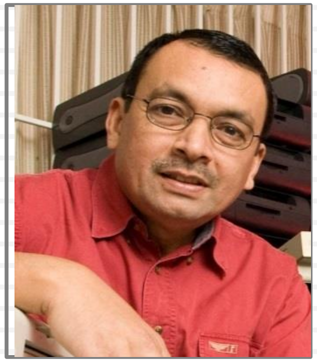
Science-Policy-Business Interface towards Economic Utilization of E-waste

Special Session - 3R Policy & Science Cooperation by UNCRD and 3RINCs
The 3rd 3RINCs (3R International Scientific Conference on Material Cycles and Waste Management)
Melia Hotel (Hanoi), Viet Nam, 9-11 March 2016



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What is E-waste?

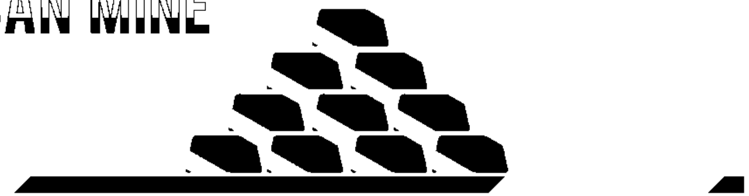
- Temperature exchange equipment (refrigerators, freezers, air conditioners, heat pumps).
- Screens, monitors (televisions, monitors, laptops, notebooks, and tablets).
- Lamps (fluorescent lamps, compact fluorescent lamps, high intensity discharge lamps and LED lamps).
- Large equipment (washing machines, clothes dryers, dish washing machines, electric stoves, large printing machines, copying equipment and photovoltaic panels).
- Small equipment (vacuum cleaners, microwaves, toasters, electric kettles, electric shavers, scales, calculators, radio sets, video cameras, electrical and electronic toys, small electrical and electronic tools, small medical devices, small monitoring and control instruments).
- Small IT and telecommunication equipment (mobile phones, GPS, pocket calculators, routers, personal computers, printers, telephones).

Global E-waste Generation

- During 2014 world generated around 41.8 million tonnes (Mt) of E-waste
- Global e-waste generation to reach 50 Mt by 2018 (annual growth rate of 4 to 5%)
- Asian region produced the highest amount of e-waste (16 Mt or 38% of total), followed by Americas (11.7 Mt) and Europe (11.6 Mt).
- The top three Asia-Pacific countries with the highest e-waste generation in absolute quantities are China (6 Mt), Japan (2.2Mt) and India (1.7Mt).
- Source: Global E-waste Monitor 2014 (UNU)

Global E-waste Monitor (UNU)

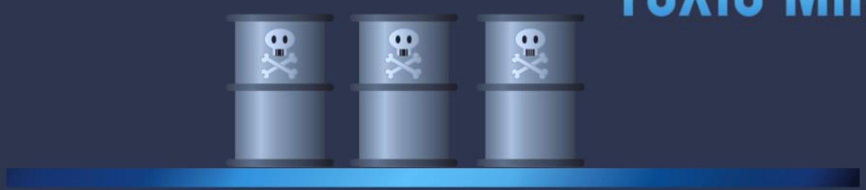
URBAN MINE



Material	Kilotons	Million Euros
METAL		
Iron, Steel (Fe)	16,500	9,000
Copper (Cu)	1,900	10,600
Aluminum (Al)	220	3,200
Precious Metals		
Gold (Au)	0.3	10,400
Silver (Ag)	1.0	580
Palladium (Pd)	0.1	1,800
PLASTICS		
PP, ABS, PC, PS	8,600	12,300

ESTIMATED 48,000,000,000 EUROS

TOXIC MINE



METALS

Mercury, Cadmium, Chromium

Lead

Lead glass - 2,200 kilotons

COMPONENTS

Batteries - 300 kilotons

CHEMICALS

Poly- / Brominated Flame Retardants in Plastics

Phosphors

PCBs/A Polychlorinated biphenyl (old capacitors)

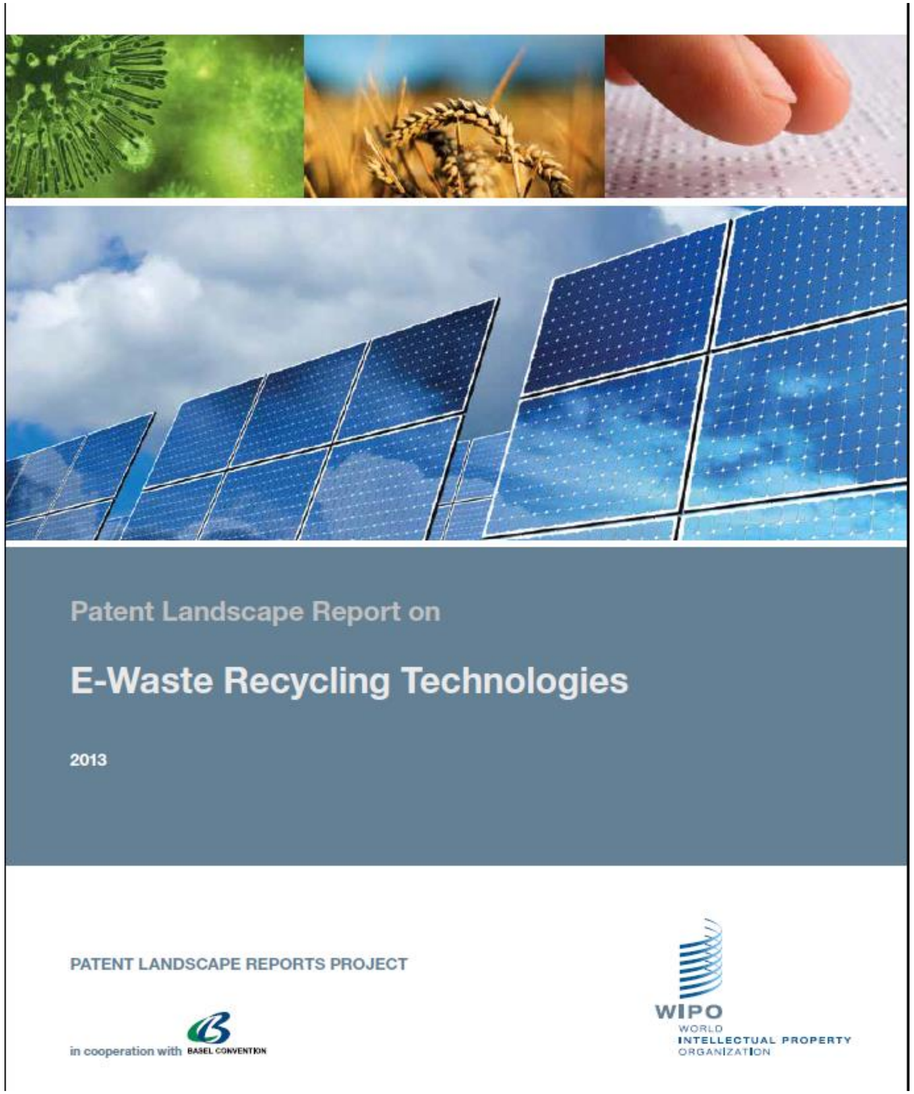
Hexavalent chromium (PVV)

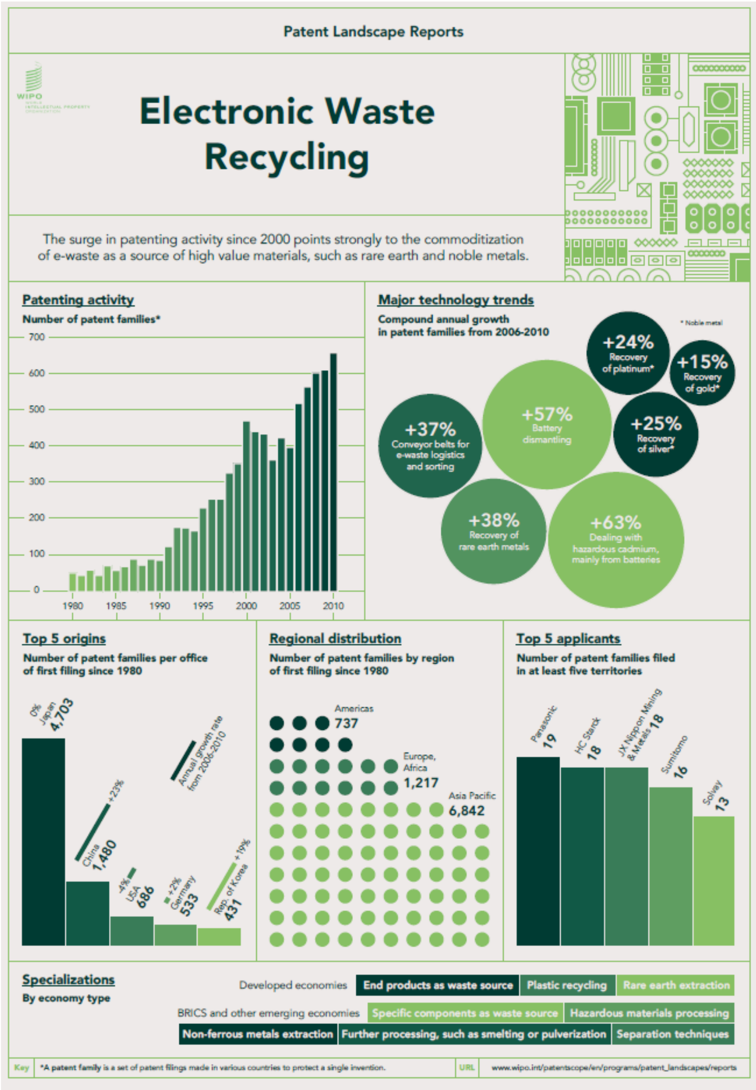
Ozone depleting substances (CFCs, HCFC, HFC, HCs) - 4.4 kilotons

Key components of E-waste resource recovery and recycling chain

- Treat the hazardous compounds contained in e-waste in an environmentally sound manner while preventing secondary and tertiary emissions
- Recover valuable material using efficient processes
- Create economically and environmentally sustainable businesses
- Consider social impact and local context of operations

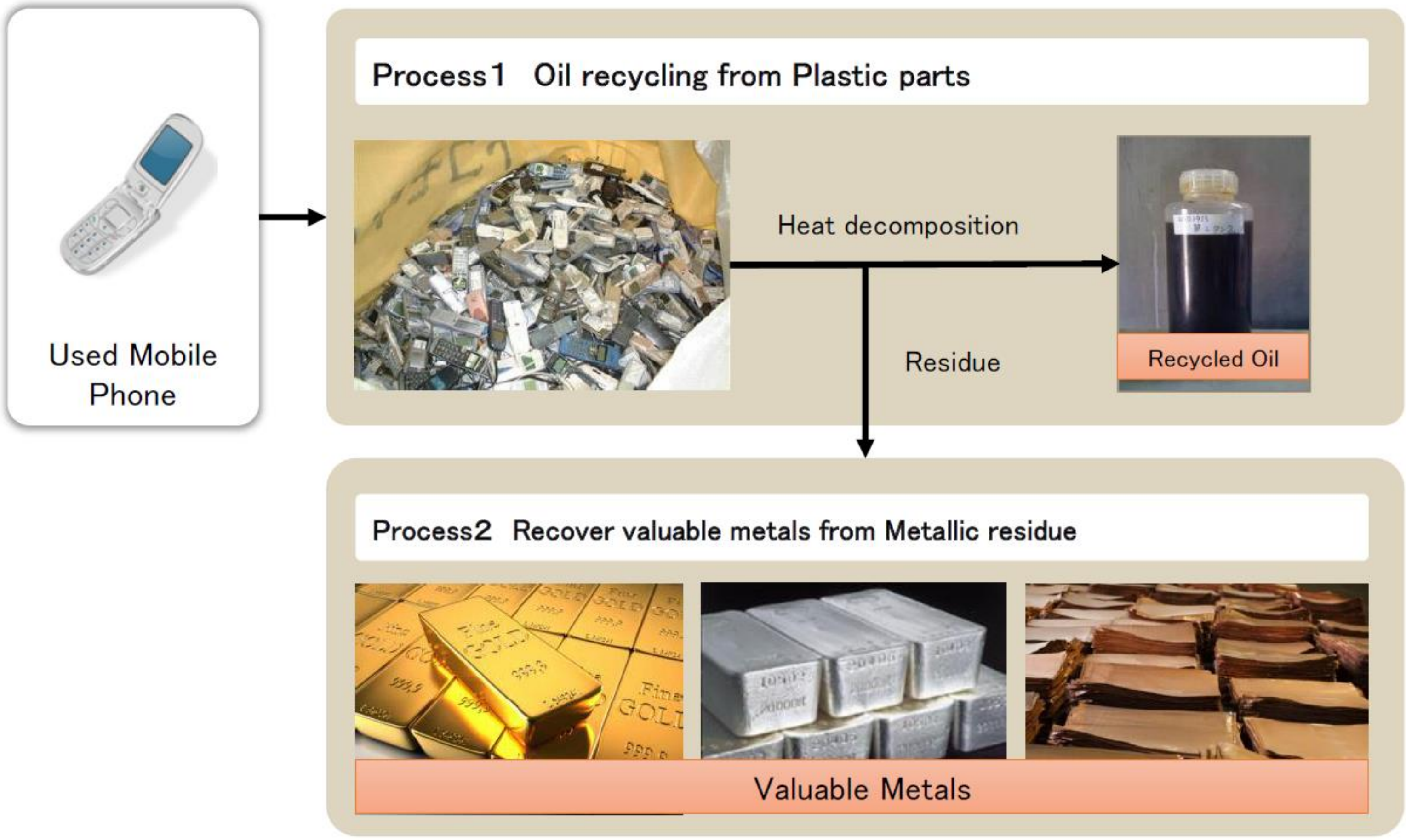
E-waste Recycling Technology





E-waste Recycling Technology

Recycle Process of Used Mobile Phone
Oil recycling for plastic parts of Mobile Phone, then recover valuable metals



E-waste Recycling Technology

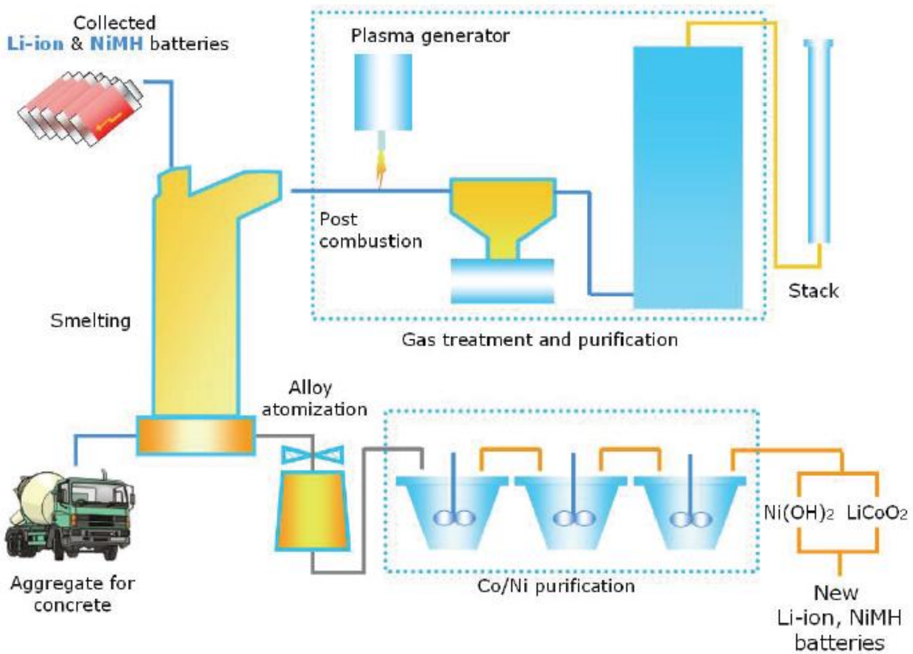


Figure 5.4: Material flows and main process units of Umicore's battery recycling process (by courtesy of Umicore Precious Metals Refining)

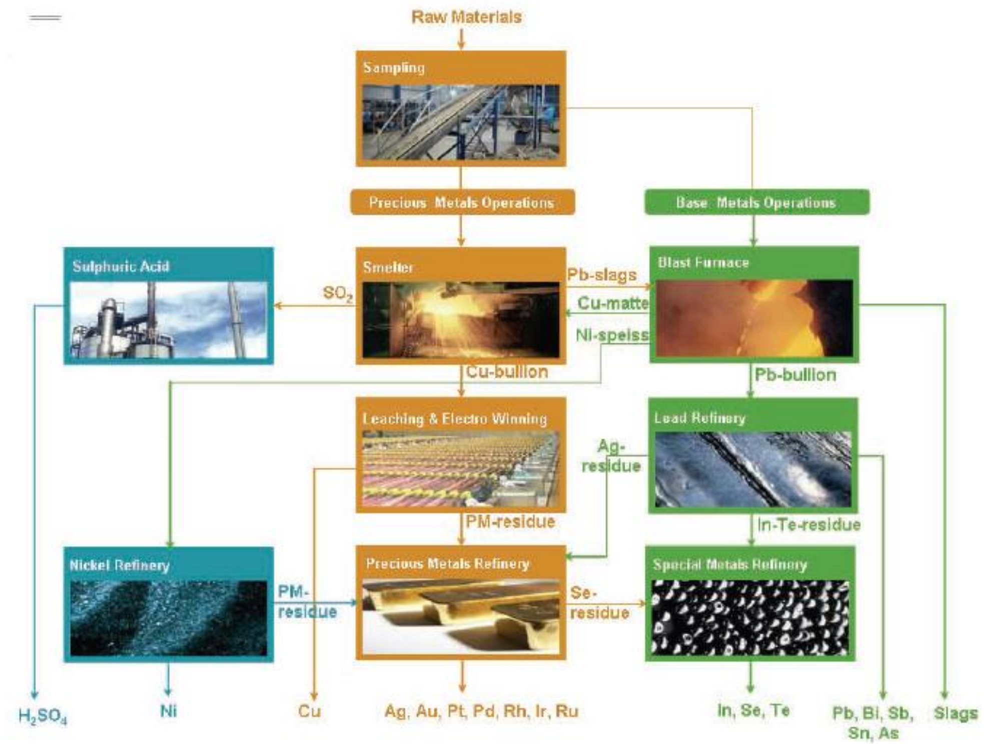
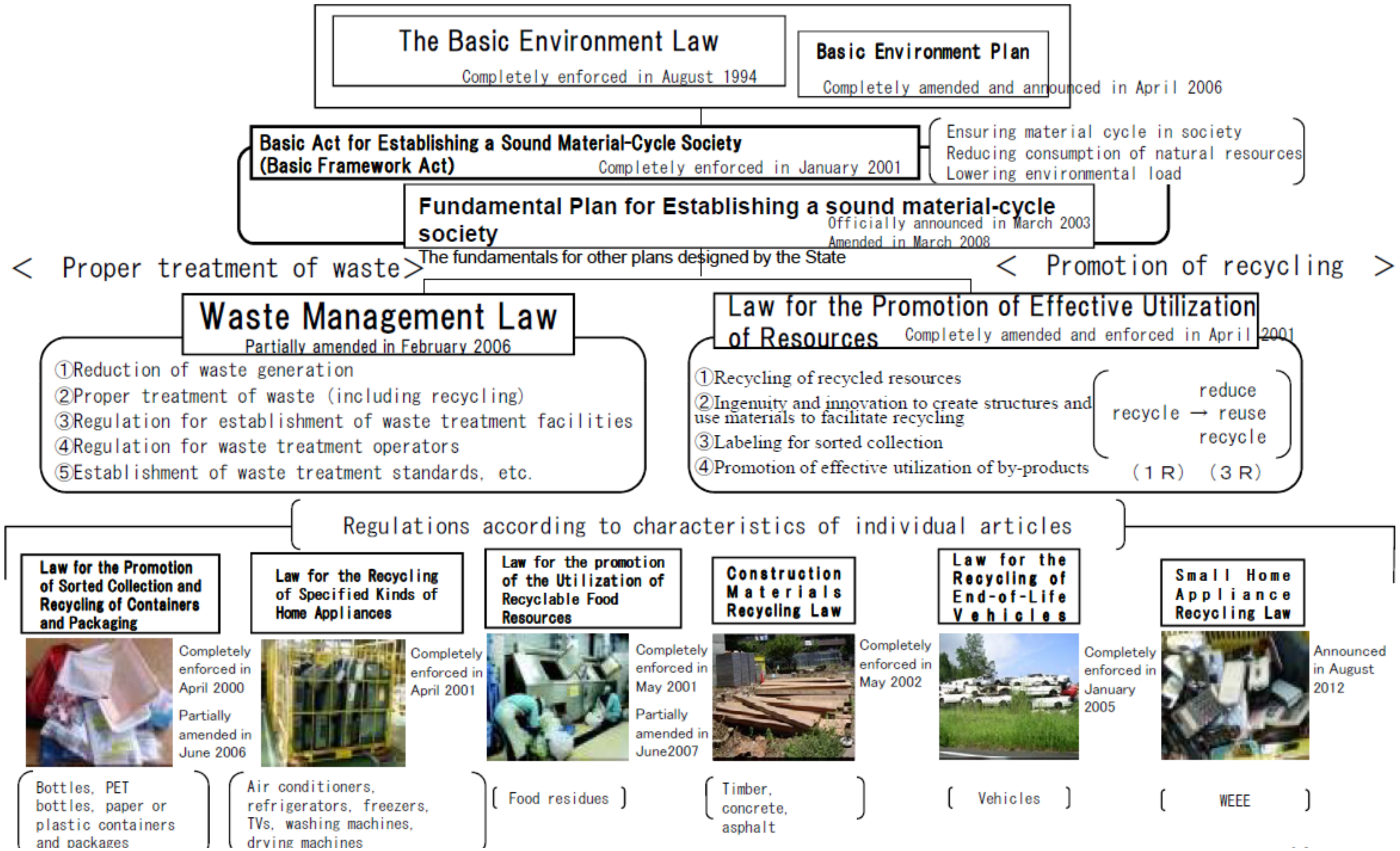


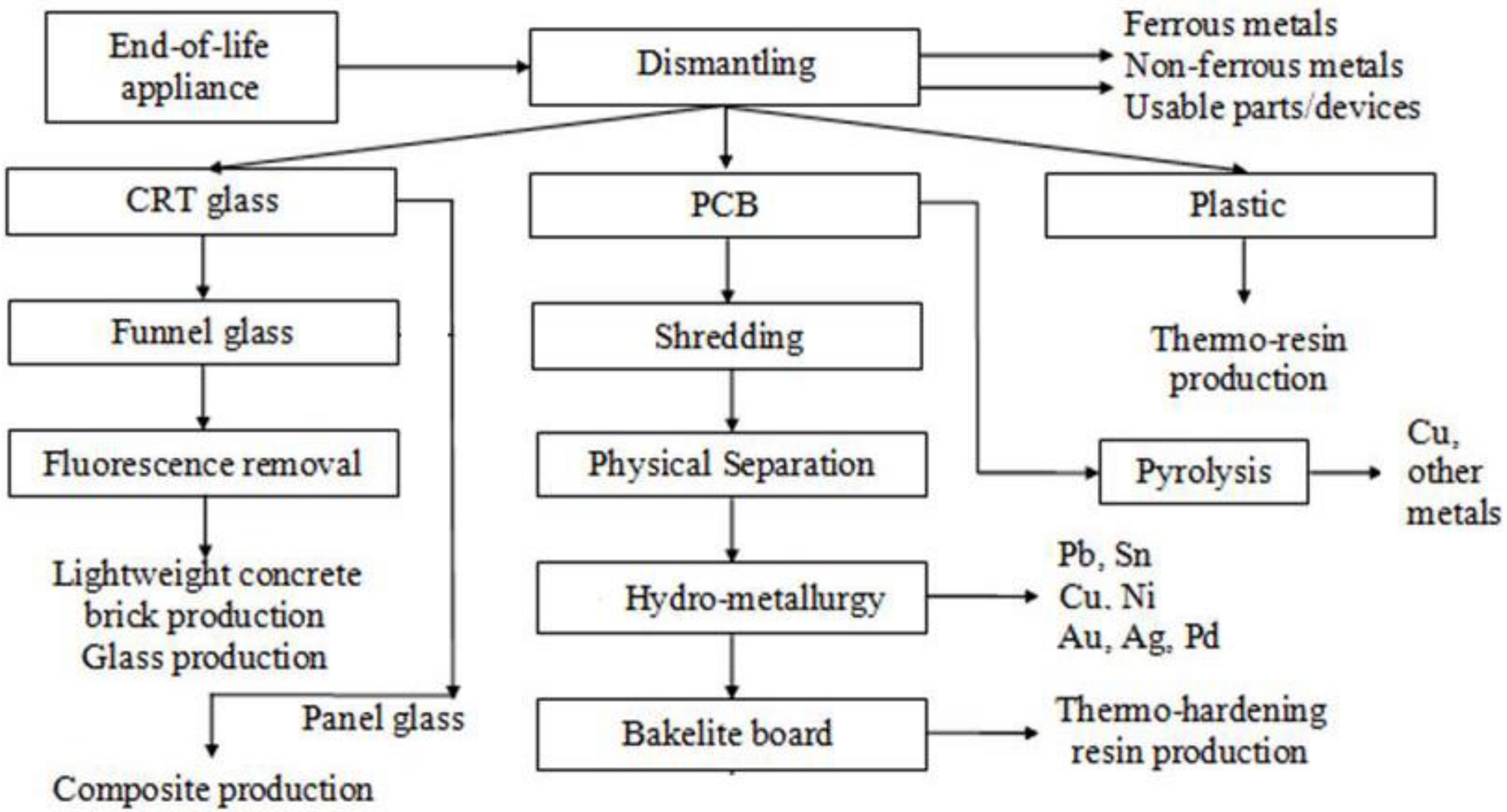
Figure 5.3: Material flows and main process units at Hoboken plant (by courtesy of Umicore Precious Metals Refining)

E-waste Management Policies

Legal systems for establishing a Sound Material-Cycle Society



E-waste Research (Prof Huynh Trung Hai, Hanoi University of Science & Technology)

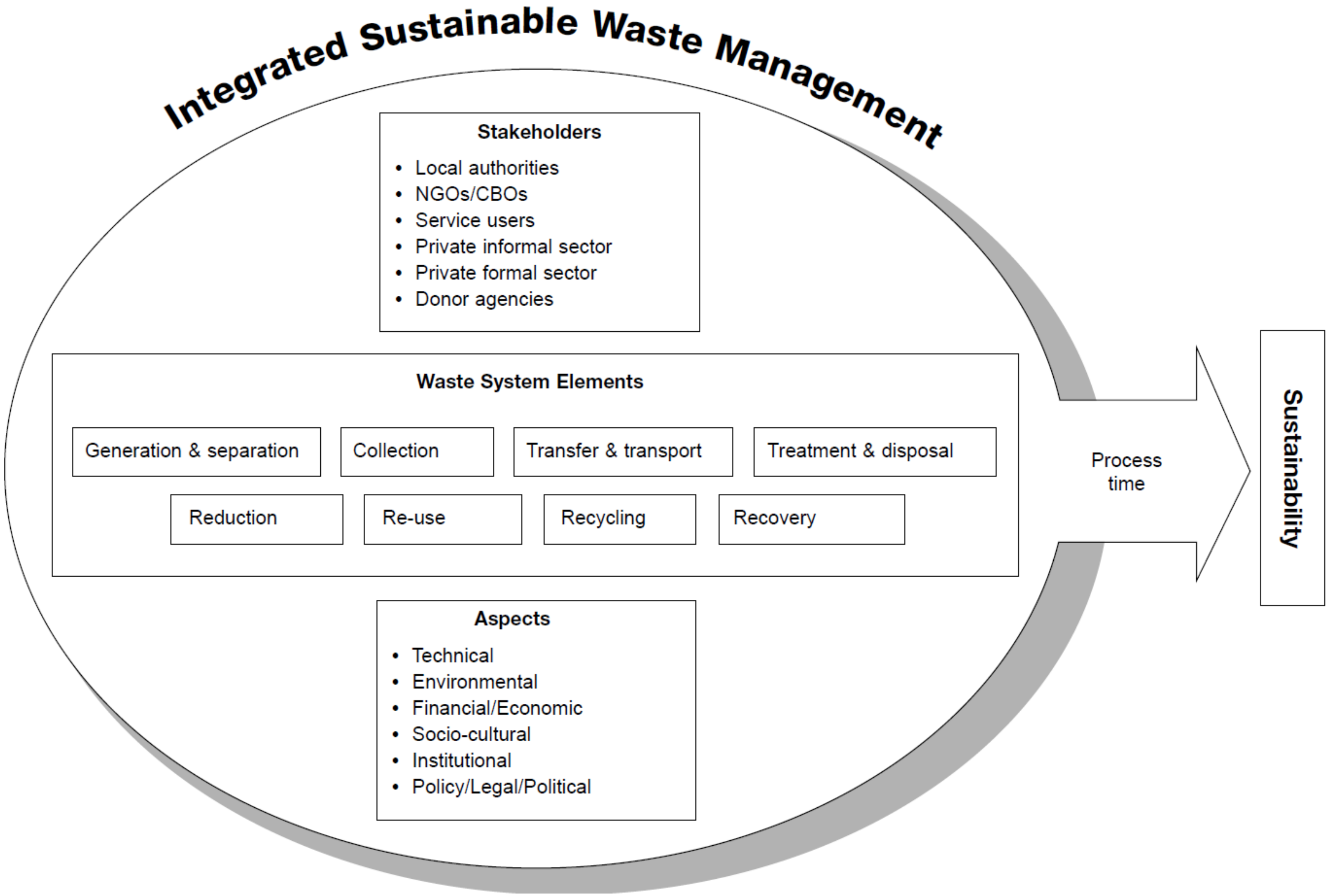


E-waste - Current Research Focus

- Research on e-waste can be broadly categorised into two components: *Impacts* (e.g. environment, health) and *Solutions* (e.g. technology, policy, management). The former is mainly basic research, conducted by researchers with environmental science, biological, medical and chemical backgrounds, while the latter is multidisciplinary, and has translational value
- Research in Scopus database shows that, as at June 2014, there were 1260 research publications related to e-waste, out of which, only 366 **(29%)** dealt with **Solutions** to the e-waste problem.

Integrated Sustainable Waste Management Model

(http://www.waste.nl/en/concept-tool-iswm)



Need for a Science-Policy-Business Interface towards Economic Utilisation of E-waste

Disconnected	Interacting
• Heavy emphasis on basic research related to impacts of poor e-waste management • Policies based on keen-jerk reactions	• Good balance of basic and translational research (Impacts and Solutions) • Policies based on sound scientific research and relevant stakeholder engagement

Partnership for Scientific and Policy Cooperation

Regional 3R Forum

- Objective of the Regional 3R Forum in Asia is to provide strategic policy advices to national government authorities in mainstreaming 3Rs in the overall policy, planning and development.

3RINCs

- The aim of 3RINCs is to provide, and serve as a platform for, academic activities that promote a 3R society.

Thank You!