollars each year on raw materials, energy and labour costs



Benefits

**ENVIRONMENT** Potential impact of improved waste management on reducing greenhouse gas emissions across the economy: 15-20%



**SOCIETY** A clean city is a successful city

- A healthy, pleasant and safe place to live as a tourist
- Fosters a sense of community and belonging
- Requires good governance

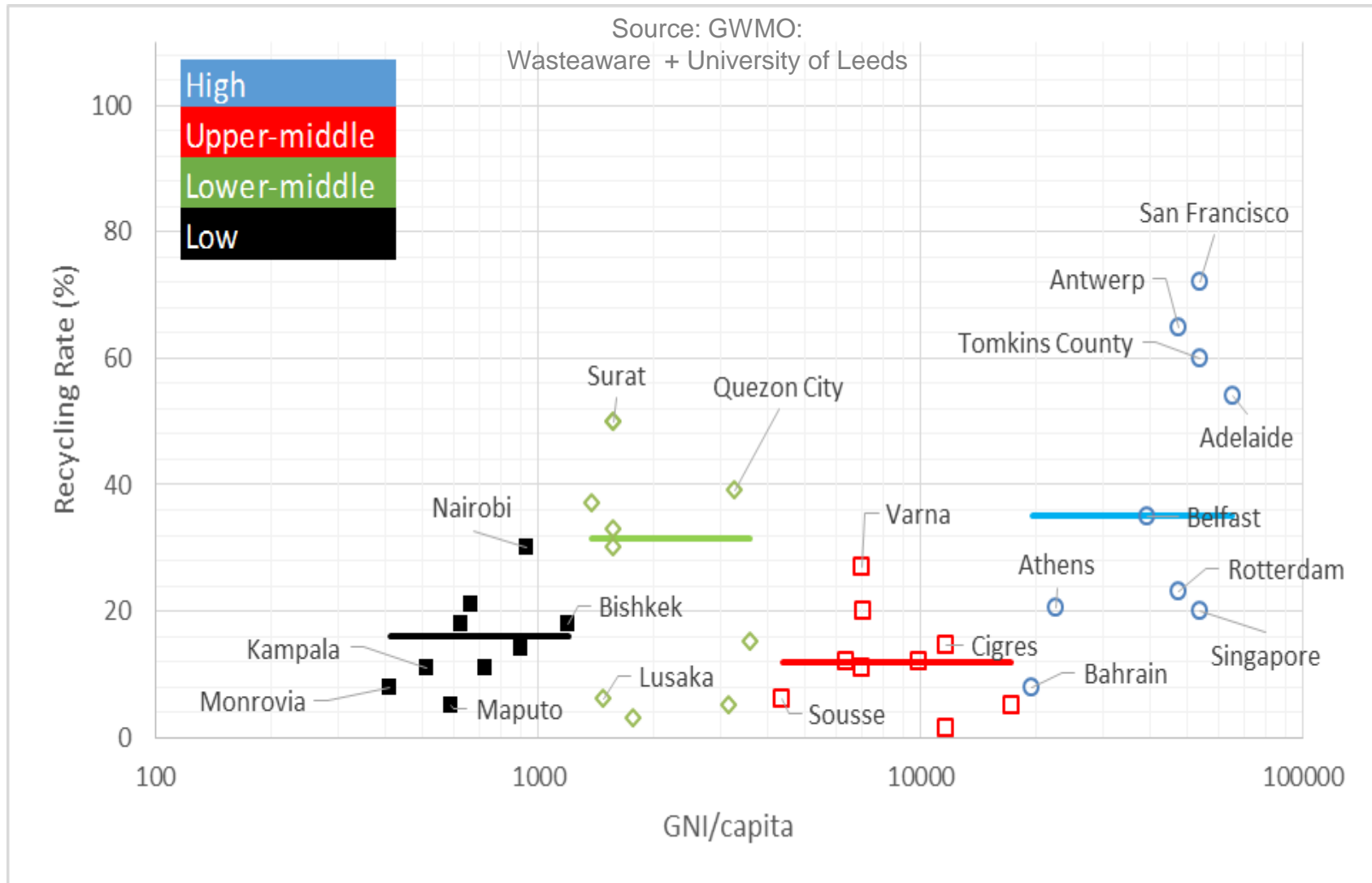


**ECONOMY** 'Waste to wealth' New waste services can provide sustainable livelihoods and support economic development in poor neighbourhoods of the world's poorest cities

# GWMO: Wasteaware city-level data



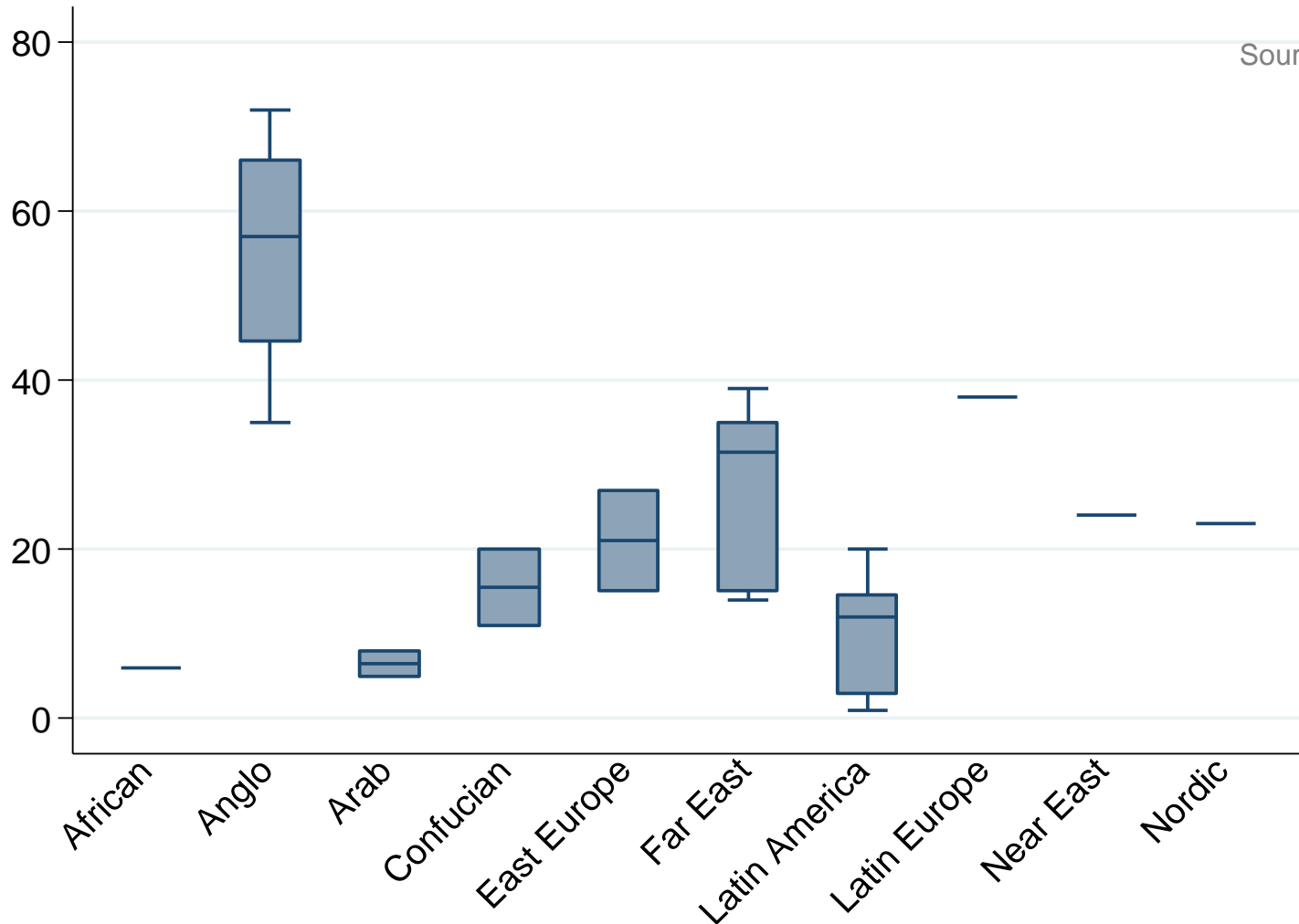
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# Wasteaware: Recycling – Cultural clusters



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Source: Fargier et al.,  
Unpublished

# 10 Challenging ideas



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**1** IRS can be found all over the world – even in the most affluent countries

**2** Politicisation of IRS is local feature in LAC and is not helping to achieve win-win solutions

**3** Focusing only on inclusion/ livelihood preservation is not a sustainable strategy: new 'circular economy' framework

**4** There are limits to what it can achieve regarding recycling rates

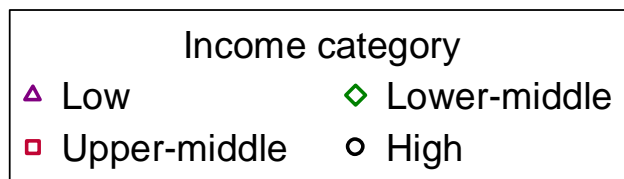
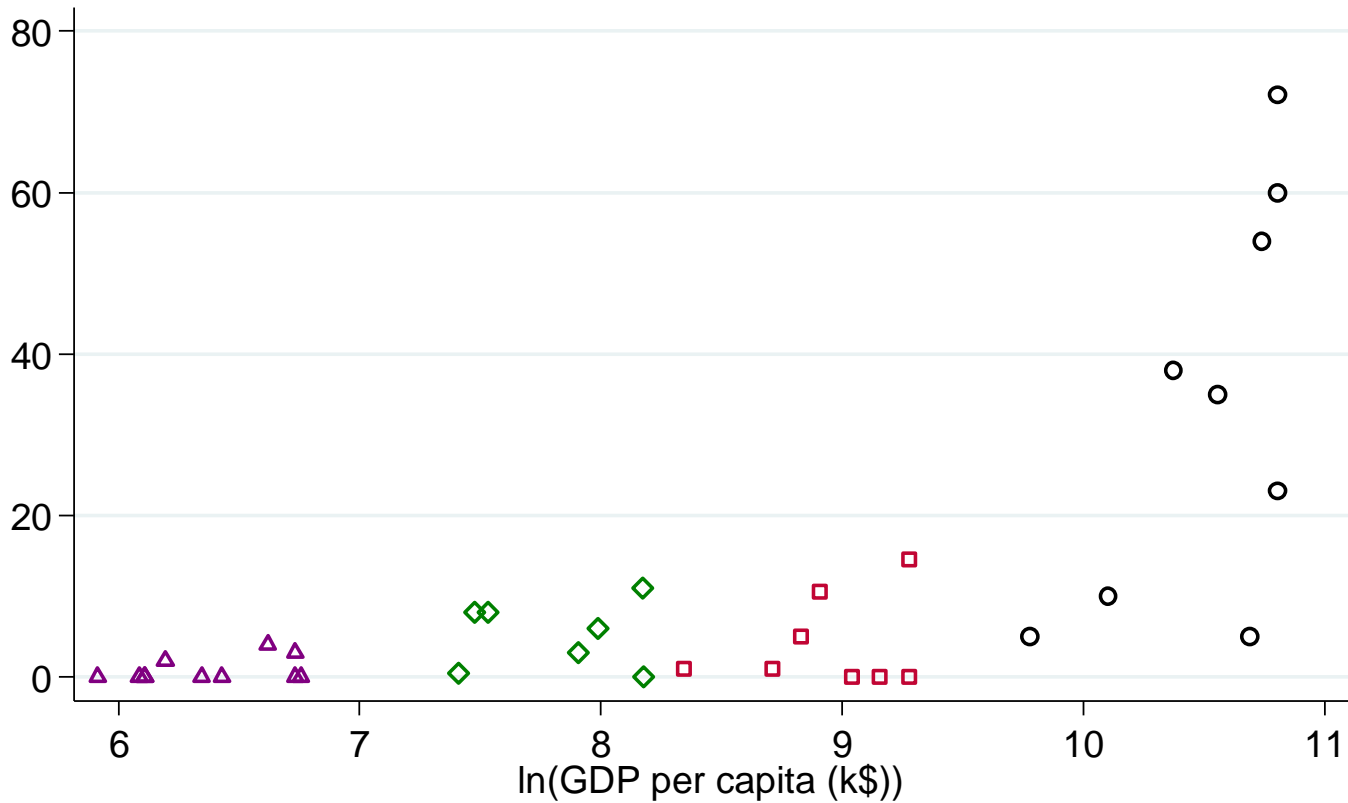
**5** The “west” has already gone through this process during 1800-1900



# Wasteaware: formal recycling



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Source: Fargier et al.,  
Unpublished

# 3 necessary conditions for waste picking



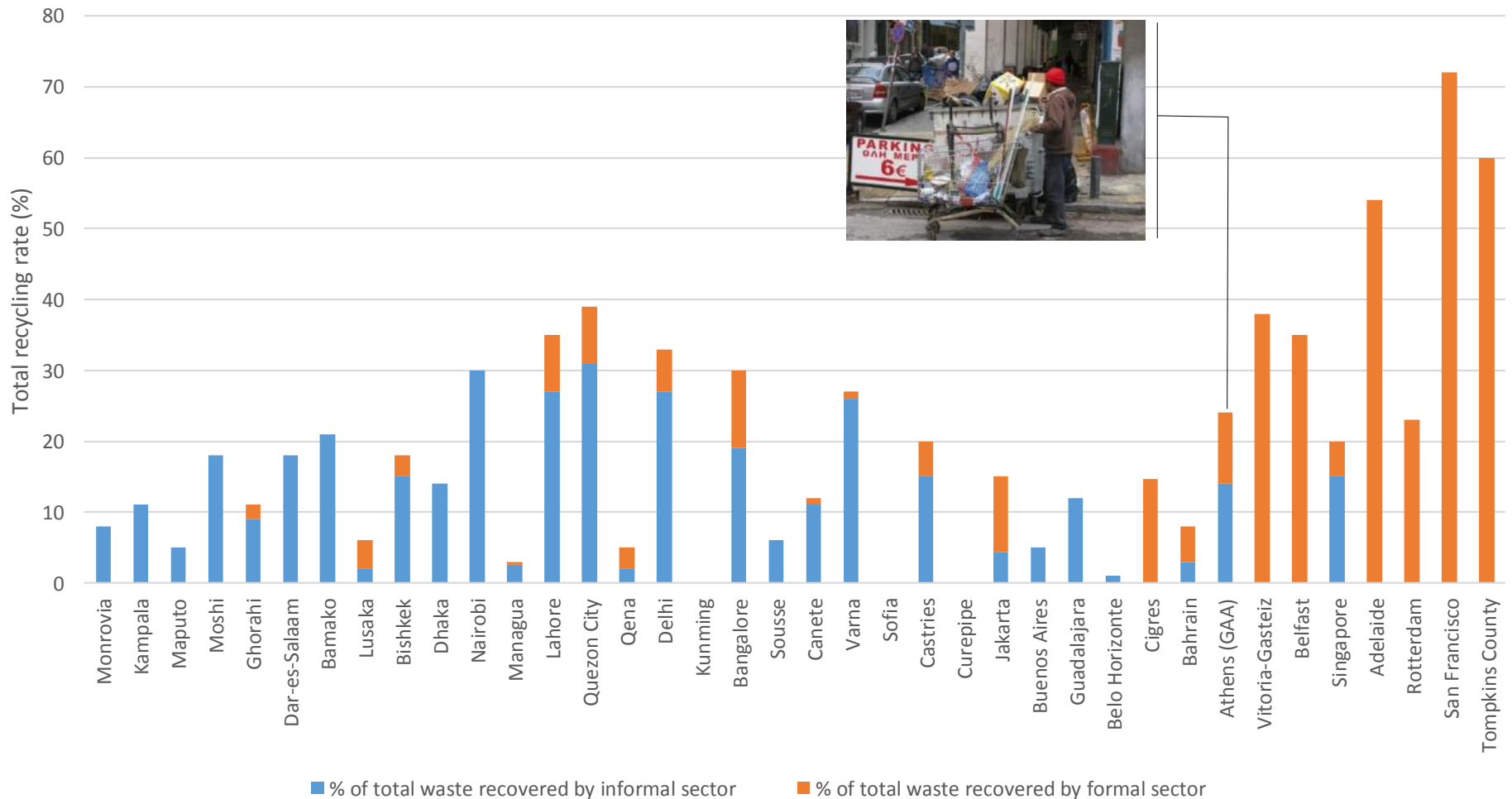
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# Wasteaware: informal recycling dominates around the world...



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Source: Fargier et al., Unpublished

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# Not just about waste!



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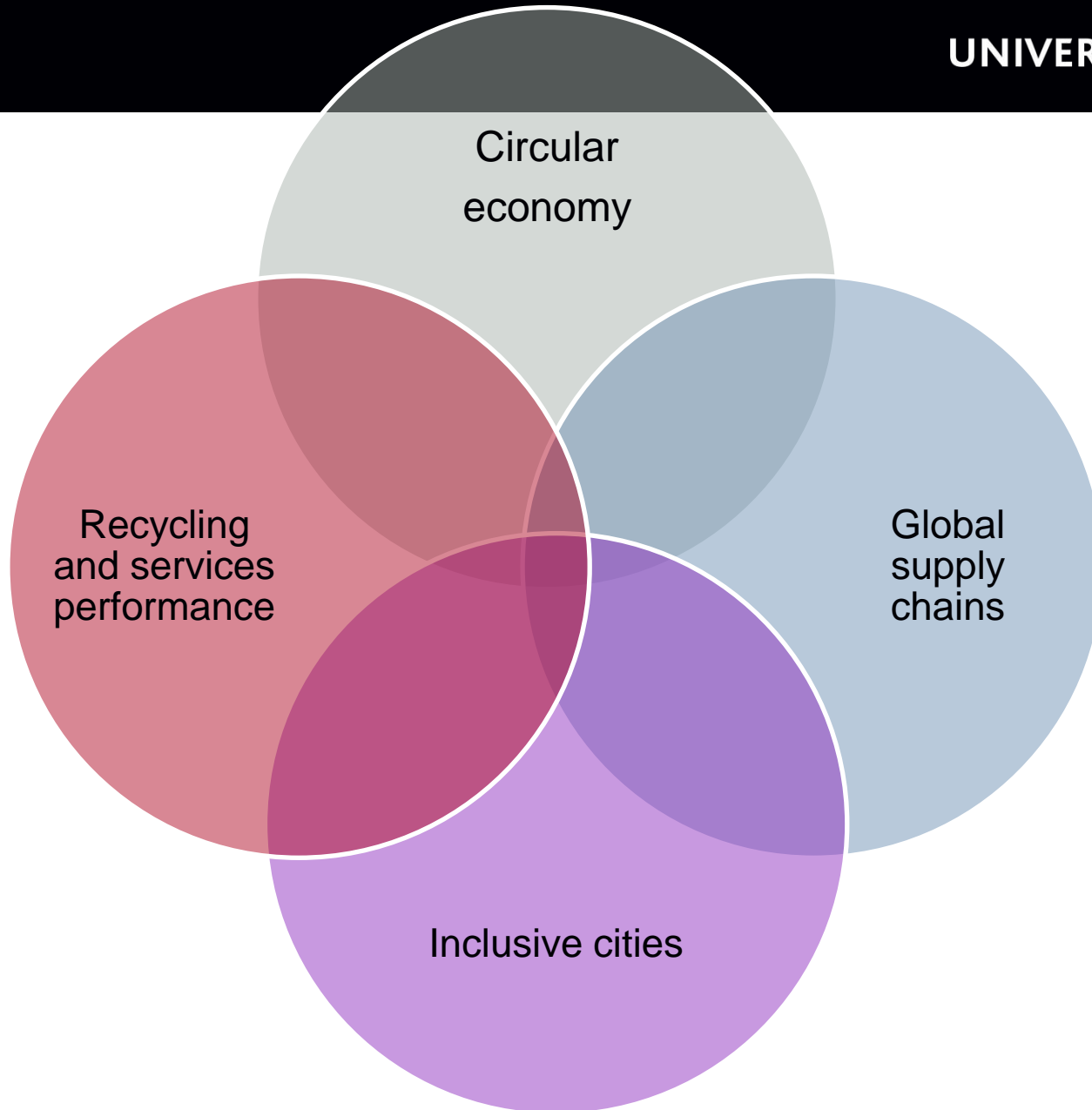
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# Some key aspects to consider



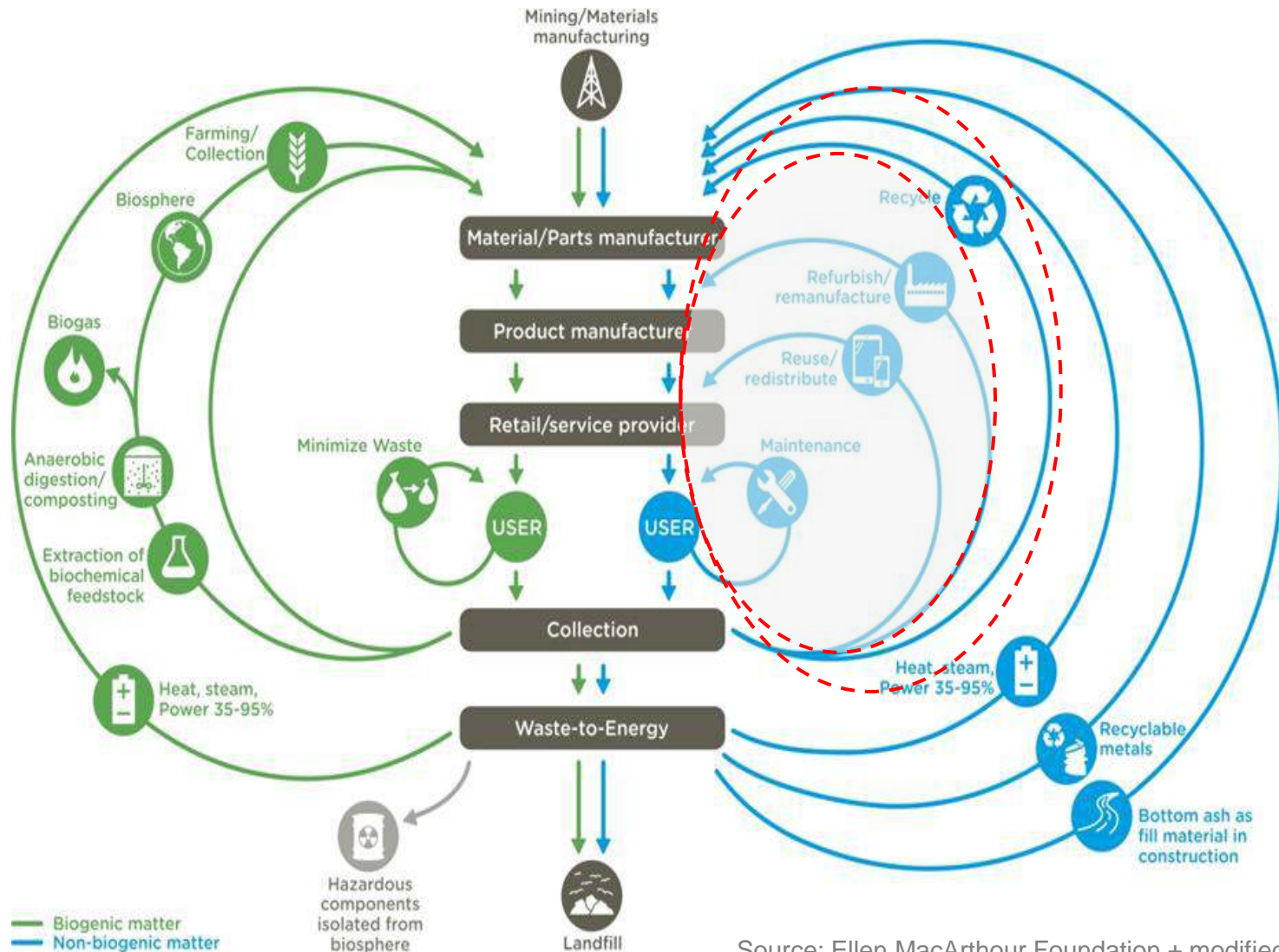
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# Circular economy vision: limits of recycling



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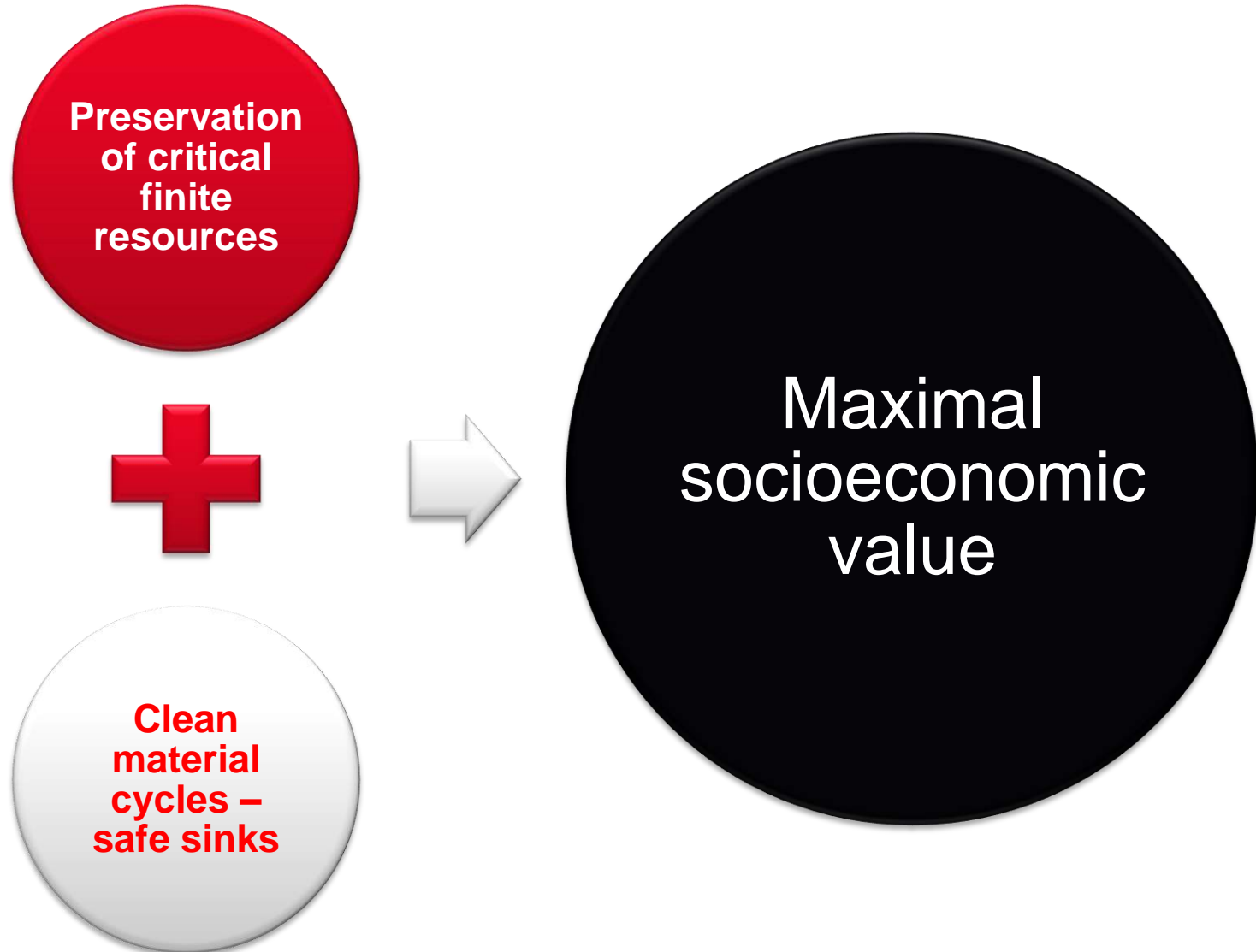


Source: Ellen MacArthur Foundation + modified by Ramboll

# Circular + green economy? Any dilemmas?



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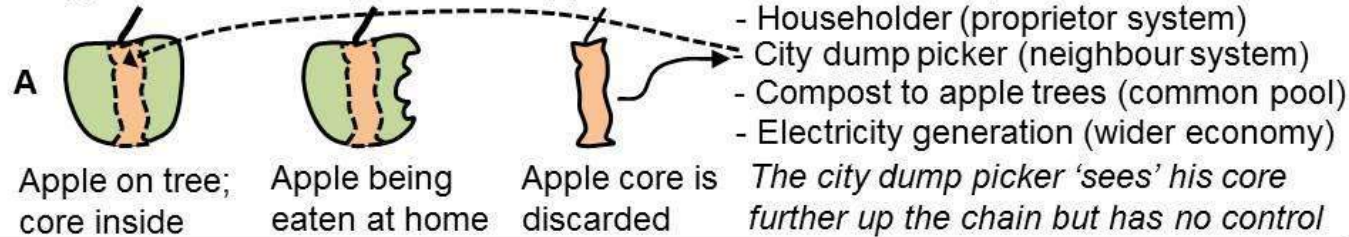


# Benefit and cost for whom? The Paracommons...

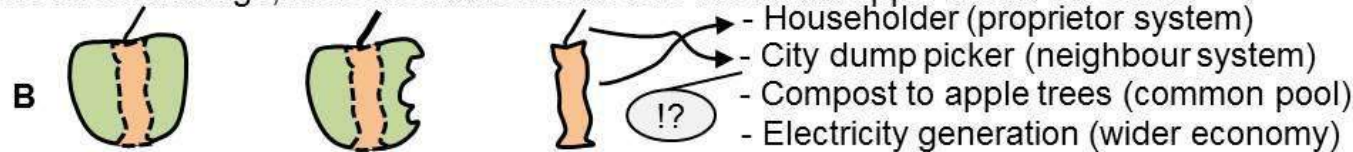


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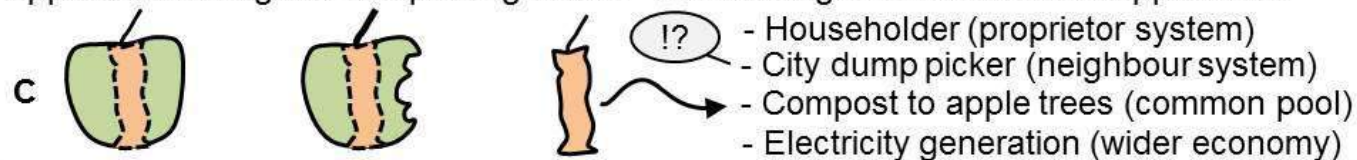
An apple-eater leaves quite a bit of apple flesh on the core which goes to waste:



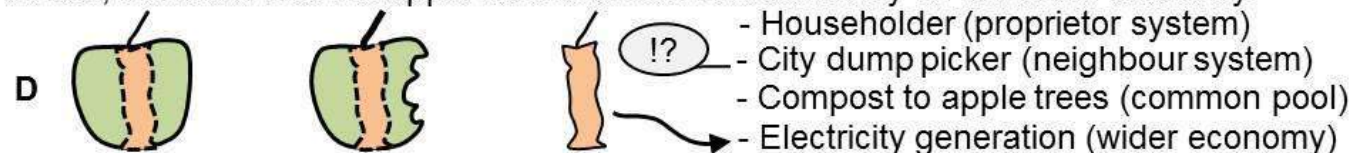
In the future, perhaps the apple is more expensive, or her new partner has different views on wastage; here the householder eats the whole apple minus the stalk:



In the future, perhaps due to a recycling or composting scheme, householder keeps the apple core as organic composting waste. The seeds germinate into new apple trees.



In the future, a new household-waste electricity generator is built. The garbage is sorted, collected and the apple core is turned into electricity for the wider economy:





# ISWA Globalisation and Waste Management: local actions – global implications



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## Global recycling markets: plastic waste

A story for one player – China



A report from the ISWA Task Force on Globalisation and Waste Management

Author: Costas Velis



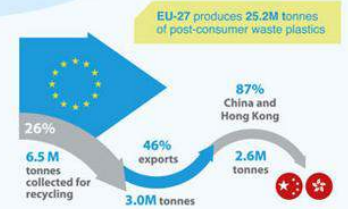
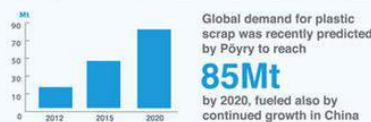
ISWA TASK FORCE  
on Globalisation and Waste Management  
PUBLICATIONS

## Sources of Waste Plastics Imported in China in 2010



### China is the dominant global player (importer)

Along with Hong Kong SAR this activity accounts for **49%** of the global financial activity in plastic scrap imports



Europe (EU-27) exports 46% of all the post-consumer plastics collected for recycling; 87% wt. exported to China + Hong Kong SAR



# Complex and volatile globalised markets



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# Documentary on past reprocessing plastic scrap imports “Deadly waste in China”



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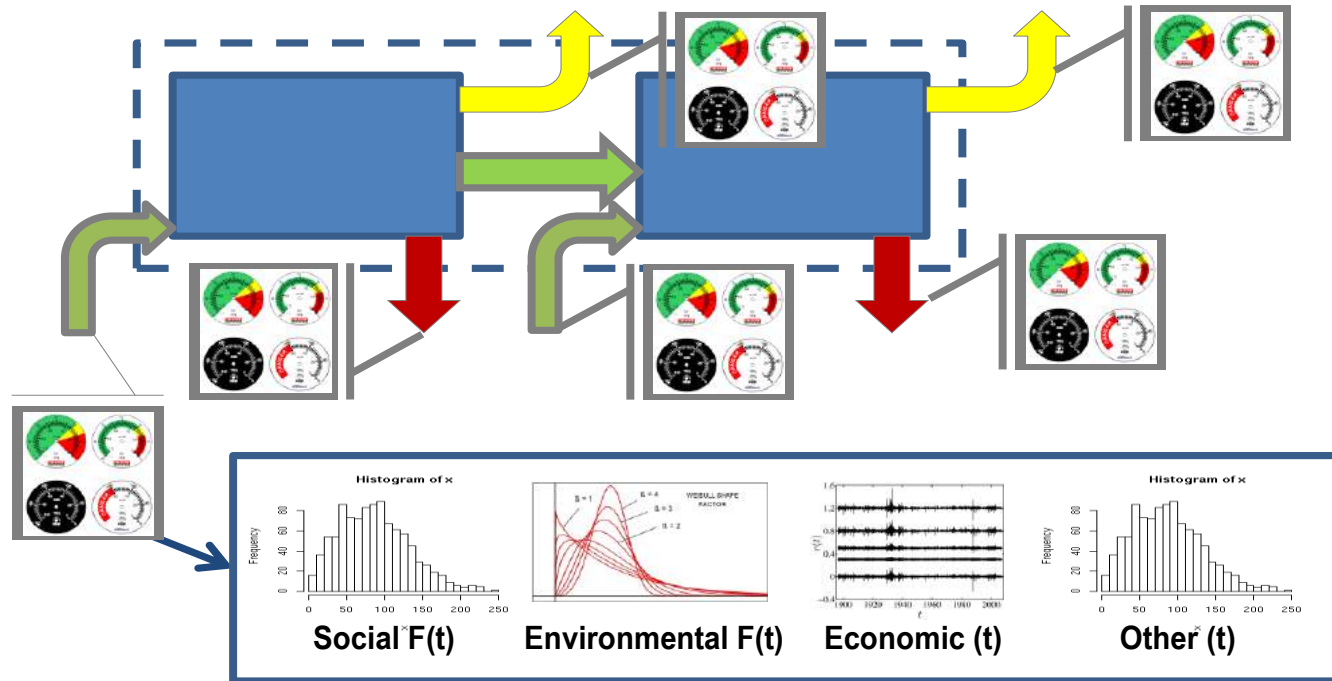


See at **2DF**: <http://www.zdf.de/ZDFmediathek#/beitrag/video/1993090/Die-Doku:-Tödlicher-Müll-in-China>

# C-VORR: multiple-value dimensions systems and concurrent approach



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# 10 Challenging ideas



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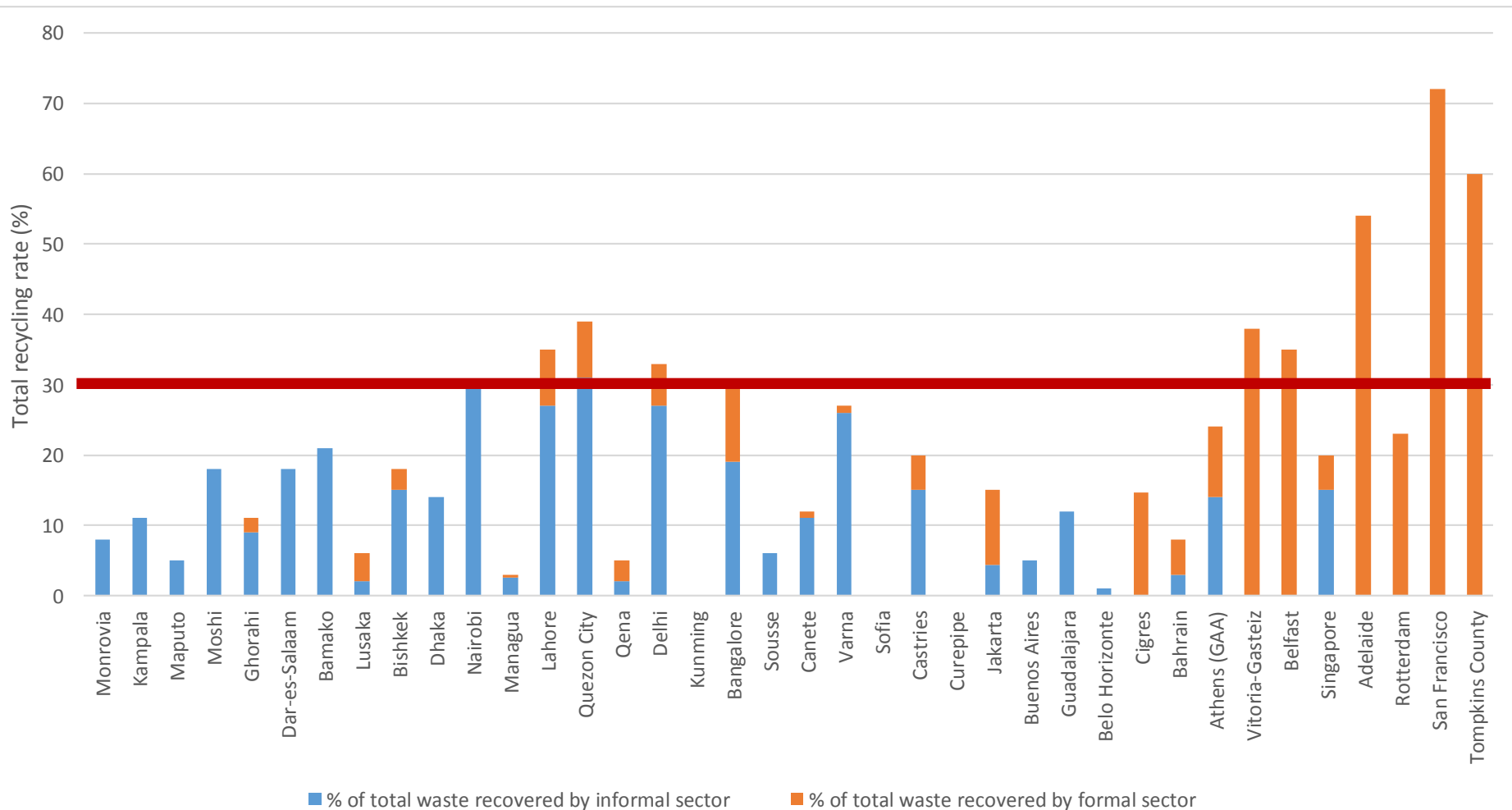
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**5** The “west” has already gone through this process during 1800-1900

# Recycling: There is a cap depending on recyclability of materials and organics separate collection



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Source: Fargier et al., Unpublished



25% of global plastics production is polypropylene (PP)



Why PP is one of the least recycled polymers?

# ISWA Task Force Resource Management Report No.3



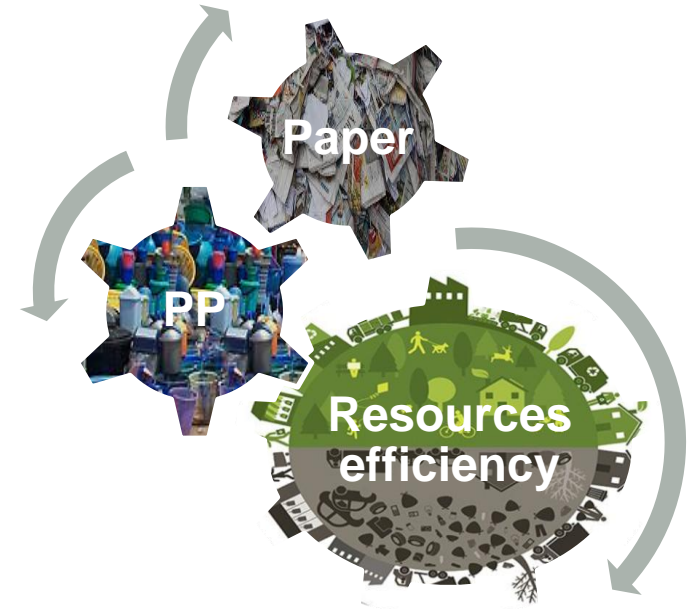
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## CIRCULAR ECONOMY: CLOSING THE LOOPS

Costas Velis  
Maria Coronado  
David Lerpiniere



# 3

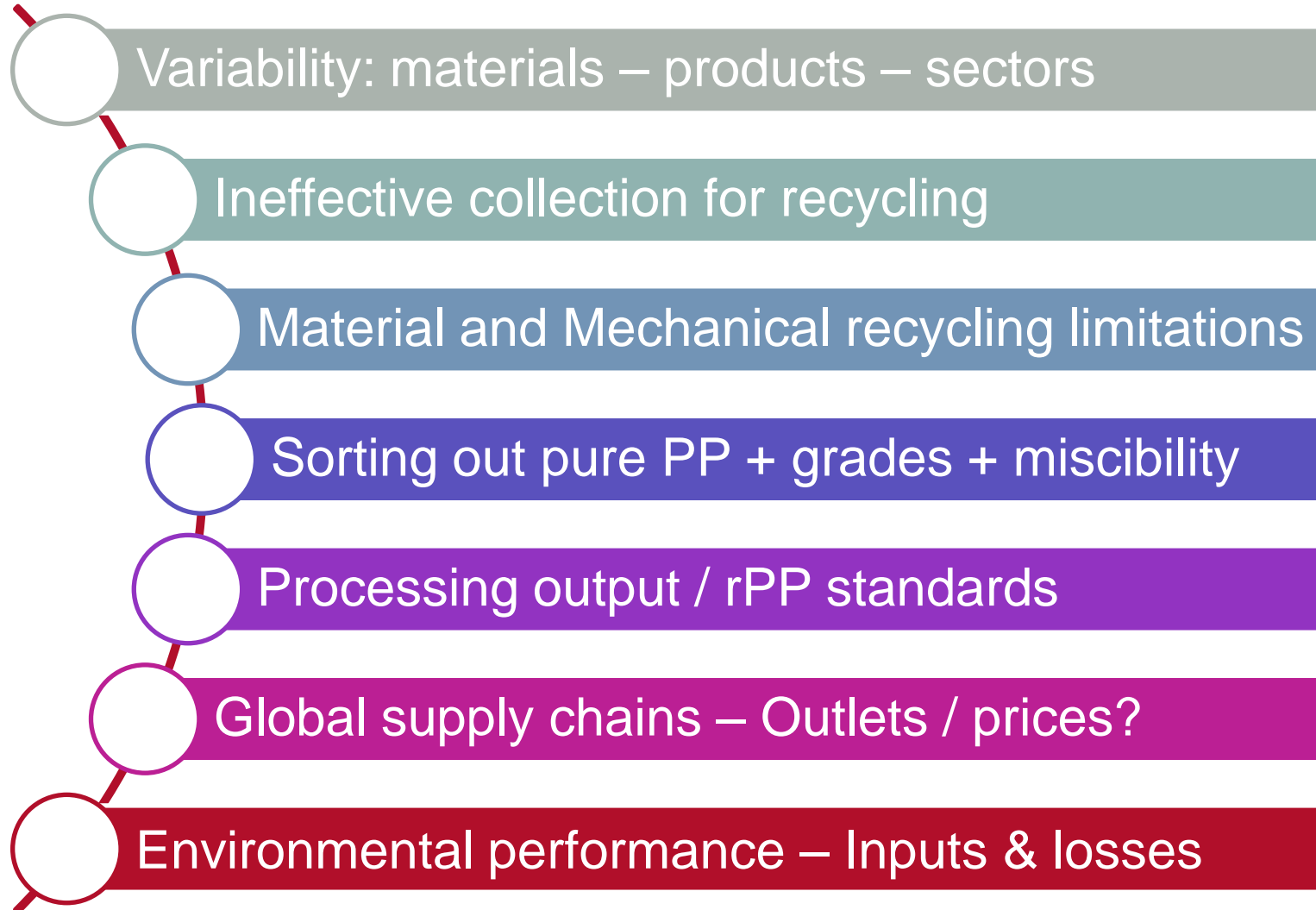


ISWA TASK FORCE  
on Resource Management

# Technical challenges for closing the PP loops



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## Materials Grades

Homo-polymer

Co-polymer  
Multi-layer  
Wood-plastic composites

Additives:

Fillers  
Stabilisers  
Inks  
Flame retardants

Food / non-food grade

Colour:  
Black / clear PP

## Products

Bottles

Non-Bottles

PTTs:  
Pots Tubes Trays

Rigid / films

## Sectors

Packaging

Electrical and electronic

Automotive

Construction

Agriculture

## Lifespans

Pack.: < 1 y

WEEE: e.g.  
2-10 y

ELVs: 12-15 y

Const.: ca.  
35 y

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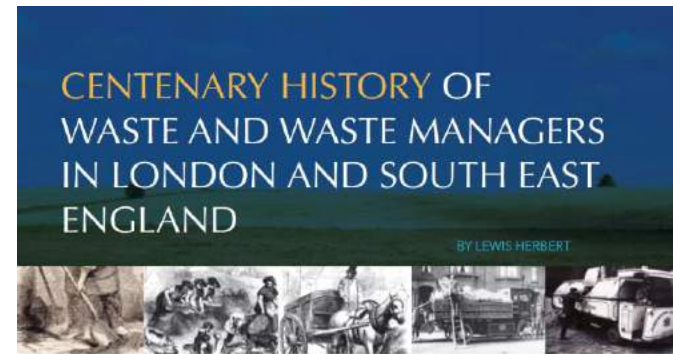
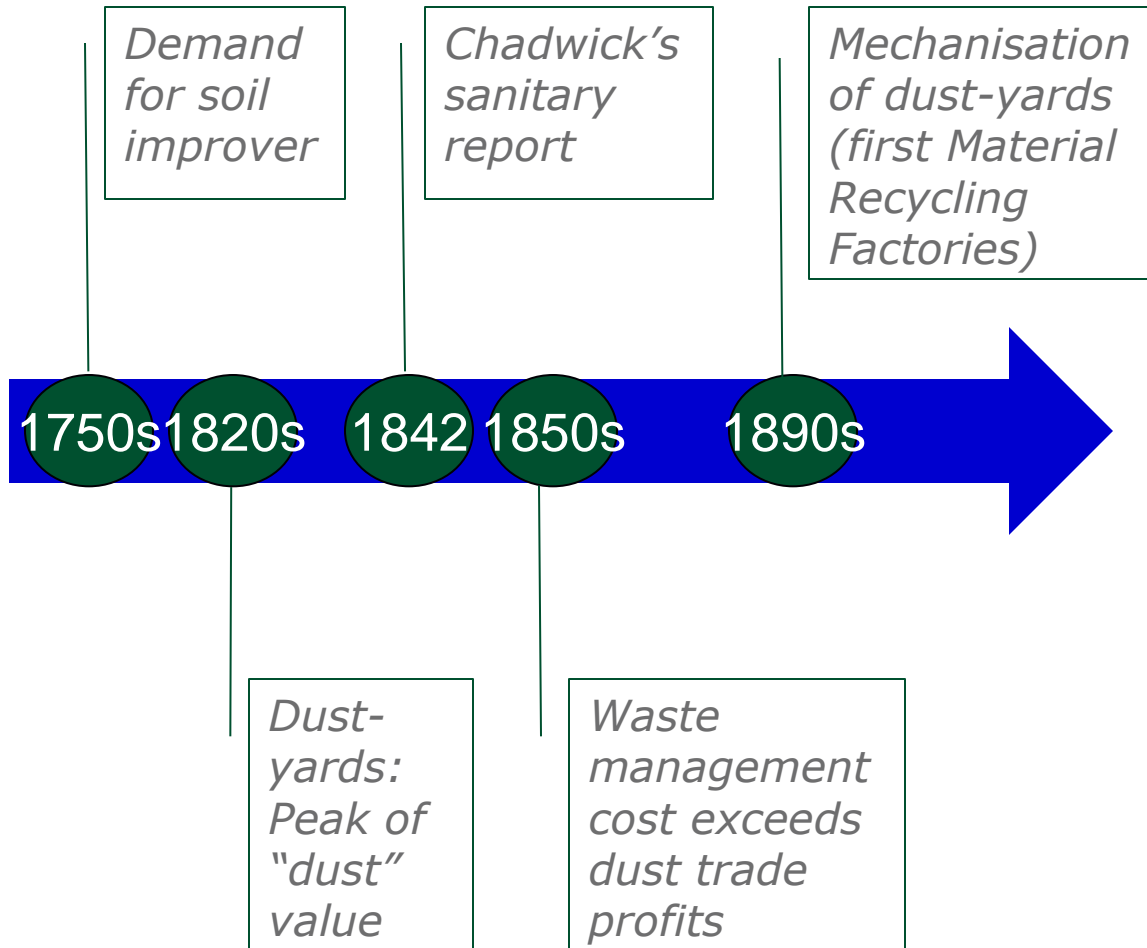
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# Waste sorting 200 y ago in London Then **sanitation era** arrived



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The Chartered Institution of Wastes Management

Celebrating the 100th anniversary of the creation, in 1907, of the London and Southern Counties Centre of the Chartered Institution of Wastes Management (CIWM)

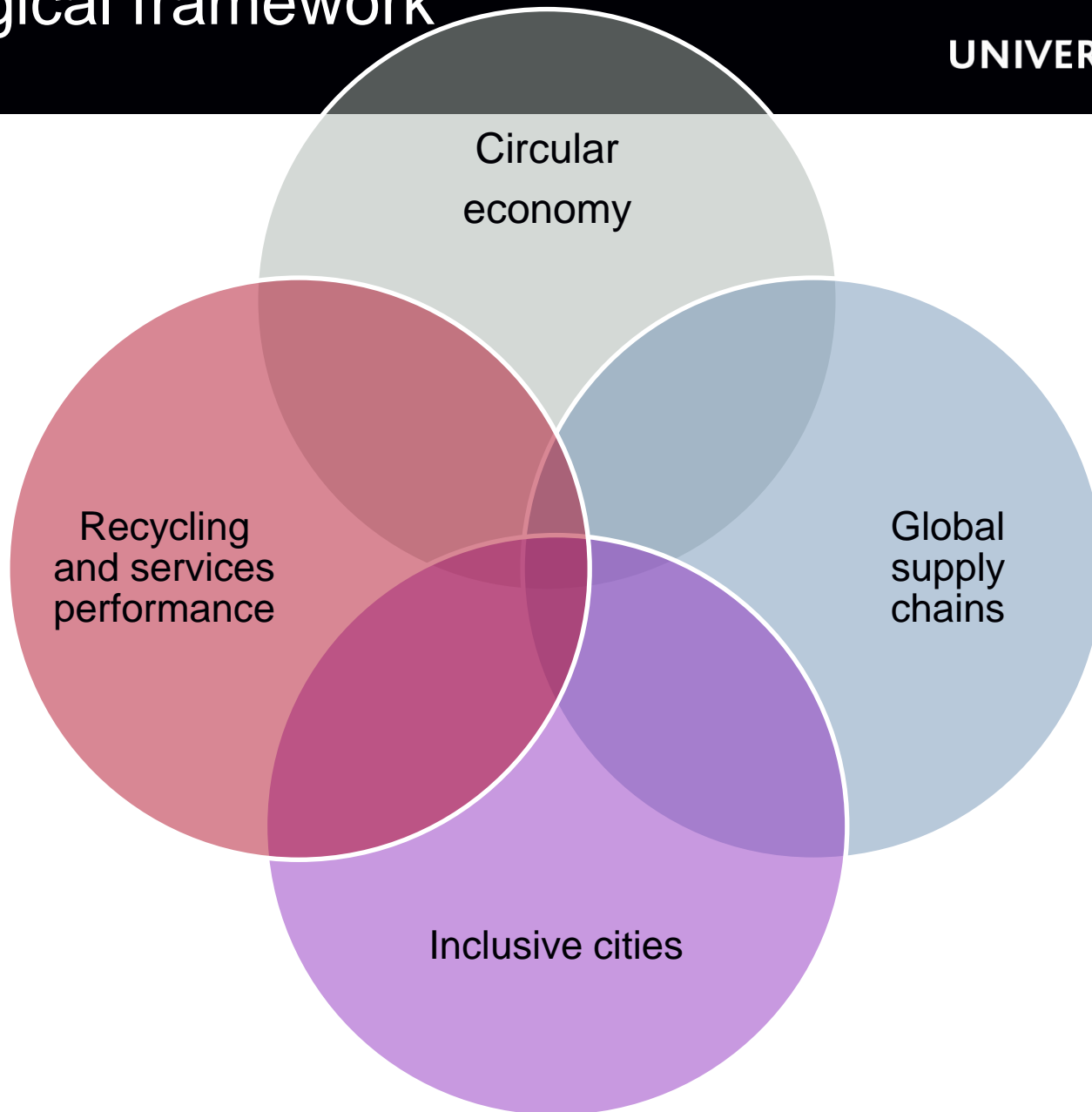
(Velis et al., 2009, *Waste Management*)



# But today we have different technologies and ideological framework



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# High-tech, mechanised Materials recycling facility (MRF)



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# 10 Challenging ideas



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**6** Waste pickers cannot be empowered without understanding material properties, secondary material supply chains

**7** Recycling is vulnerable: no effective 'safety networks' for formal recycling business: how IRS will be more competitive?

**8** Waste is a negative economy – one could ask: 'if waste pickers get the best materials, who will pay the increased cost'?

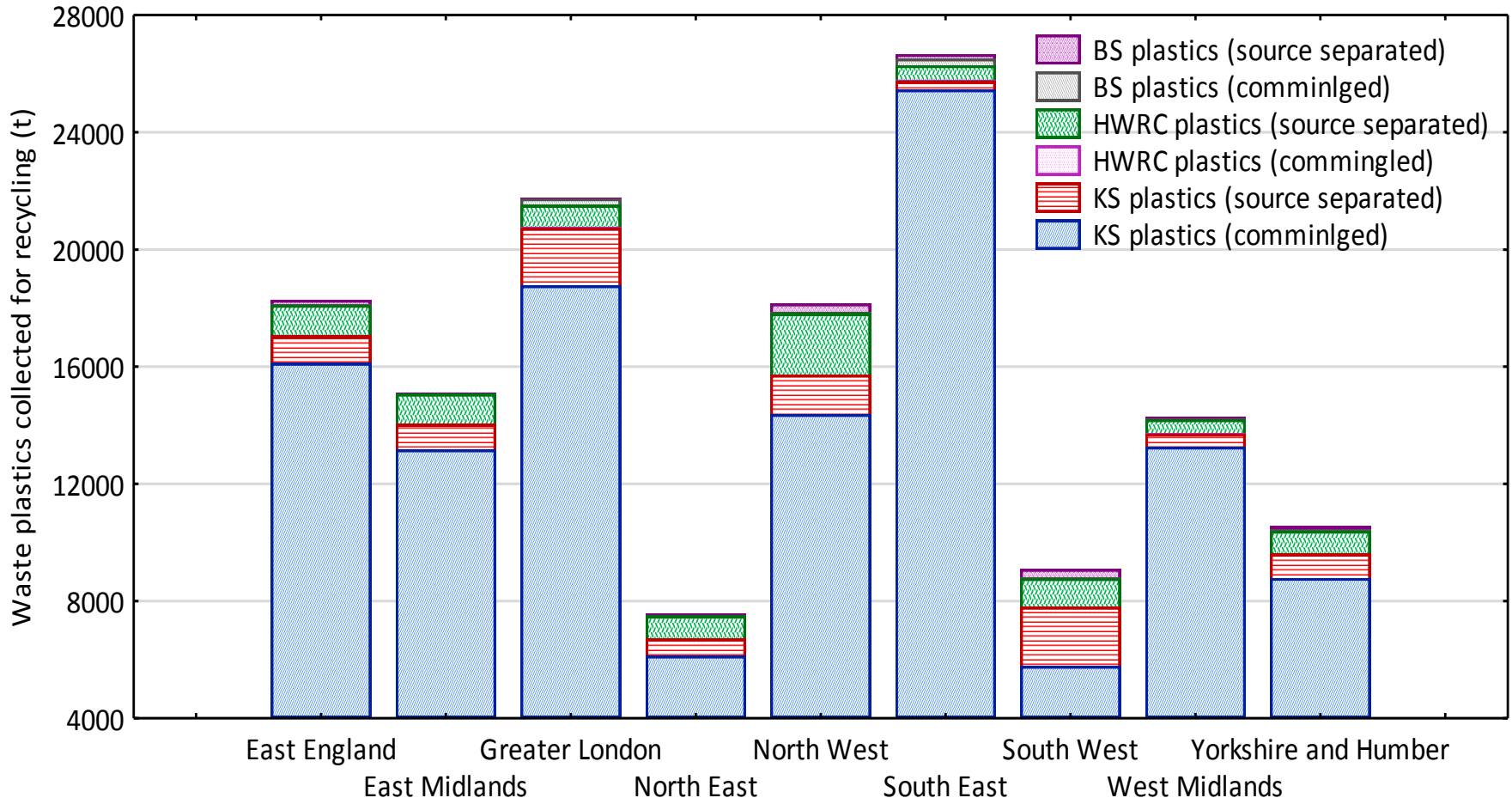
**9** The cost of externalities is largely unknown

**10** What about those not willing to enter cooperatives? Long-term poverty eradication

# England UK – collection of plastics for recycling



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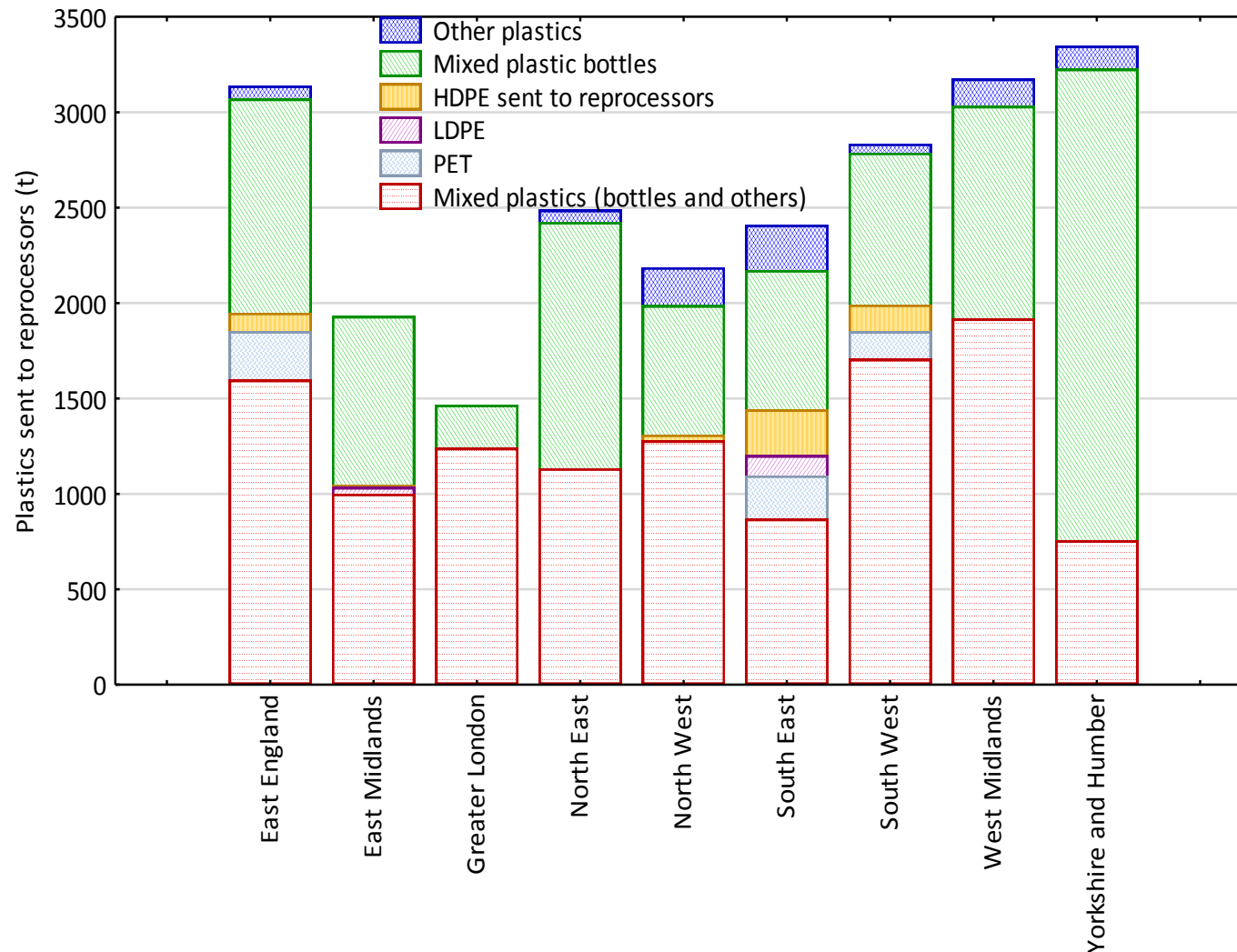


Source: University of Leeds

# England UK – collection of plastics for recycling



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Source: University of Leeds



Original Article



## 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) Supplement 43–66  
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DOI: 10.1177/0734242X12454934  
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Costas A Velis<sup>1,2</sup>, David C Wilson<sup>2</sup>, Ondina Rocca<sup>2</sup>, Stephen R Smith<sup>2</sup>,  
Antonis Mavropoulos<sup>3</sup> and Chris R Cheeseman<sup>2</sup>

*Waste Management & Research:*

***Florence Congress Issue***

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***In India: adapted  
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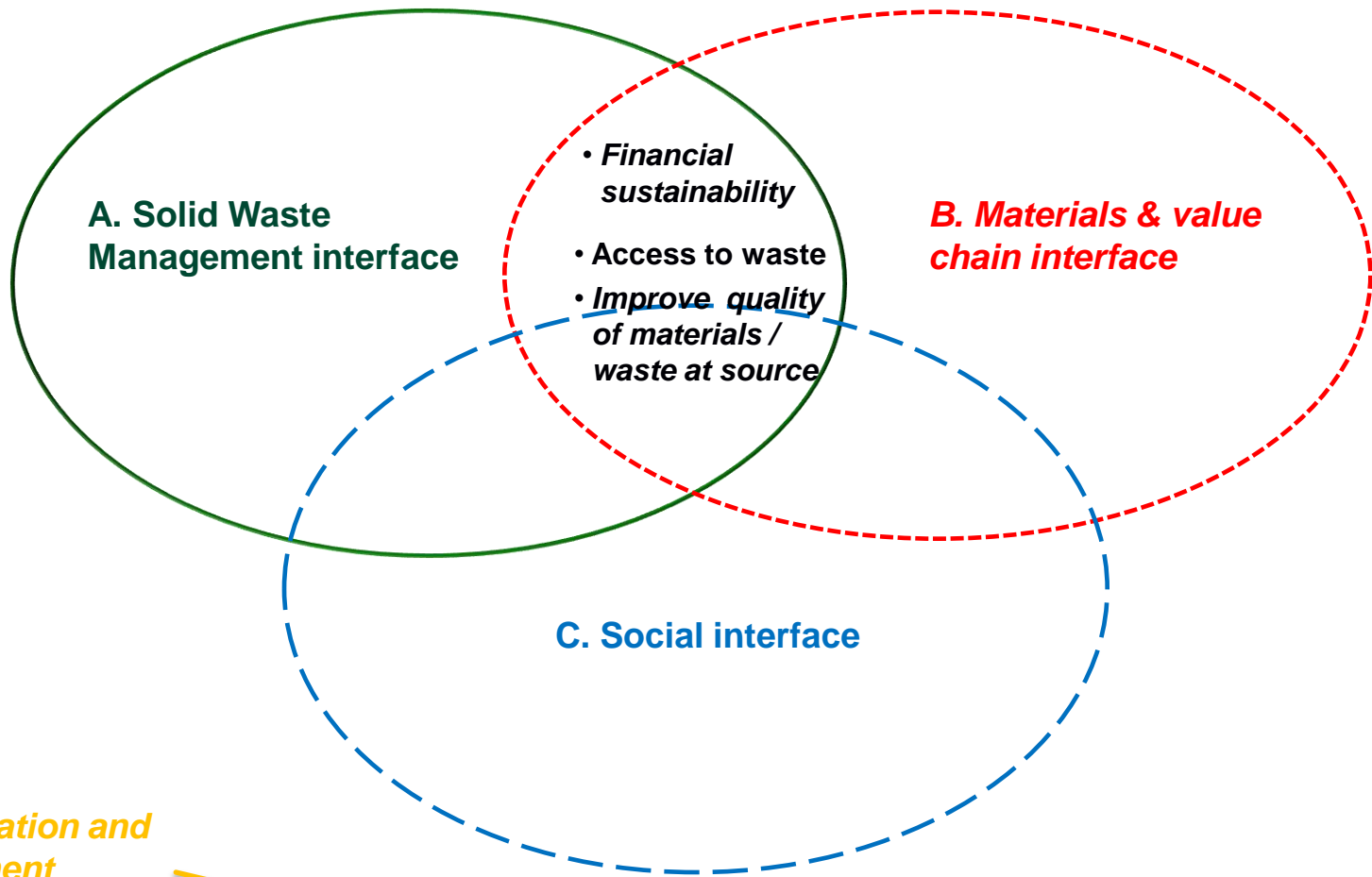




# Systems description of informal recycling sector



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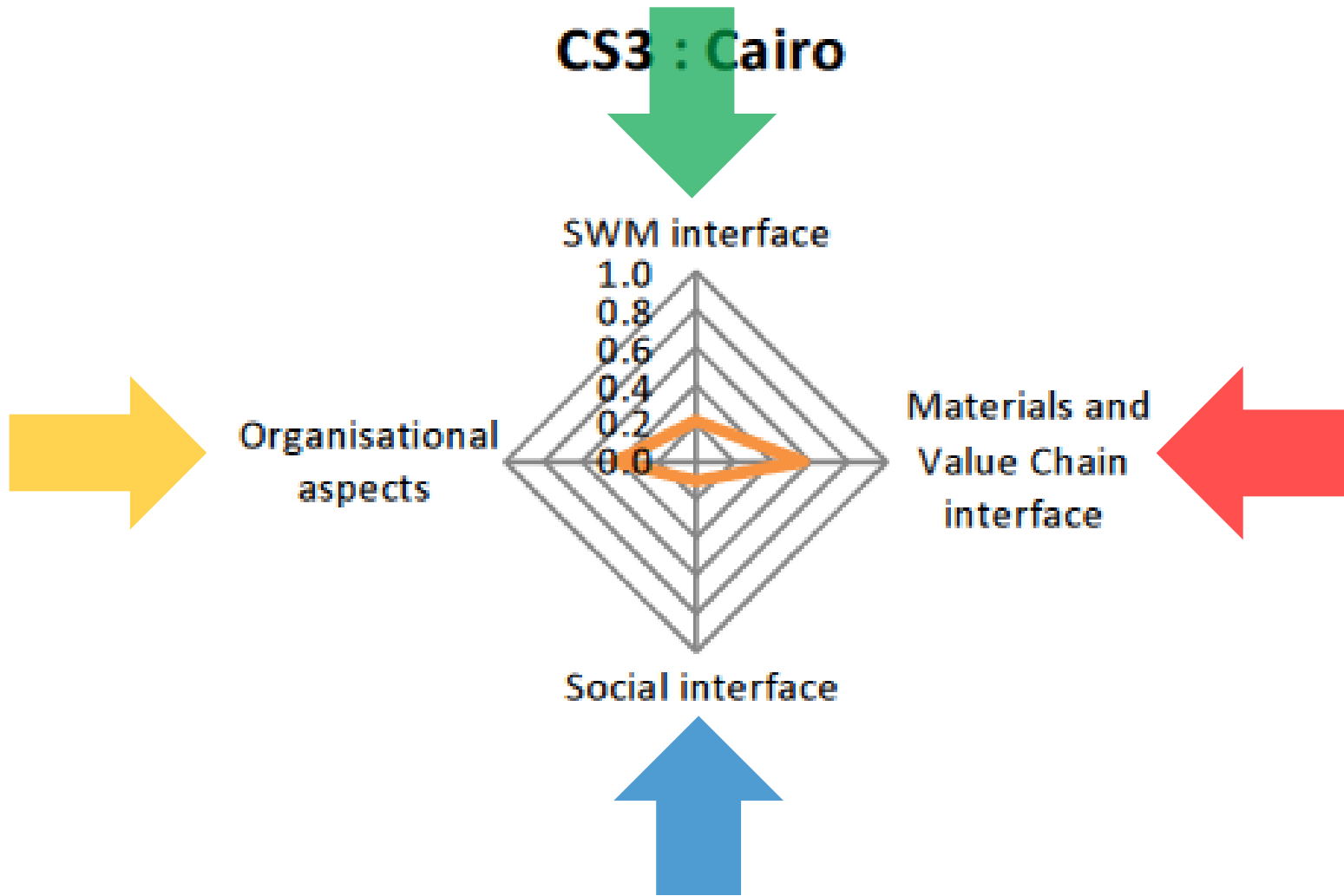


**O. Organisation and empowerment**  
(*underpinning basis*)

# Visualisation tool for inclusive recycling initiatives



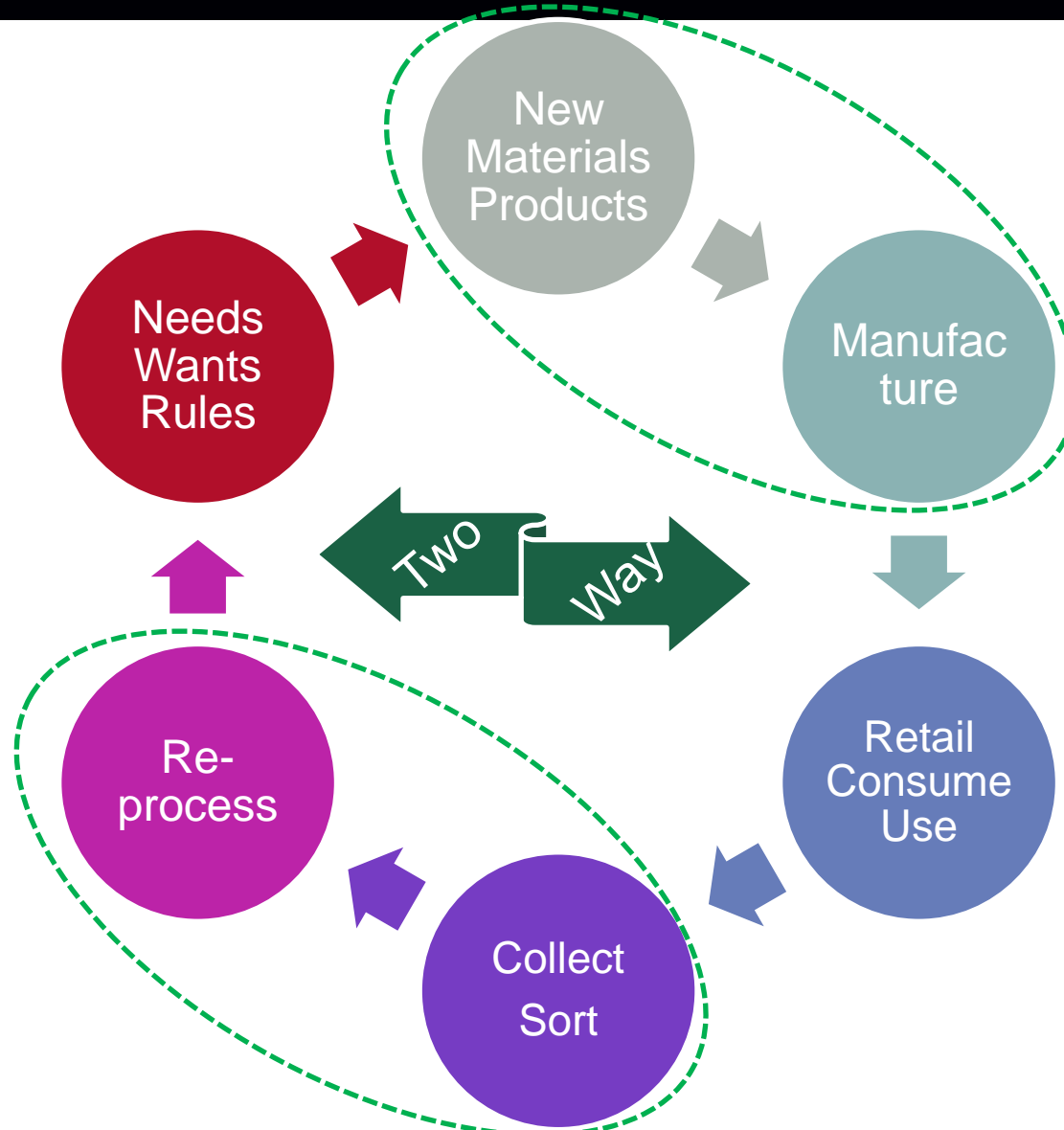
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# SWM only one part of a circular economy...



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# Meaning / role of “recycling”: Recycling vs. primary raw material substitution



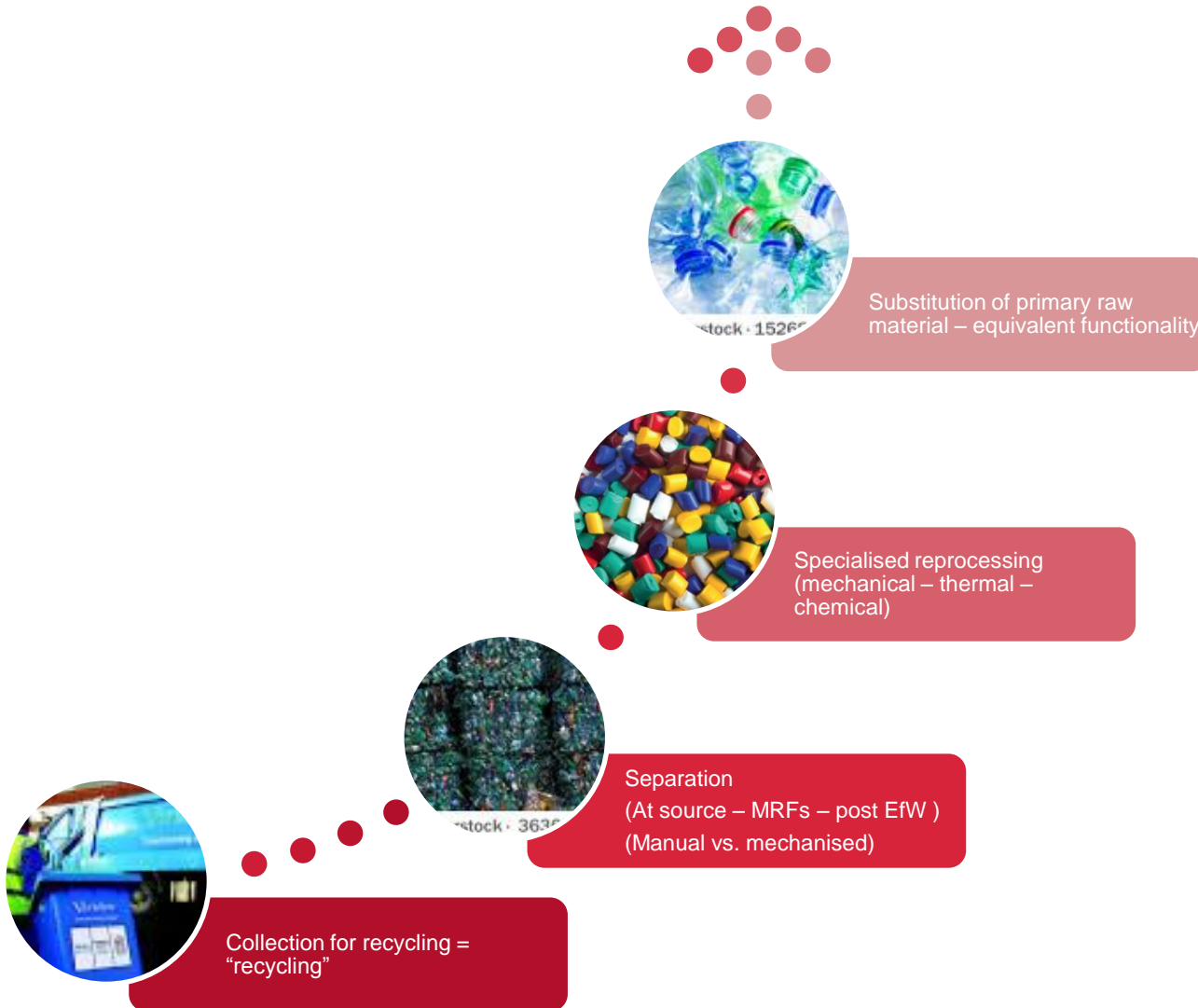
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Goal

Basis -  
NOT  
Goal

Least consid  
ered

Focus  
to date



# ISWA Globalisation and Waste Management: local actions – global implications



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## Global recycling markets: plastic waste

A story for one player – China



A report from the ISWA Task Force on Globalisation and Waste Management

Author: Costas Velis



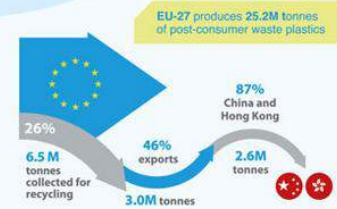
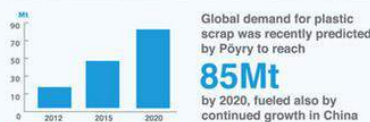
**ISWA TASK FORCE**  
on Globalisation and Waste Management  
PUBLICATIONS

## Sources of Waste Plastics Imported in China in 2010



### China is the dominant global player (importer)

Along with Hong Kong SAR this activity accounts for **49%** of the global financial activity in plastic scrap imports



Europe (EU-27) exports 46% of all the post-consumer plastics collected for recycling; 87% wt. exported to China + Hong Kong SAR



# 10 Challenging ideas



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**6** Waste pickers cannot be empowered without understanding material properties, secondary material supply chains

**7** Recycling is vulnerable: no effective 'safety networks' for formal recycling business: how IRS will be more competitive?

**8** Waste is a negative economy – one could ask: 'if waste pickers get the best materials, who will pay the increased cost'?

**9** The cost of externalities is largely unknown

**10** What about those not willing to enter cooperatives? Long-term poverty eradication





- High cost of infrastructure
- High cost of collection / separation systems for recyclable materials
- Lack of public participation
- Unstable prices for materials (particularly internationally traded materials)
- Quality of materials
- Quantity of recovered material

# How about EPR (Extended producer responsibility)?



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*Editorial*

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## **Which material ownership and responsibility in a circular economy?**

**WM&R**

*Waste Management & Research*

2015, Vol. 33(9) 773-774

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# 10 Challenging ideas



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**10** What about those not willing to enter cooperatives/associations?  
Long-term poverty eradication

# GWMO:

## Typical net cost for key systems parts



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PART A: WORLD BANK PROJECT DATA (NOMINAL DATE 2006) <sup>11</sup>	LOW INCOME COUNTRIES	LOWER MIDDLE INCOME	UPPER MIDDLE INCOME	HIGH INCOME COUNTRIES
Income (GNI/capita) 2006	< 876 USD	876-3 465 USD	3 466-10 725 USD	> 10 725 USD
Waste generation (kg/cap/yr)	220	290	420	780
Collection coverage <sup>12</sup> (percent of households served)	43%	68%	85%	98%
	<b>Cost of Collection and Disposal (USD/tonne)</b>			
<b>Collection</b>	20-50	30-75	40-90	85-250
Sanitary landfill	10-30	15-40	25-65	40-100
Open dumping	2-8	3-10	NA	NA
Composting	5-30	10-40	20-75	35-90
Waste-to-energy incineration	NA	40-100	60-150	70-200
Anaerobic digestion	NA	20-80	50-100	65-150

Collection: **Up to 30% of total net costs** for high income –  
BUT: assuming high level of treatment and disposal



- **Combined net costs for unit operations:** incl. investment and operating costs, minus: resource recovery revenues
- **Unit costs increase with income level** (higher costs of personnel and compliance + more stringent environmental regulations)
- **As income levels rise, more sophisticated technologies generally become more affordable**
- **Upper limit on affordability of 1% of the GDP/GNI per capita**

PART B: RESEARCH STUDY COMPARING ALTERNATIVE TECHNOLOGIES (2012 DATA) <sup>13</sup>	LOW INCOME COUNTRIES	LOWER MIDDLE INCOME	UPPER MIDDLE INCOME	HIGH INCOME COUNTRIES
GDP [USD/capita/year]	< 2 700	2 700-5 400	5 400-8 100	34 000-41 000

PART C: CALCULATED FOR GWMO <sup>16</sup>	UPPER LIMIT ON AFFORDABILITY CALCULATED AT 1% OF GNI <sup>17</sup> (USD/TONNE)			
Affordability limit for total cost of solid waste management	< 40	40-120	120-255	> 255

# 10 Challenging ideas



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# Some ongoing research...



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University of Leeds | School of Civil Engineering | Leeds | United Kingdom

Dr Velis Wednesday, June 01, 2016

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**Buenos Aires  
Argentina:**

**Following the informal  
sector plastic scrap supply  
chain formal to global**

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## Newton Fund

### UK- Brazil: Costing methodology for inclusive recycling

# 10 Challenging ideas



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# 3 necessary conditions for waste picking



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# Waste and children...



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Dandora dumpsite,  
Nairobi



Photo: Lameck Nyagudi

Web:

[http://www.africanews.com/site/Van\\_Nistelrooy\\_at\\_Nairobi\\_dump\\_site/list\\_messages/17449](http://www.africanews.com/site/Van_Nistelrooy_at_Nairobi_dump_site/list_messages/17449)



Payatas Philippines, young  
boys working

Copywrite: David Paul Morris

Web:

<http://davidpaulmorris.com/#/portfolio/stories/payatas-dumpsite-child-labor/PAYATAS017DPM>

Image by: Paul Jeffrey

Source: New World Outlook

Web: [http://gbgm-umc.org/global\\_news/full\\_article.cfm?articleid=3470](http://gbgm-umc.org/global_news/full_article.cfm?articleid=3470)



“New site has opened  
nearby Smokey  
Mountain after it has  
been discontinued as a  
dump site”



# Africa-EU research collaboration. Can basic services combined with resource recovery?



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Building a

“Joint European and African Research & Innovation Agenda On Waste Management”

Waste as a Resource: Recycling & Recovery of Raw Materials

(2014-2020)

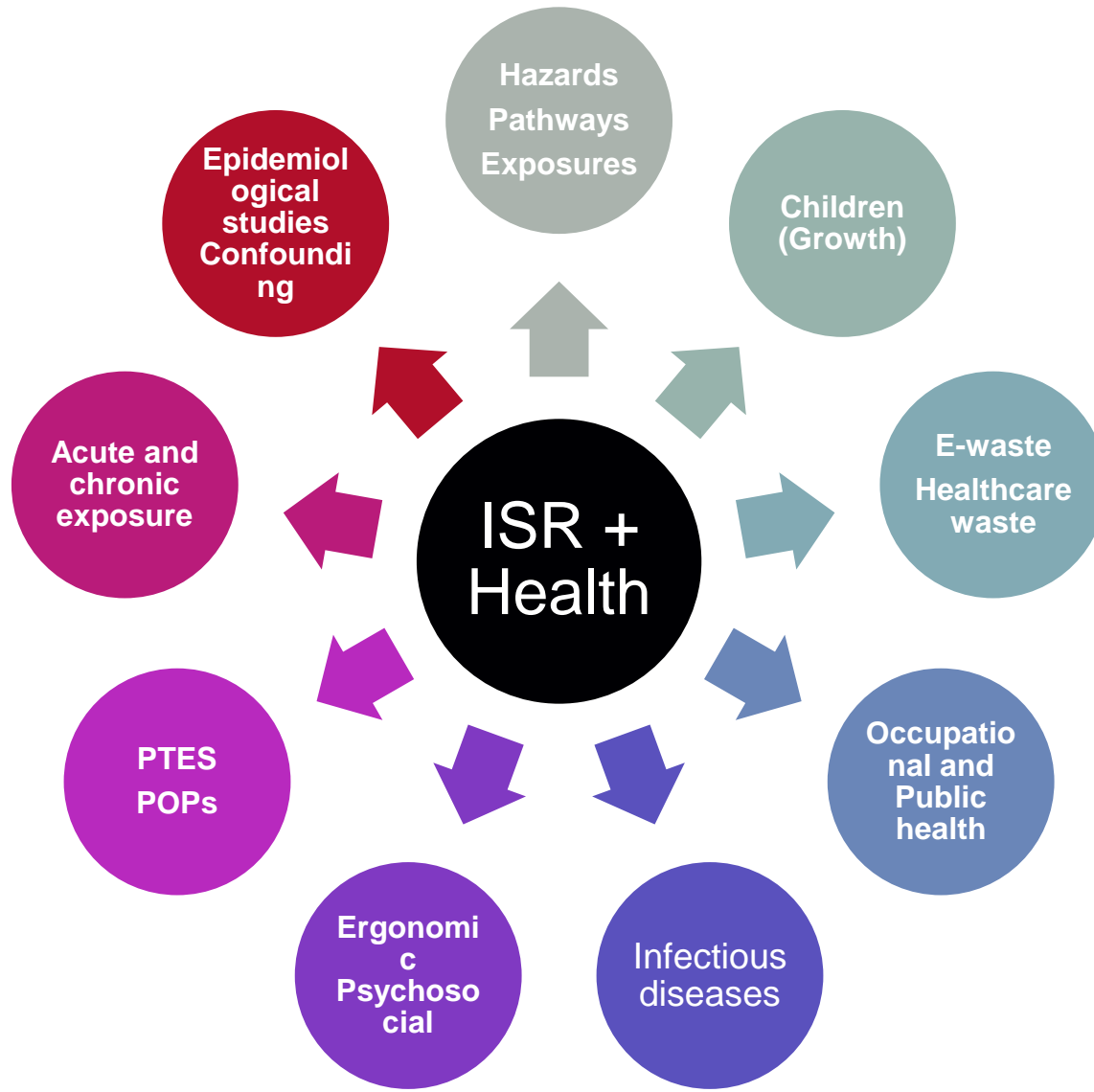
Research and Innovation

The image shows a satellite map of Europe and Africa. The text is overlaid on the map. The European Commission logo is at the top left. The text 'Building a' is on the left side of the map. The main title is in the center. The subtitle is below the title. The dates are at the bottom. The 'Research and Innovation' logo is at the bottom right.

# Waste picking and processing of WEEE and health



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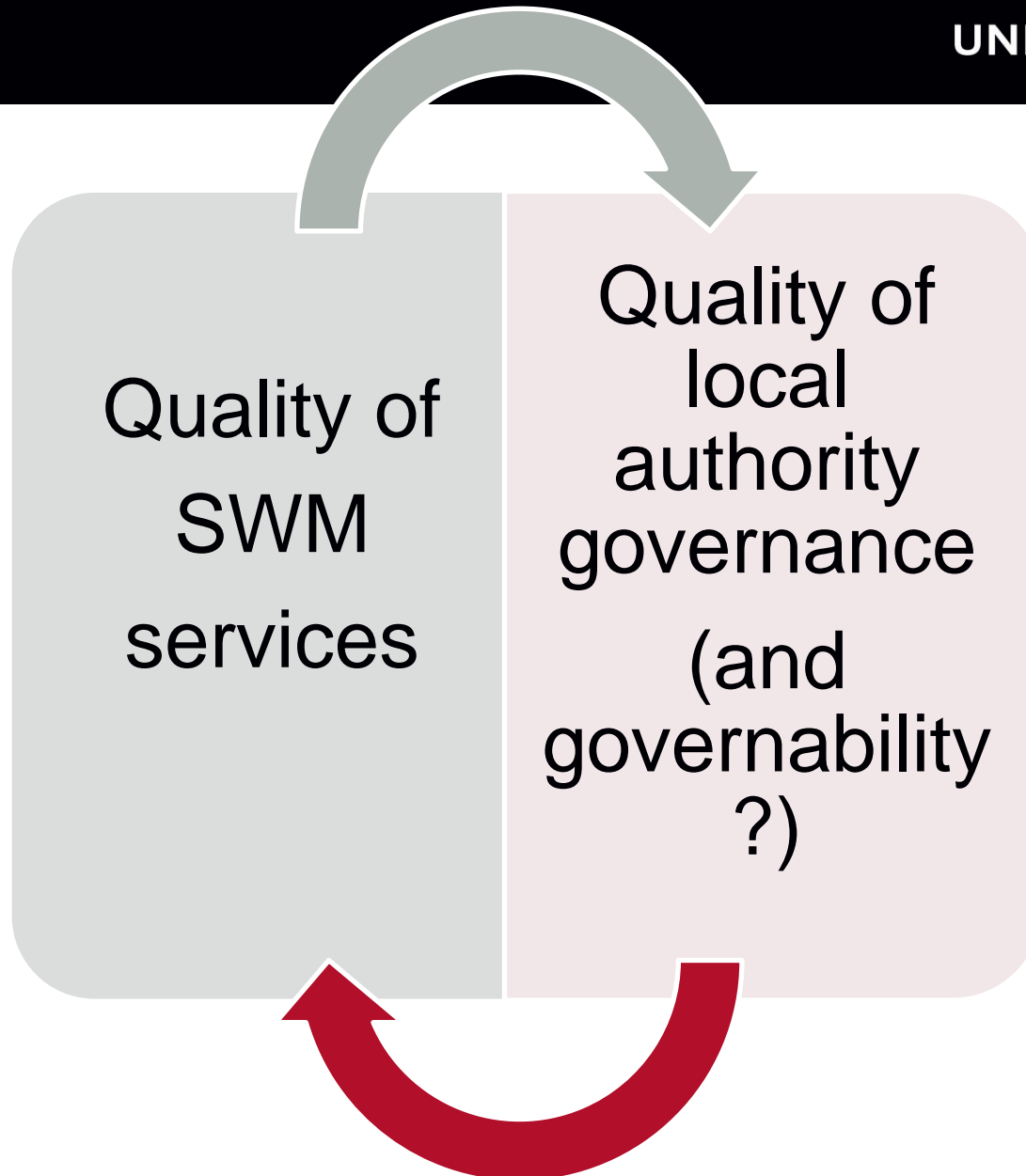


# E-waste toolkit: Knowledge Base (KB: TU Vienna – Website: UoL)



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A data set for each region		Stage in the (W)EEE-Cycle					
		Consumption	Collection	Recovery of Function	Recovery of Materials	Disposal	Total system
Field of Information	Goals of WEEE-Management						
	(W)EEE-characteristics						
	Treatment options						
	Secondary resources						
	Environment & Health						
	Regional characteristics						
	Costs						
	% GDP						
	Stakeholder issues						
	Other issues						





*Editorial*

## Which material ownership and responsibility in a circular economy?

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Establish the  
baseline  
situation



Agree on  
long term  
high level  
goals



Build on  
reality (limits  
of recycling)



EPR can be  
part of the  
solution



Optimise  
waste and  
resources  
management

**Thank you for listening!!**

**Muito Obrigado!!**



**Dr Costas Velis**

**[c.velis@leeds.ac.uk](mailto:c.velis@leeds.ac.uk)**

**With many thanks to  
my research team,  
students, collaborators  
and ORIS**

