ITU/CITEL Workshop on "Environmentally Sound Management of E-waste"

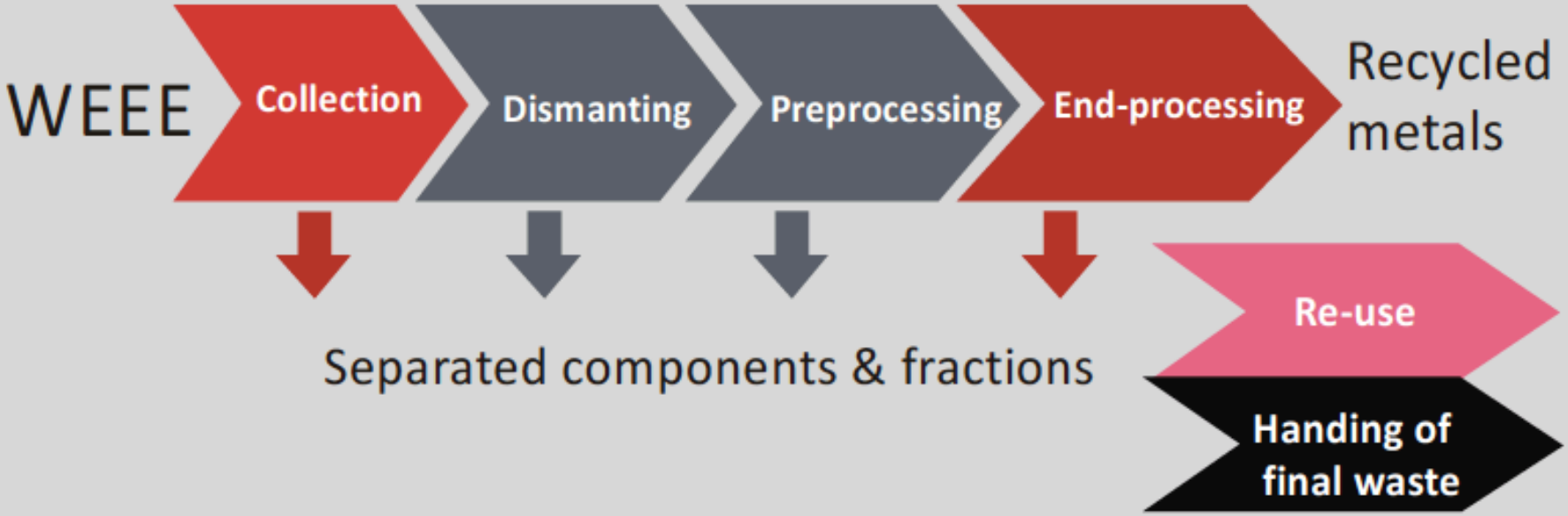
(Mendoza, Argentina, 9 October 2013)

"Best Practices on Electronic Scrap Management Facilities and Urban Mining Development"

Gustavo Fernandez Protomastro,

Consultant, UNEP Basel Convention Regional Center, South America (WEEE in Argentina and Uruguay)

The value chain on e-waste management



Source: Recycling – From E-waste to Resources: Sustainable Innovation and Technology Transfer Industrial Sector Studies, UNEP, 2009

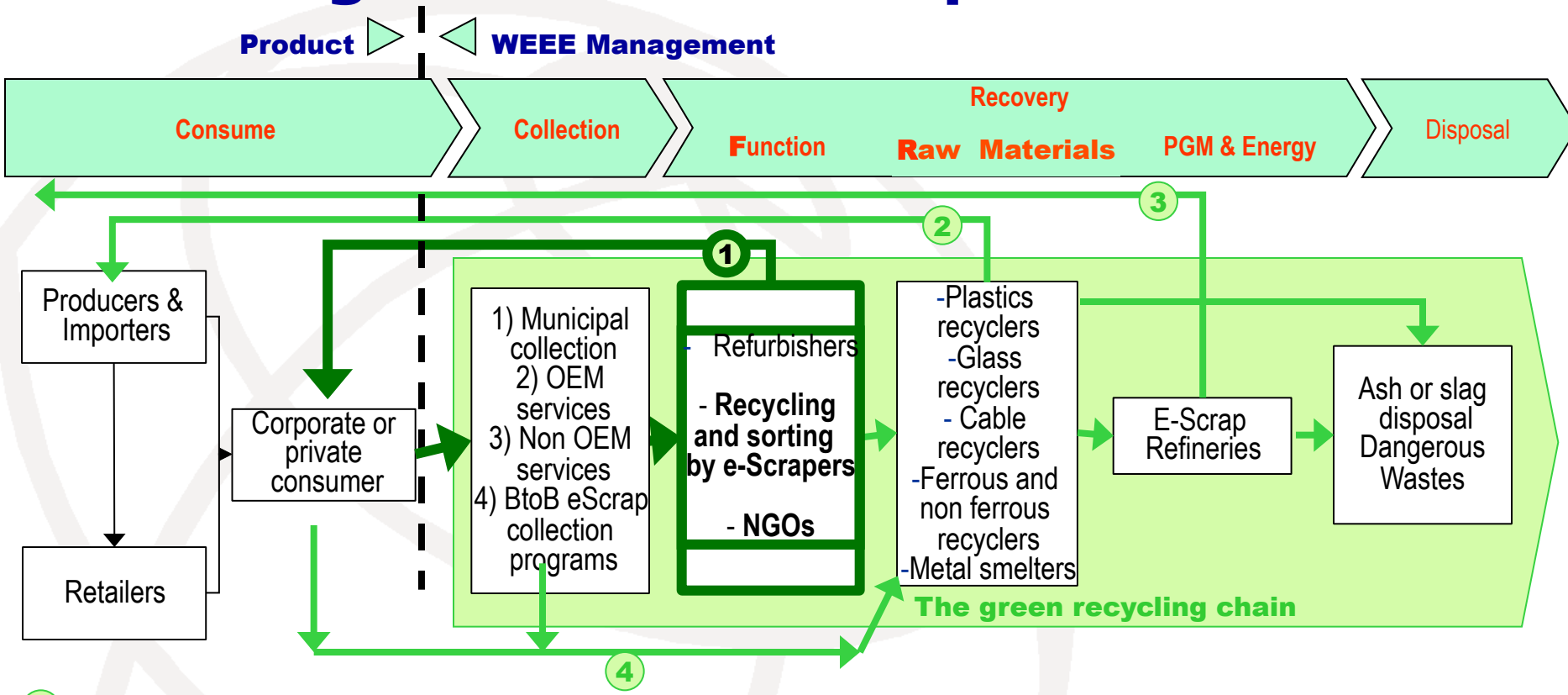
Why you need "three" to dance the e-waste management Tango?

- A) **State:** legal and regulatory framework to regulate and develop the EPR and the recycling industry. The government function should create the market and then control the actors and the e-waste flows, in accordance to the Basel Convention directories and procedures.

- B) **Corporate**: Producers and recyclers should find the best way, considering the Argentine culture, to manage the e-waste in BtoB contracts, EPR/IPR contracts, subsidy contracts or State managed solutions.

- C) **Consumers:** are the key actors where reverse logistic begins. Education and communication on how to handle and mange the post consume electronic stuff, should be a priority

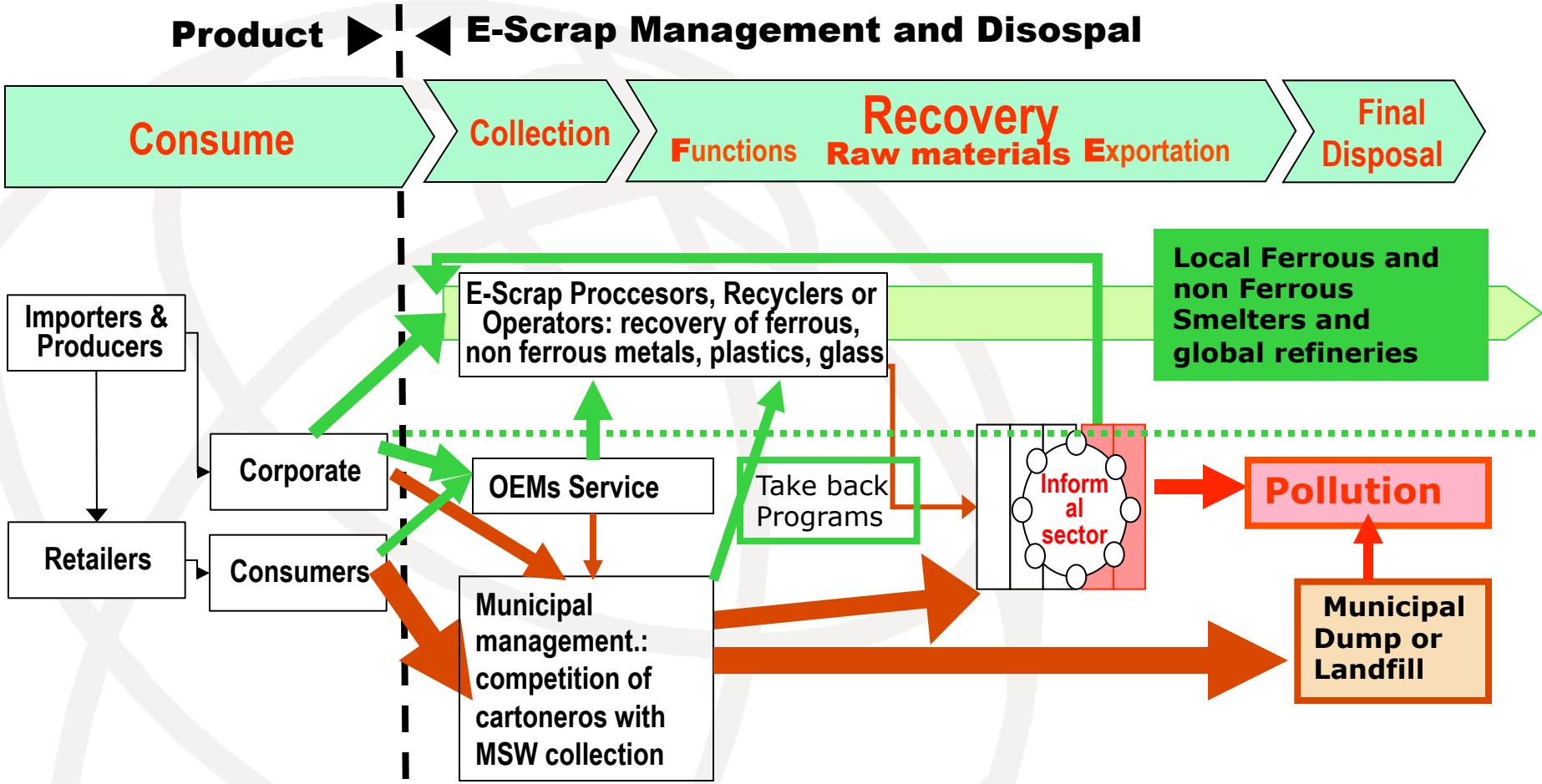
How is the Value Chain of e-Scrap Management in Developed Countries



1. Recovery of function from refurbishes or recyclers that recover memories, IC chips, power supplies, batteries, etc.
2. Raw material recyclers : get ferrous scrap for iron/steel smelters; plastics for extruders; copper/aluminum and other base metals processors or smelters
3. Base and precious metal refineries
4. Consumers can send, pay to send or resell used equipment's to the e-Scrap industry, depending the quality and value of the e-waste

Adapted from EMPA

How is the Value Chain of e-Scrap Management in Developing Countries:



The green flow: from corporate, Service and individual consumers to collectors, de-manufacturers, raw material recyclers/resellers to smelters and printed circuit boards exporters to refineries.

The brown flow: from post consume to "the street", where informal collectors compete with Municipal Solid Waste service, ending in dumps or polluting the environment

Adapted from EMPA

Basel Convention PACE Project Group 5.1

The 10th meeting of the Conference of the Parties to the Basel Convention in 2011 in Columbia, in its Decision on PACE, amongst other things, decided that the **Partnership for Action on Computing Equipment (PACE)** Working Group should :

- Develop strategies on the **Environmentally Sound Management (ESM**);
- Identify actions and incentives that can be taken to promote ESM through the implementation of the **Partnership guidelines and existing certification schemes**; and
- Assess the possibility of **using facility certification as a tool for assuring ESM**.

PACE Project Group 5.1: Current Work

Web based survey

Priority Task 1: PG5.1 participants were asked to send examples of:

(a) policies for ESM of computer equipment waste from developing countries and countries with economies in transition in particular?

(b) incentive schemes that are: voluntary, financial, regulatory, or administrative?

PACE Project Group 5.1: Current Work

Priority Task 3: PG5.1 participants: were asked to identify barriers to implementing collection and take-back schemes;

Producers' representatives were asked to give examples of barriers to starting up voluntary schemes;

All participants were asked "What incentives or support is needed to overcome barriers identified in WEEE management".

Priority Task 4: Key items to be explored could include identifying

a) existing certification scheme(s) / guideline(s)

(b) the key steps to get certified?

(c) links to certification scheme website

(d) the key components or elements of the scheme(s) / guideline(s)?

(e) the scheme(s) / guideline(s) compatible with PACE guidelines?

(f) How are governments, NGOs and industry using facility certification mechanisms now?

Priority PACE Task 4:
Current work

- ✓ **Collation of results of Survey**
- ✓ **Integration of information from published studies**
- ✓ **Overcome use of information from "Official Use Only" sources**
- ✓ **Compare key aspects of existing standards**

Questions on e-waste management for ICT regulators

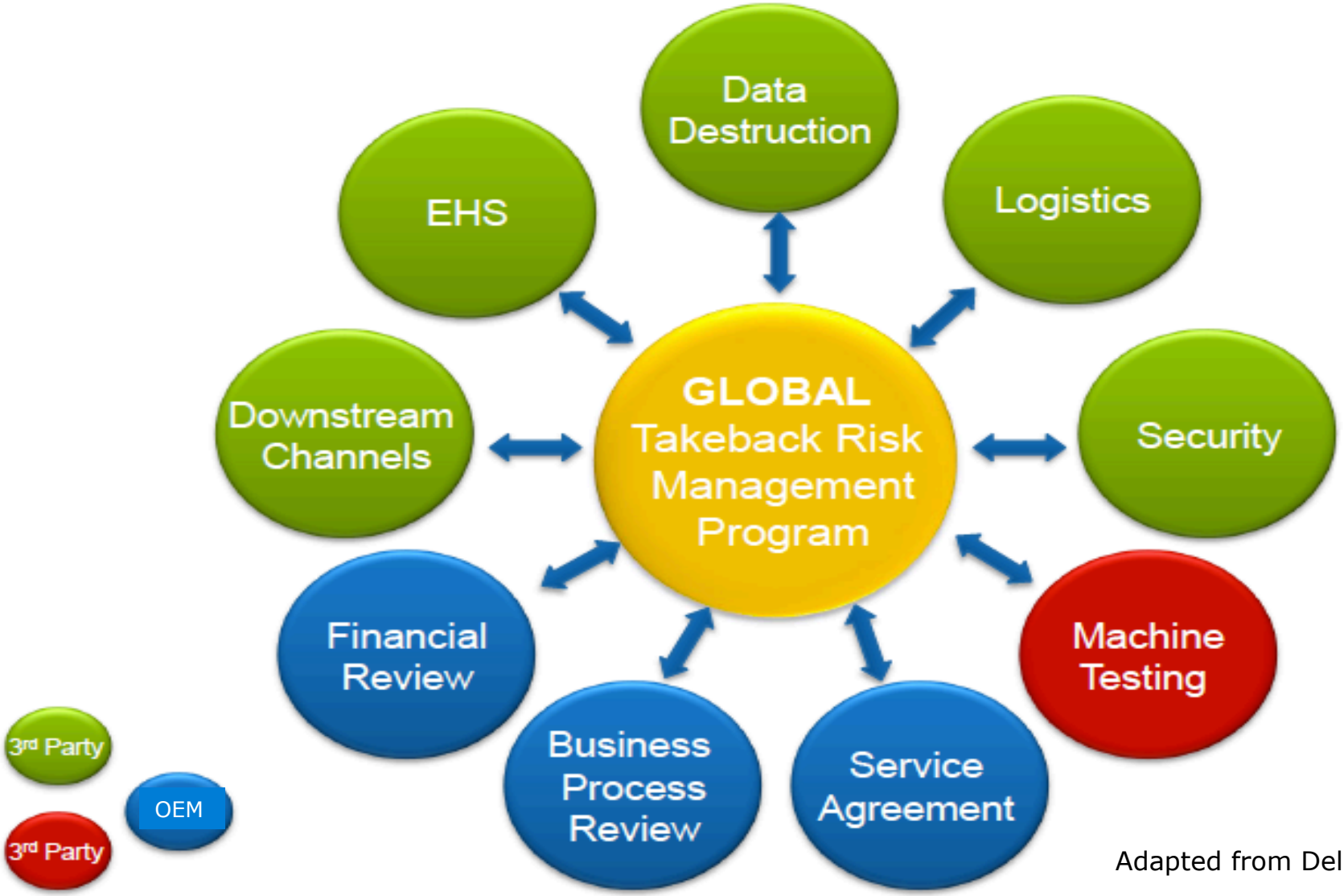
- Should the ICT Regulator play a role in encouraging its licensees to integrate e-waste concerns in their business strategies?
- What role should the ICT regulator assume in relation to e-waste management: facilitator, enabler, promoter, awareness raiser, and/or enforcer?
- How should e-waste policies be designed so that they do not present a bottleneck to innovation, competition and universal access in the ICT sector?

Questions on e-waste management for ICT regulators

- Which mode of reverse logistic, collection, transport, dismantling and treatment would be ideal to ensure achievement of the desired objectives?
- What should be the scope and extent of regulatory interventions that are designed towards effective e-waste management?
- How can the ICT regulator ensure that there is effective co-ordination with other agencies, such as the environmental agency, in relation to any interventions directed at compliance and enforcement of e-waste obligations?

Auditing Best Practices in WEEE Partners Facilities

Global Partner On-boarding Elements



Adapted from Dell Inc.

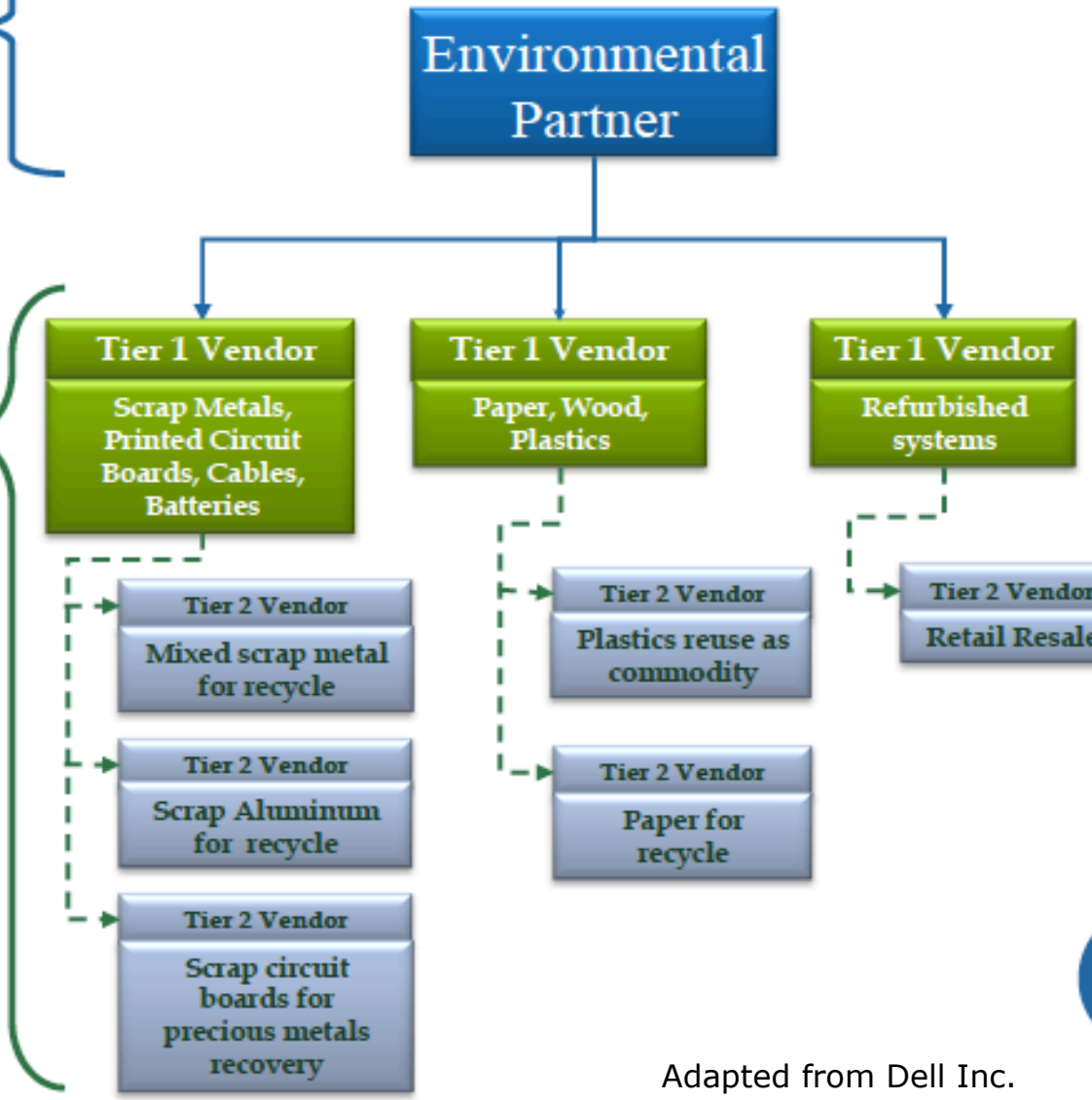
Auditing Best Practices in WEEE Partners Facilities

Site Audit

Site visit and document review of EHS, Security, Data Destruction & Logistics

Downstream Channel Audit

Process and document review of materials volumes transferred & shipment documentation/ authorizations for transfers from Partner to Tier 1 and from Tier 1 to Tier 2 (to final disposition for sensitive materials)



Adapted from Dell Inc.

Auditing Best Practices in WEEE Partners Facilities

Environmental, Health and Safety

- Siting and General Operations
- Housekeeping
- Storm Water Discharges
- Air Emissions
- Water Discharges
- Hazardous Materials
- Hazardous Wastes
- Emergency Prevention and Planning
- Final Materials Disposition
- Employee Safety
- Management Systems

Security

- Personnel Security
- Facility Security
- Asset Security

Data Destruction

- General Operations
- Software-Based Destruction
- Physical Data Destruction
- De-Gaussing Operations

Logistics

- Permits and Licenses
- Transboundary Shipments
- Asset Security
- Employees and Drivers
- Trucks and Trailers
- In Transit Storage
- Routes, Schedules and Transfers

Audit Remediation Action Plan (for recurring audits)

- Corrective Action Documentation
- Downstream Change Notification Documentation
- Downstream Audit Reports

Adapted from Dell Inc.

Principles & Policies on e-Waste management

- Two policy principles that should be a key part of the ICT policy response to e-waste are recycling and extended producer responsibility:

- **1) EPR:** The first principle seeks to promote the high utilization of product and material quality through effective collection, treatment and re-use or recycling in an environmentally friendly and socially desirable manner.

- **2) DfE:** The second principle focuses on encouraging producers to assume responsibility for the products they generate through their entire life cycle. This is done through a matrix of incentives that systematically encourage the producer to design improvements of products and product systems that have an optimal environmental performance even at their end of life. This is known as design for environment (DfE).

Principles & Policies on e-Waste management

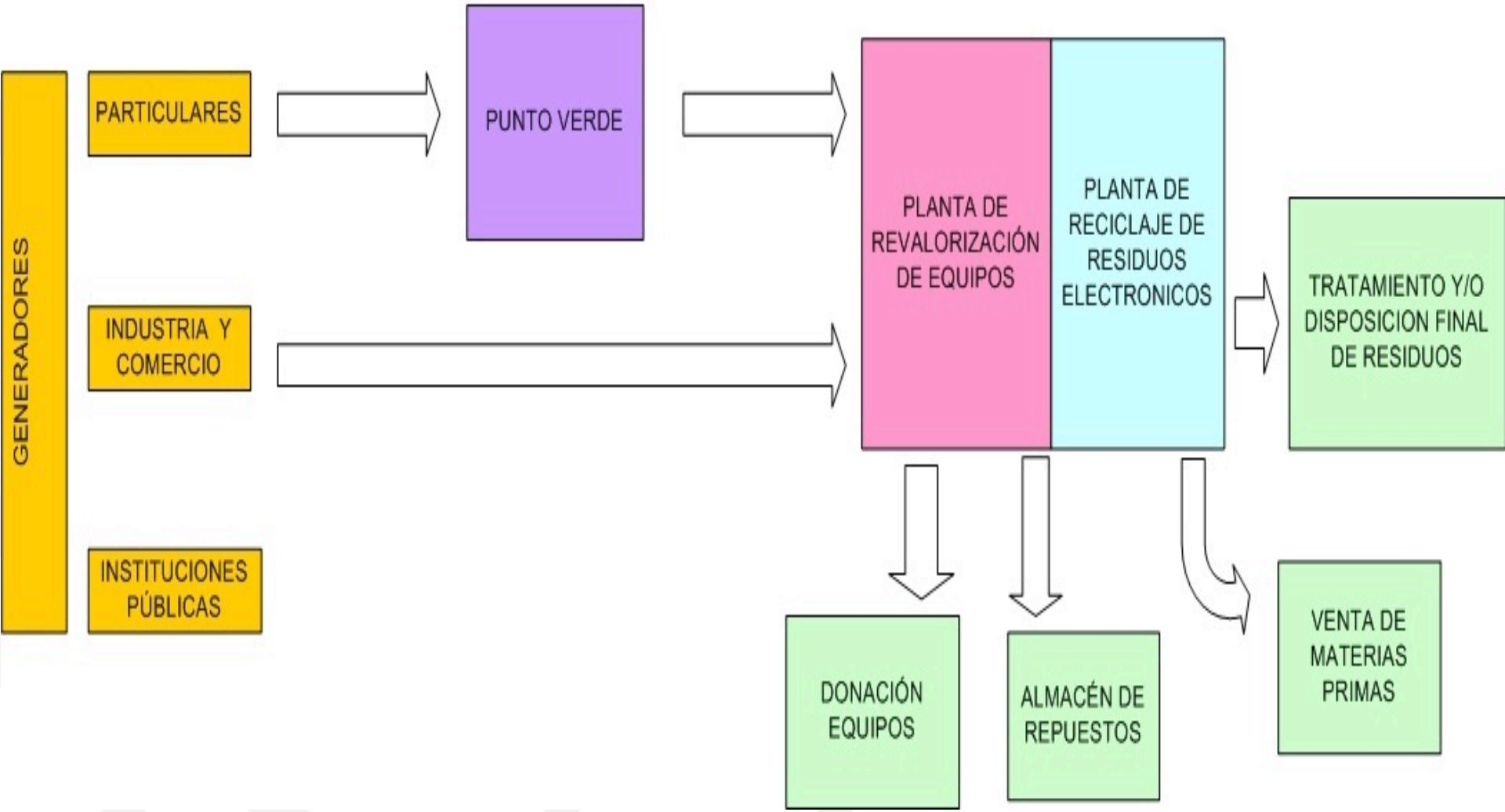
- An effective response to the e-waste problem also requires a clear allocation of roles and responsibilities among several actors, as well as the identification and implementation of a mix o policy interventions, which must be adapted to the local context as much as possible.
- General policy and regulatory recommendations relate to harmonization; standards and certification; obligations and incentives of key actors; extended producer responsibility policies; and various forms of partnerships designed to address e-waste.

Principles & Policies on e-Waste management

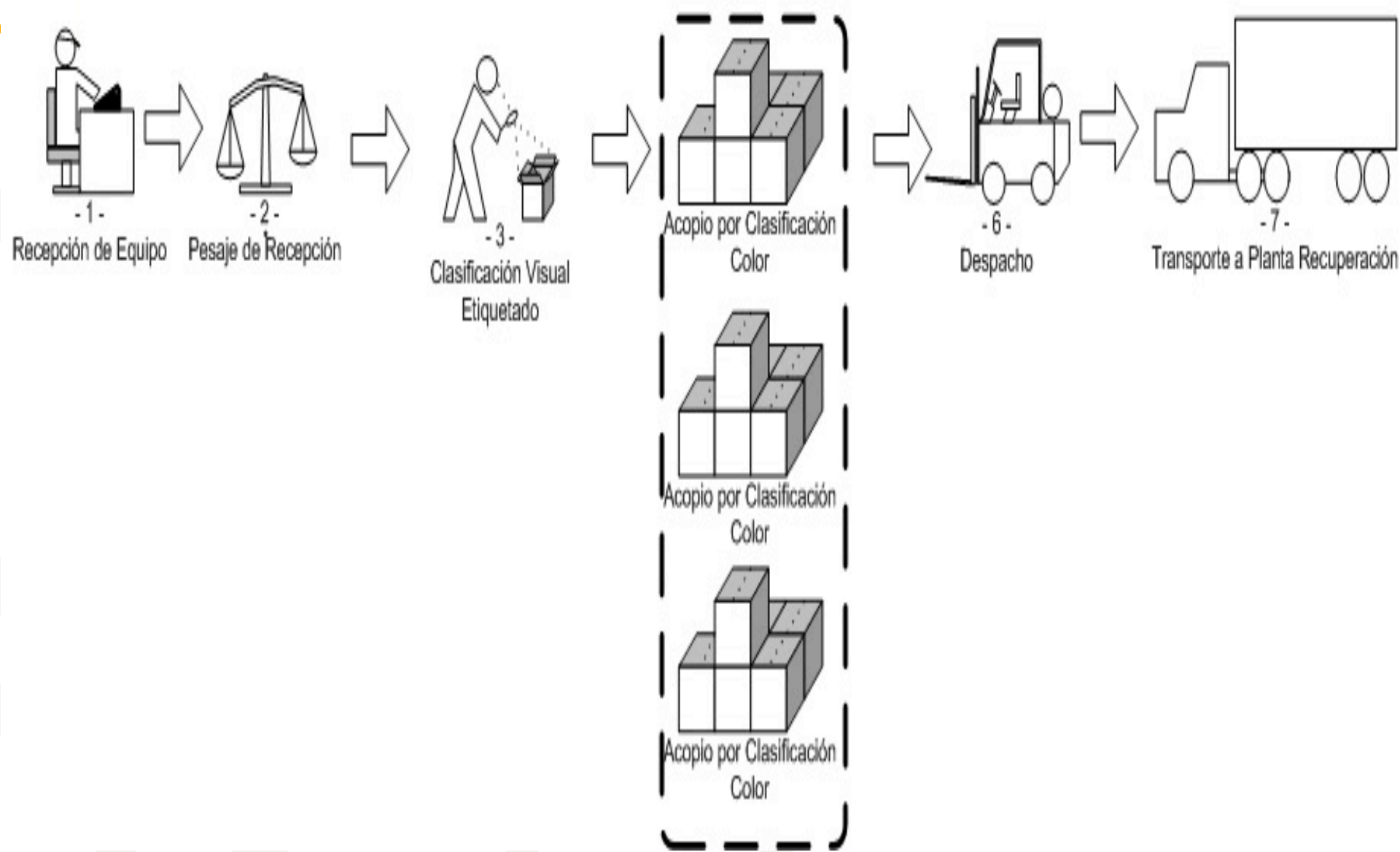
- Any effective e-waste management ecosystem must address the local context at the core of its design. There is a need to balance the push for access to ICTs with the practicality of harnessing the resultant e-waste in a manner that is sustainable for the long term.

- Other critical aspects of developing a roapmap for e-waste management include identifying stakeholders; compliance; enforcement; and awareness and capacity-building.

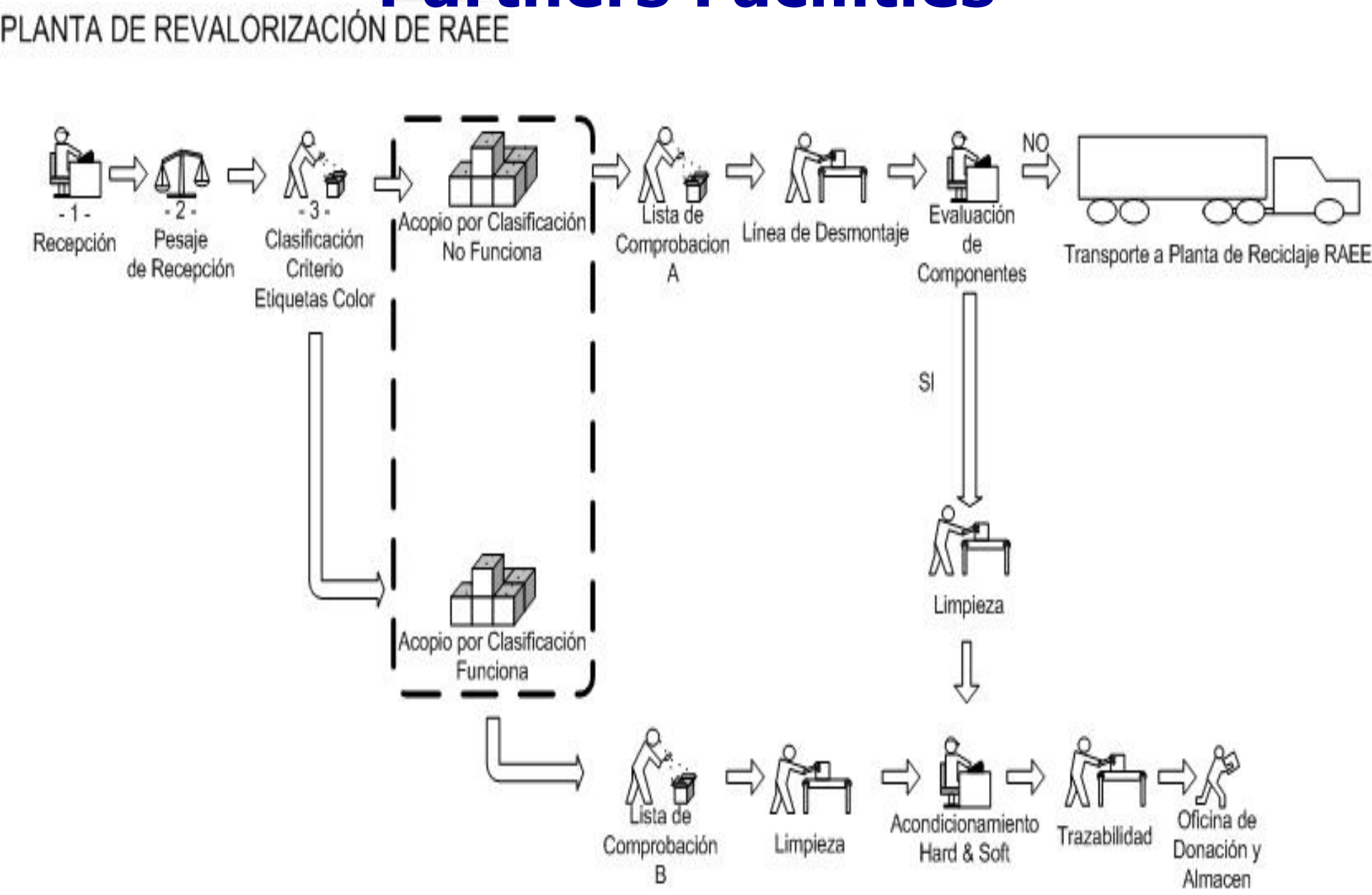
Auditing Best Practices in WEEE Partners Facilities

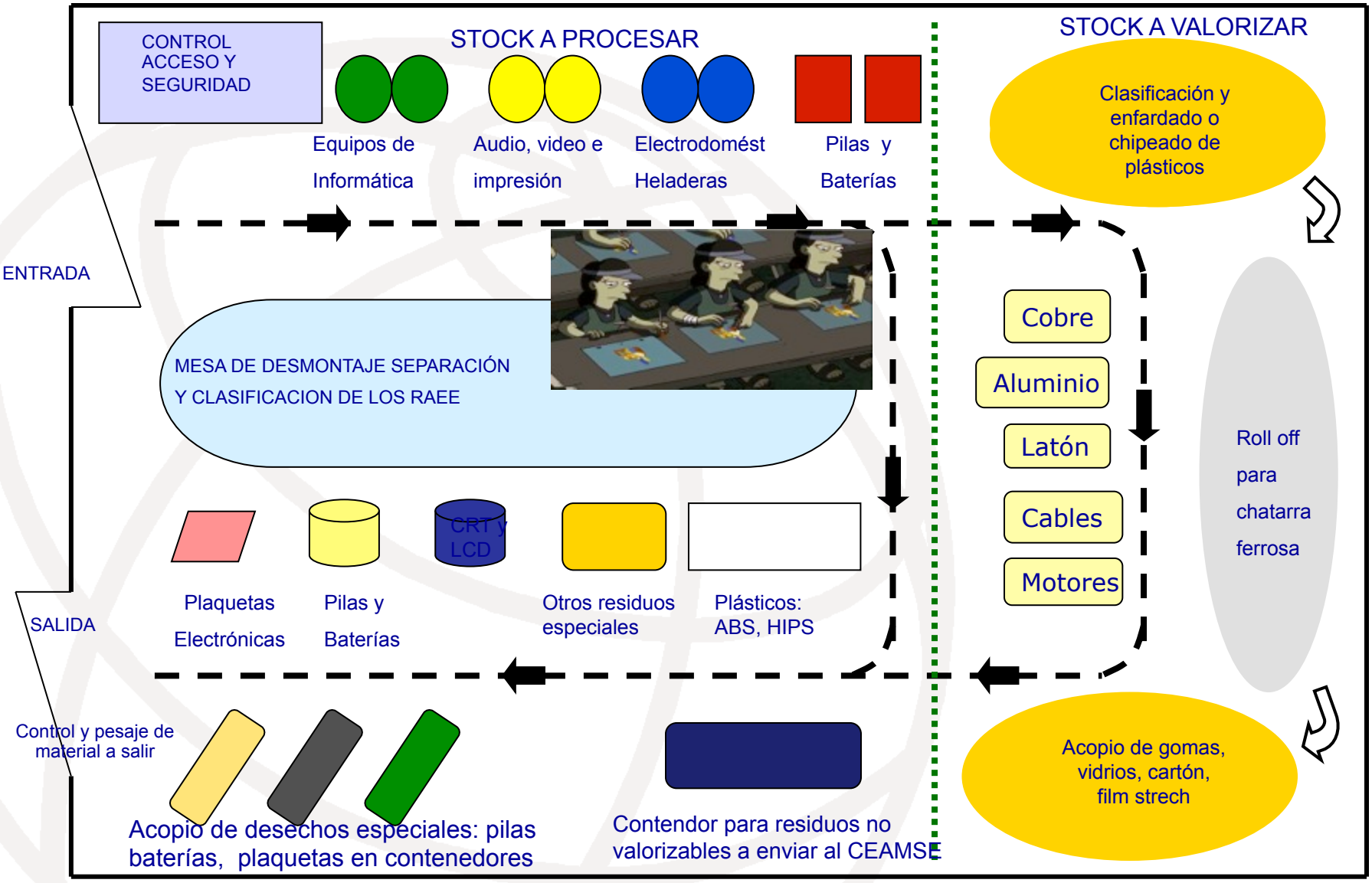


Auditing Best Practices in WEEE Partners Facilities



Auditing Best Practices in WEEE Partners Facilities





STOCK A DISPONER CON OPERRADOR PELIGROSOS

Urban mining: getting resources from the e-scrap

Printed circuit boards

CRT's

Recharchable batteries

Developed country refineries

Argentine extruders, mills and smelters

Ferrous scrap

Copper

Aluminum

Plastics

Cable

Urban mining: getting resources from the e-scrap

weight-%	plastics	Fe	Al	Cu	Ag [ppm]	Au [ppm]	Pd [ppm]
TV-board	28%	28%	10%	10%	280	20	10
PC-board	23%	7%	5%	20%	1000	250	110
mobile phone	56%	5%	2%	13%	3500	340	130
portable audio	47%	23%	1%	21%	150	10	4
DVD-player	24%	62%	2%	5%	115	15	4
calculator	61%	4%	5%	3%	260	50	5

value-share	Fe	Al	Cu	Ag	Au	Pd	sum PM
TV-board	4%	10%	50%	7%	22%	7%	36%
PC-board	0%	1%	18%	5%	61%	15%	81%
mobile phone	0%	0%	9%	13%	64%	14%	91%
portable audio	2%	0%	82%	3%	10%	2%	15%
DVD-player	13%	3%	42%	5%	32%	5%	42%
calculator	0%	5%	14%	7%	69%	4%	80%

<1%	1-10%	10-20%	20-50%	50-70%	>70%

Prices of Oct. 2006

Adapted from UMICORE

Mining a Mobile Phone

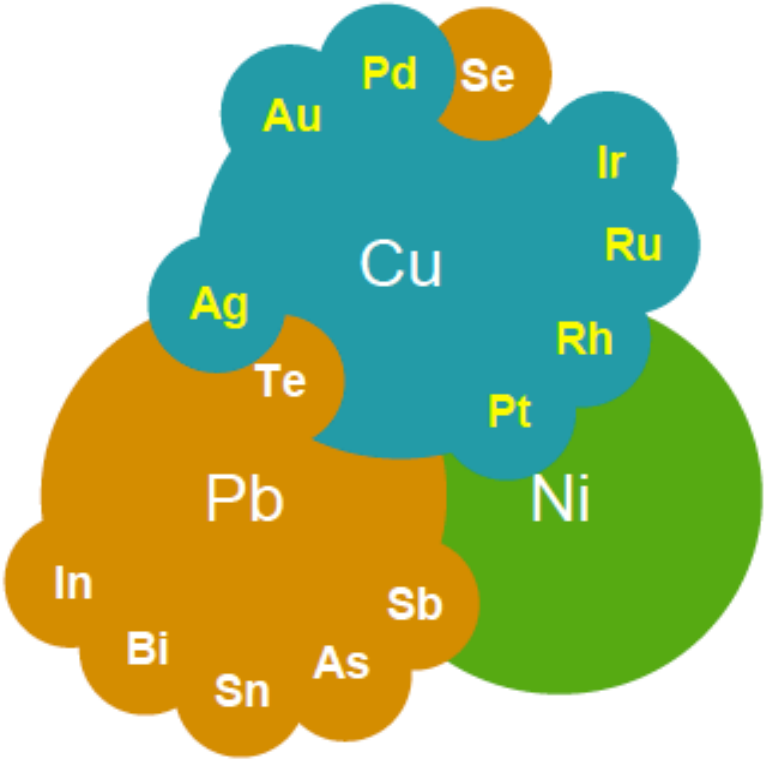
Material	Content	'Backpack'	Materials required						Energy consumption	
			Primary			Secondary			Primary	Secondary
	(g)	(g)	Abiotic material	Water	Air	Abiotic material	Water	Air		
Plastic	60.75	13,061.25	4	207	4				99	
Epoxy resin	7.06	2,188.17	14	290	6				83	
Glass fibre	4.87	501.40	6	95	2					
Flat glass	4.75	76.00	3	12	1				15	
Iron	4.16	923.52	14	205	3	1	59	1	73	68
Aluminium	13.43	14,718.95	37	1,048	11	1	31	1	194	24
Copper	19.06	13,688.45	349	367	2	2	86	1	60	28
Gold	0.04	126,828.80	540,000	2,000,000	500,000				312,776	7,453
Silver	0.24	11,561.50	7,500	30,000	10,000				6,738	128
Silicon	0.87	14,773.00	2,000	10,000	5,000				1,591	
Lithium	1.17	42.04	6	20	10				415	
Manganese	9.93	2,114.30	17	194	2				0.25	
Nickel	1.17	484.64	141	233	41				187	15
Graphite	9.34	3,101.68	20	306	6				68	
Electrolytes	11.68	1,623.24	3	134	2				39	
Other	21.25	962,741.87	15,000	30,000	300	5,000	10,000	100	13,476.02	6,738.01
Total	169.77	1,168,428.82								

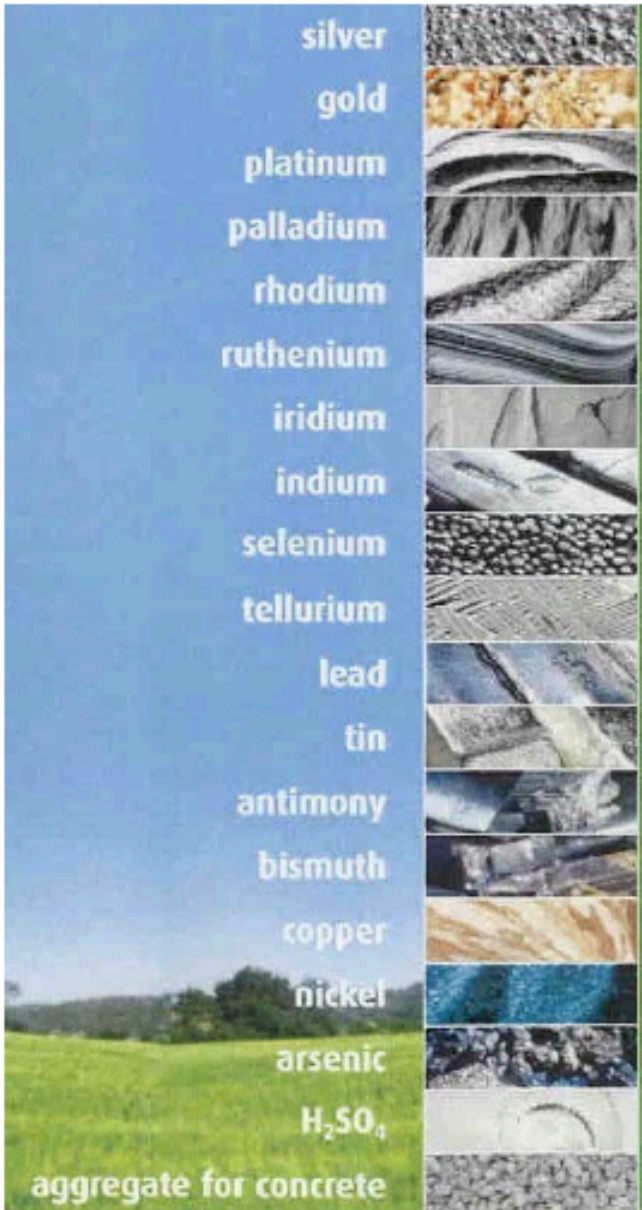
Source: MIT value table (as at 14 July 2011): material intensity of materials,

Adapted from EMPA SWICO

Strategic and Preciuos Metals recovered from e-scrap

Using Pb, Cu & Ni as base metals to drive our recycling process and recover PM's at highest yields

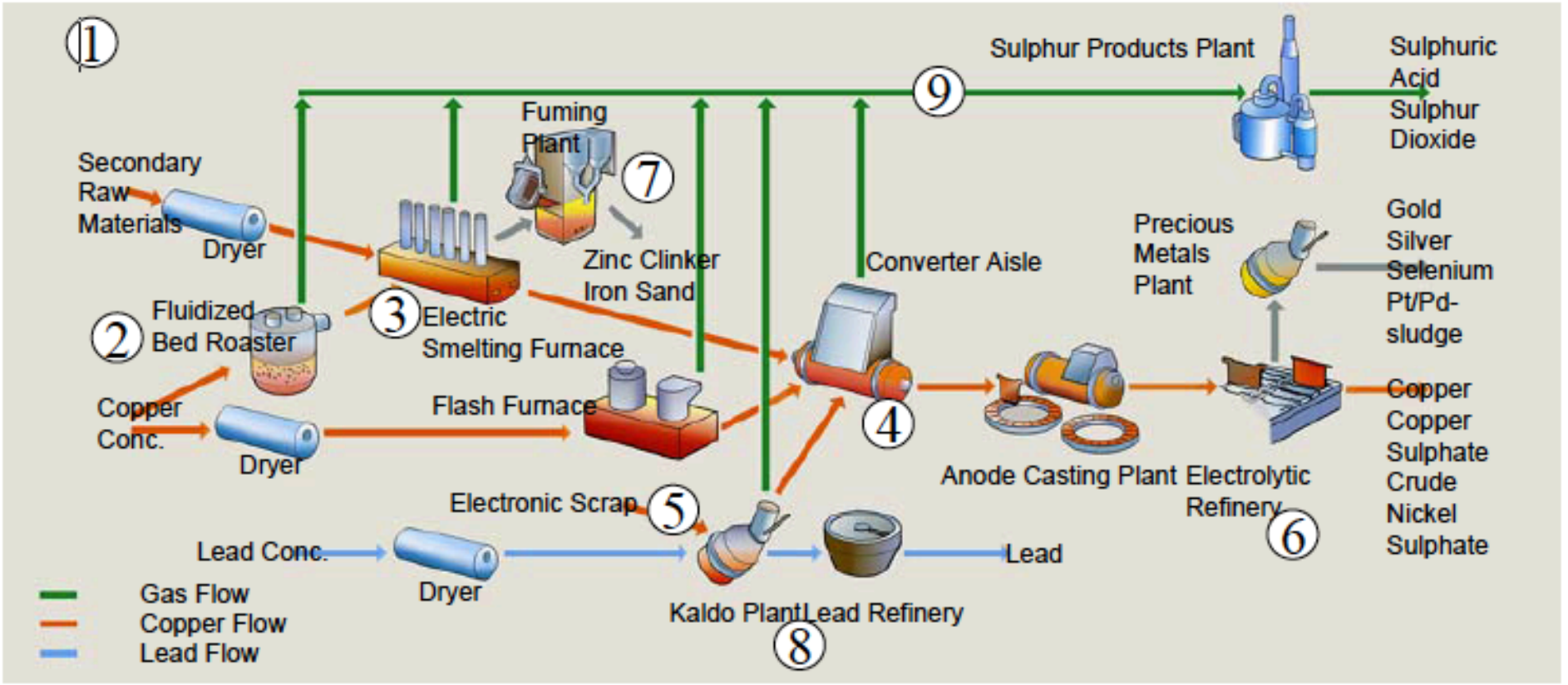




Adapted from UMICORE

Evolution and trends in PGM recycling - Christian Hagelüken - IPMI, June 2005

Urban mining: getting resources from the e-scrap by using a pyrolitic furnace with current technology



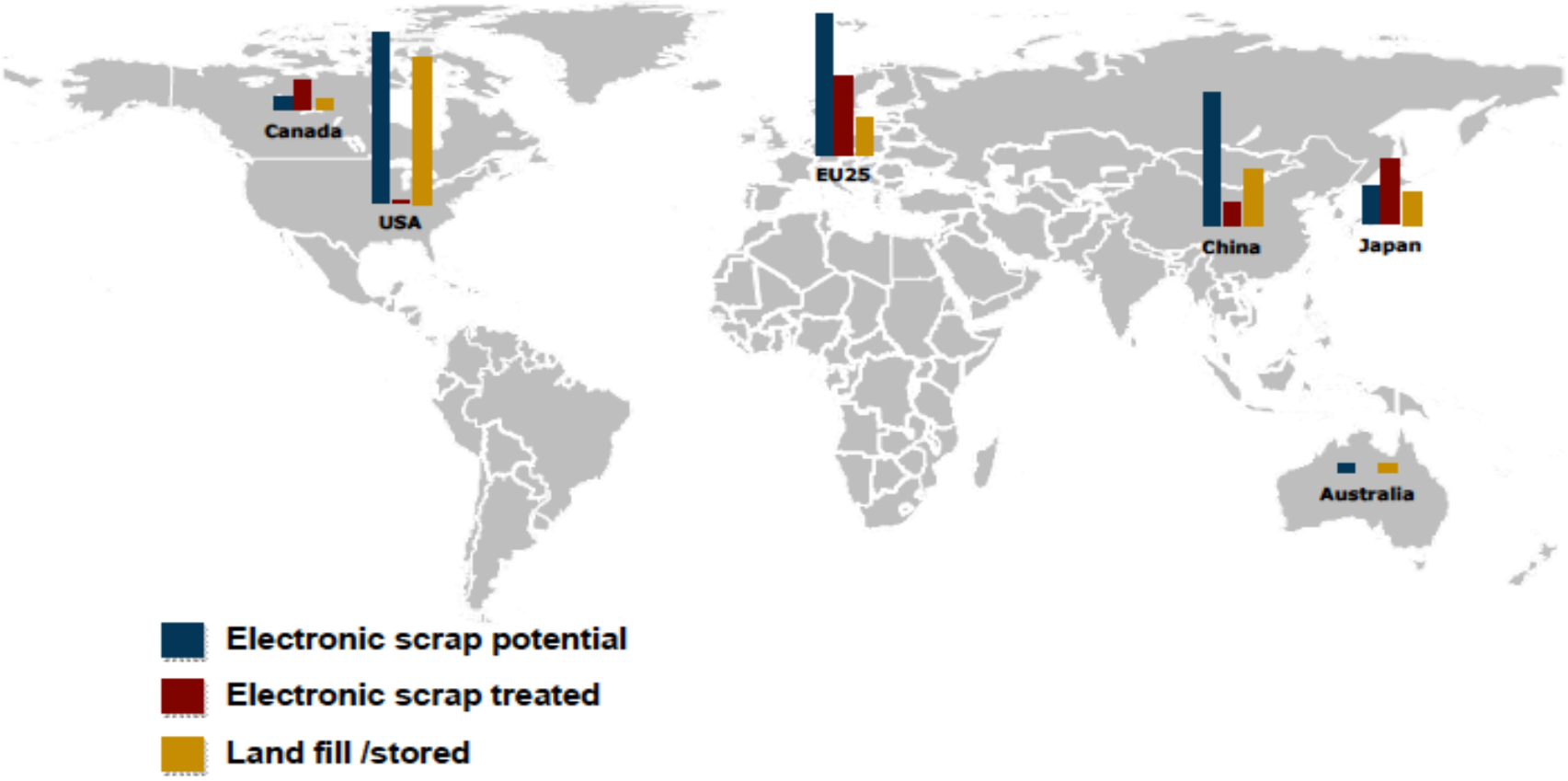
x Recycling illustrated

NEW BOLIDEN

Adapted from BOLIDEN

Where electronic scrap can be recycled

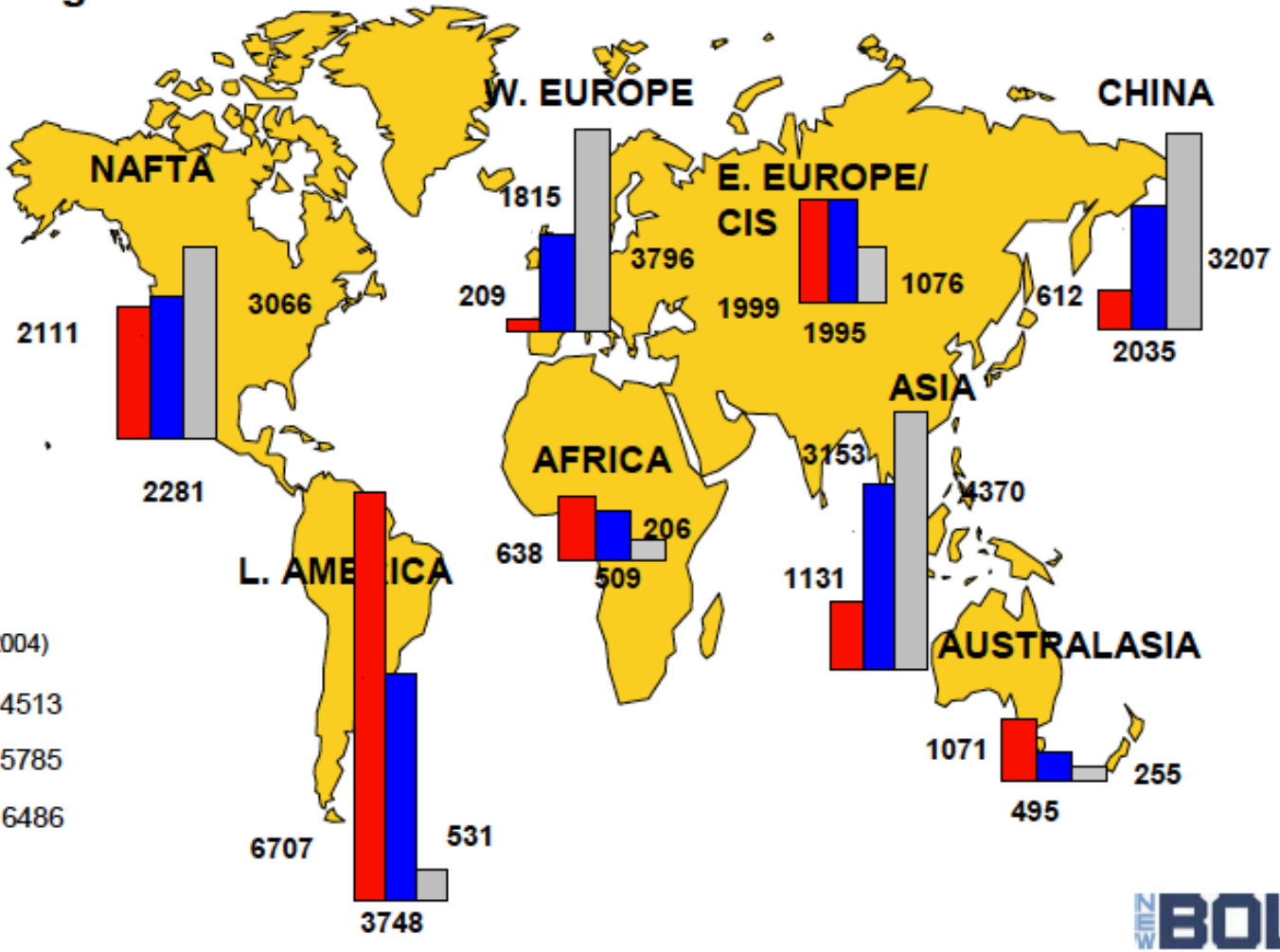
E-scrap smelting vs potential



Adapted from BOLIDEN

Copper

China and the rest of Asia together represent 32% of global copper metal production but 48% of consumption. It is forecast that this region will increase its imports of copper metal during the planning period, thus creating an imbalance in the market



('000 tonnes preliminary 2004)

Mine Production	14513
Metal Production	15785
Metal Consumption	16486

Source: Brook Hunt

BOLIDEN

Adapted from BOLIDEN

The relevance of recycling

- **The production of metals from secondary raw materials reduces environmental impacts compared to primary metals production**
  - High energy savings and reductions of greenhouse gas emissions
  - Secondary steel causes 75% less GHG emissions compared to primary steel
  - GHG emissions of secondary aluminum production are about 12 times lower than of primary aluminum production
  - Recycling reduces the pressure on biodiversity, water resources etc.
- **Recycling of metals moderates dependencies on natural resources, which are often concentrated in insecure regions**
- **Recycling ensures sustainable access to potentially scarce metals**
- **Recycling creates new jobs and income all over the world**

Urban mining targets: what are recyclers and refiners looking for?

- **Key metals searched to be recycled and valuated as new raw material:**
- **The metals are grouped into four categories**
  - 9 ferrous metals: iron, manganese, nickel, chromium etc.
  - 8 non-ferrous metals: aluminum, copper, lead, zinc, tin, magnesium etc.
  - 8 precious metals: gold, silver, platinum, palladium, rhodium etc.
  - 37 specialty metals: indium, gallium, lithium, tantalum, rare earth metals, tellurium etc.
- **The most important metric is the end-of-life recycling rate**
  - A high end-of-life recycling rate for a metal indicates a high efficiency of the related post -consumer recycling system
- **Only a few metals, like iron and platinum, currently have an end-of-life recycling rate of above 50%. Copper and aluminum are moving to reach over 40 % of recycling rate.**

Non-ferrous metals: copper example

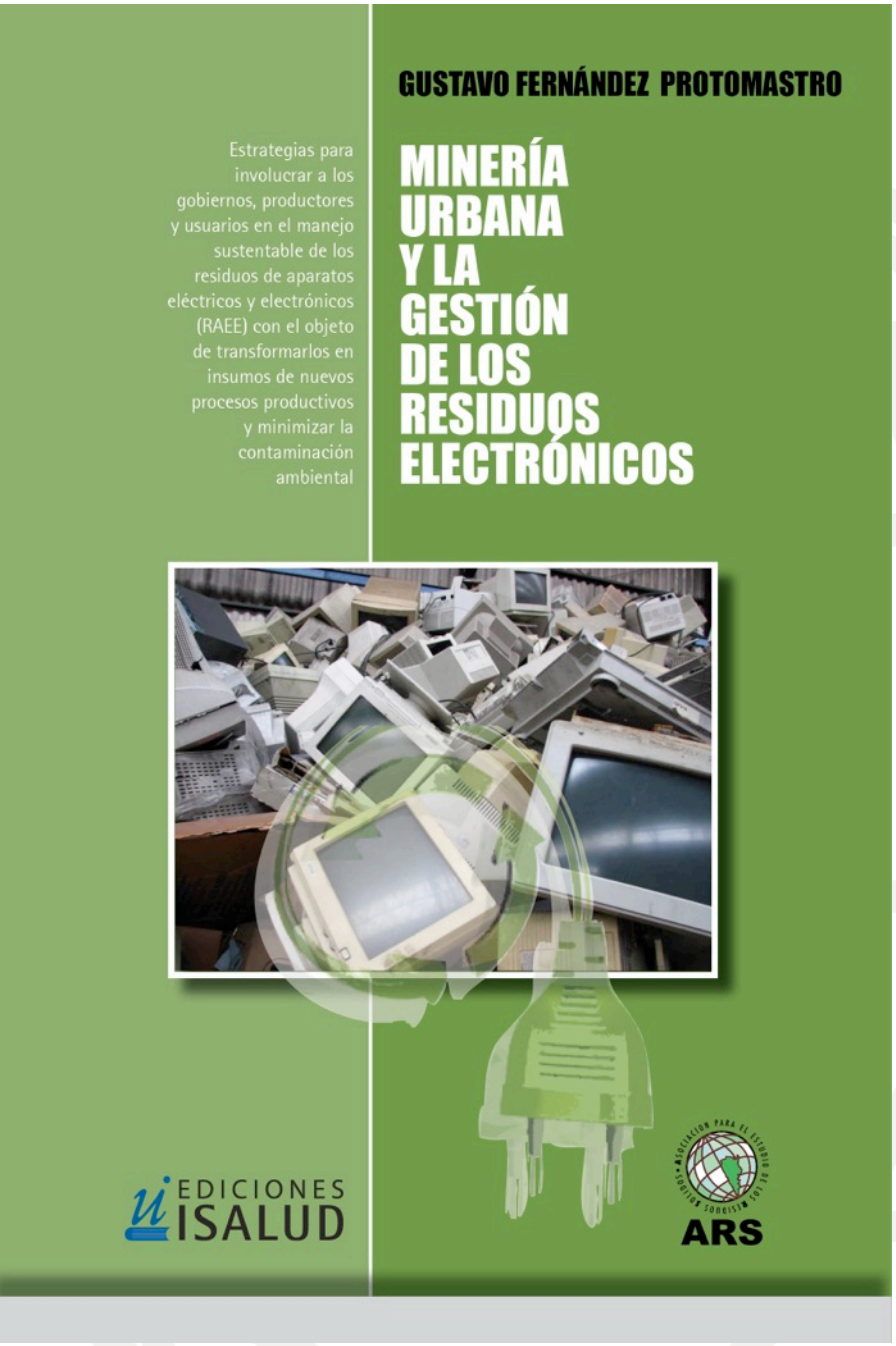
Courtesy of International Copper Association

Recycling rates of copper

- **Common uses: power distribution, electrical wiring, plumbing**
- **Usually used in pure form and in rather large pieces, which makes recycling more probable (exception: electric and electronic devices)**
  - Increasing demand for infrastructure and innovative technologies , like electric vehicles
  - Increasing small-scale applications in which copper is embedded in a complex matrix: cell phones, DVD players, electronic toys etc.
- **Estimated 2009 end-of-life recycling rate: 25-50% (varies among countries and copper-containing products)**
  - Lack of adequate recycling infrastructure for WEEE (Waste Electrical and Electronic Equipment) in most parts of the world causes total losses of copper and other valuable metals like gold, silver, palladium, tin etc.

Conclusions

- **Electric and Electronic Age needs WEEE recycling**
- **OEM and IT companies should be involved and should promote WEEE management demanding Environmental Sound Management and Best Practices**
- **WEEE facilities and logistics should adopt and Certify ESM**
- **Auditing WEEE facilities will promote adoption of best technologies and maximize recycling rates**
- **IT industries should considering supplying both from primary and secondary raw materials and key metals providers**
- **These "mines above ground" could contribute to decoupling of resource use from economic growth by efficient recycling**
- **Improved recycling schemes will give many people new jobs and a living**



Gustavo Fernández Protomastro
Centro Regional Basilea para Cono Sur

www.mineriaurbana.org

protomastro@gmail.com

info@escrap.com.ar