



A Network of Technology and Quality

**NASA/C3P – 2009 International Workshop on  
Environment and Alternative Energy**

**“Global Collaboration in Environmental and Alternative Energy Strategies”**

# **Assessment of WEEE Reuse in ELECTROVALUE: a LCA Approach**

**Eduardo Silva**

instituto de soldadura  
e qualidade



Munich, 11 November 2009



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# Life Cycle Assessment



## What is the Life Cycle Assessment?

**Compilation and evaluation of the inputs, outputs and the potential environmental impacts of the consecutive and interlinked stages of a product system, from raw material acquisition or generation of natural resources to final disposal.**

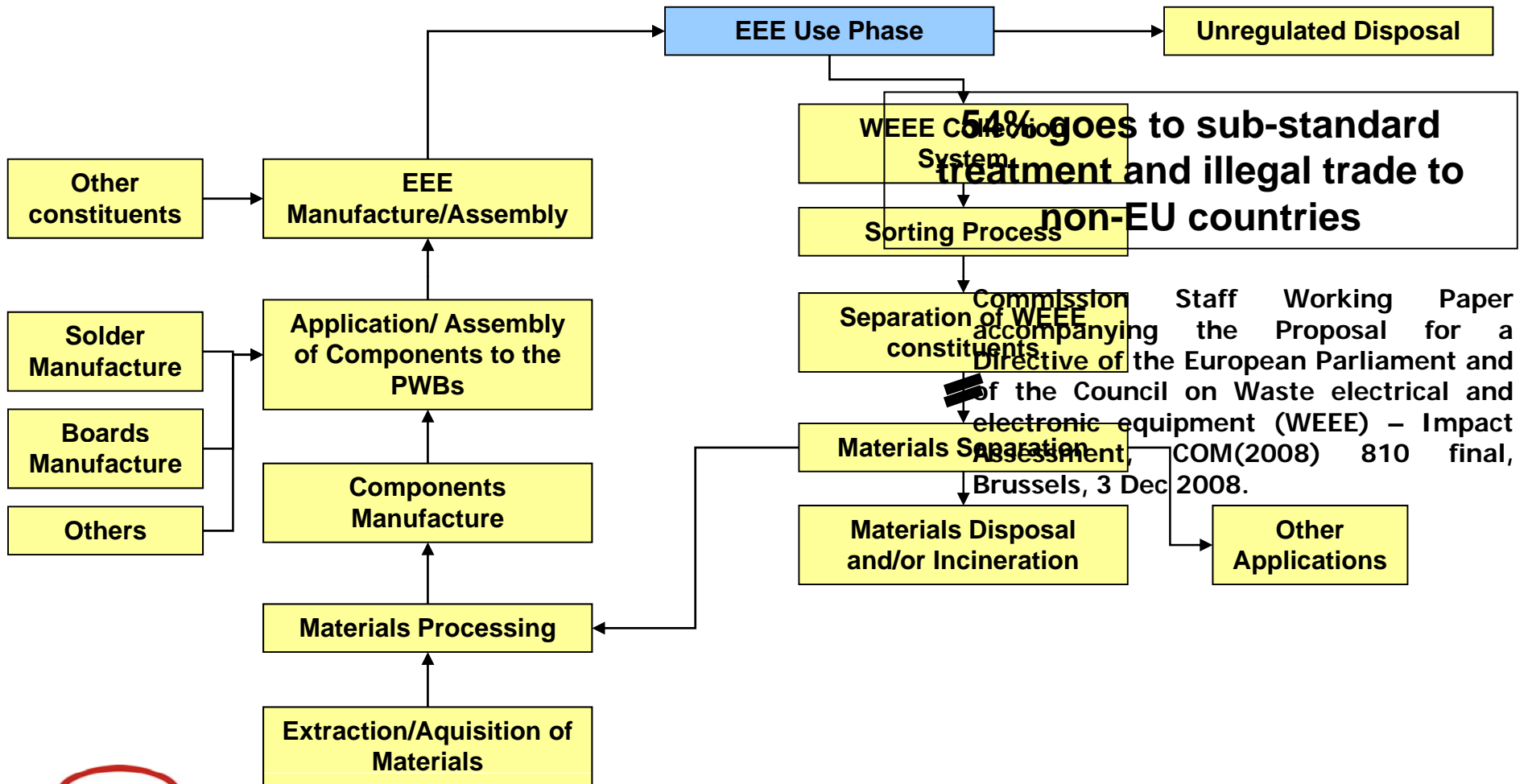
**ISO 14040: Environmental management - Life cycle assessment – Principles and framework, International Organisation for Standardisation (ISO), Geneva 2006**



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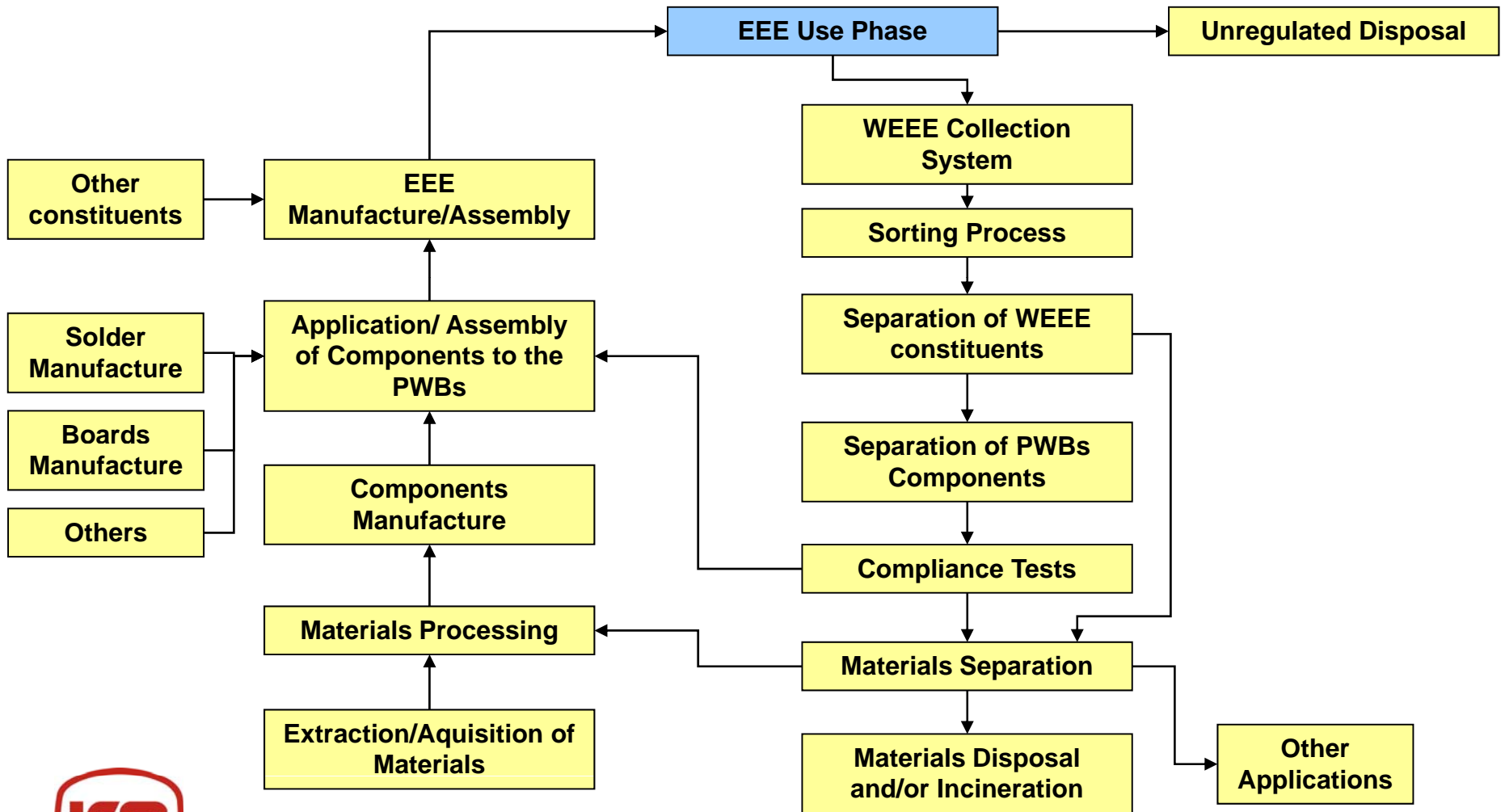


# Components Life Cycle



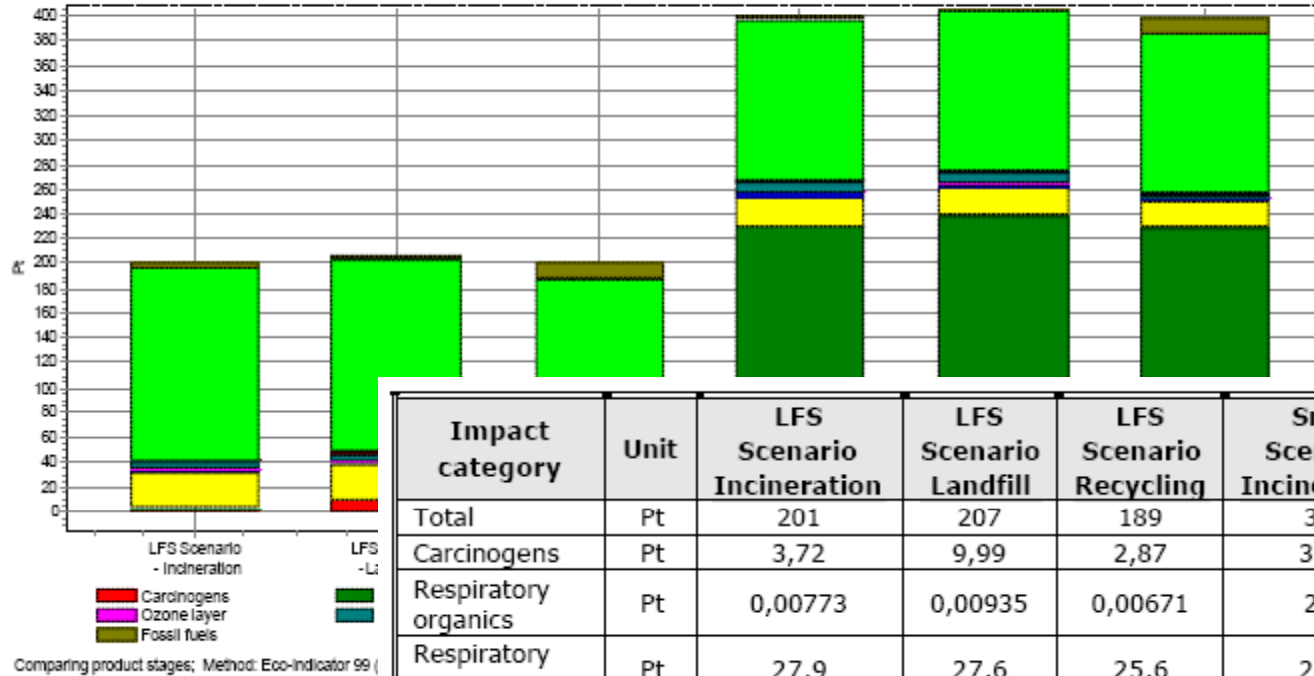


# Components Life Cycle





# Previous Results

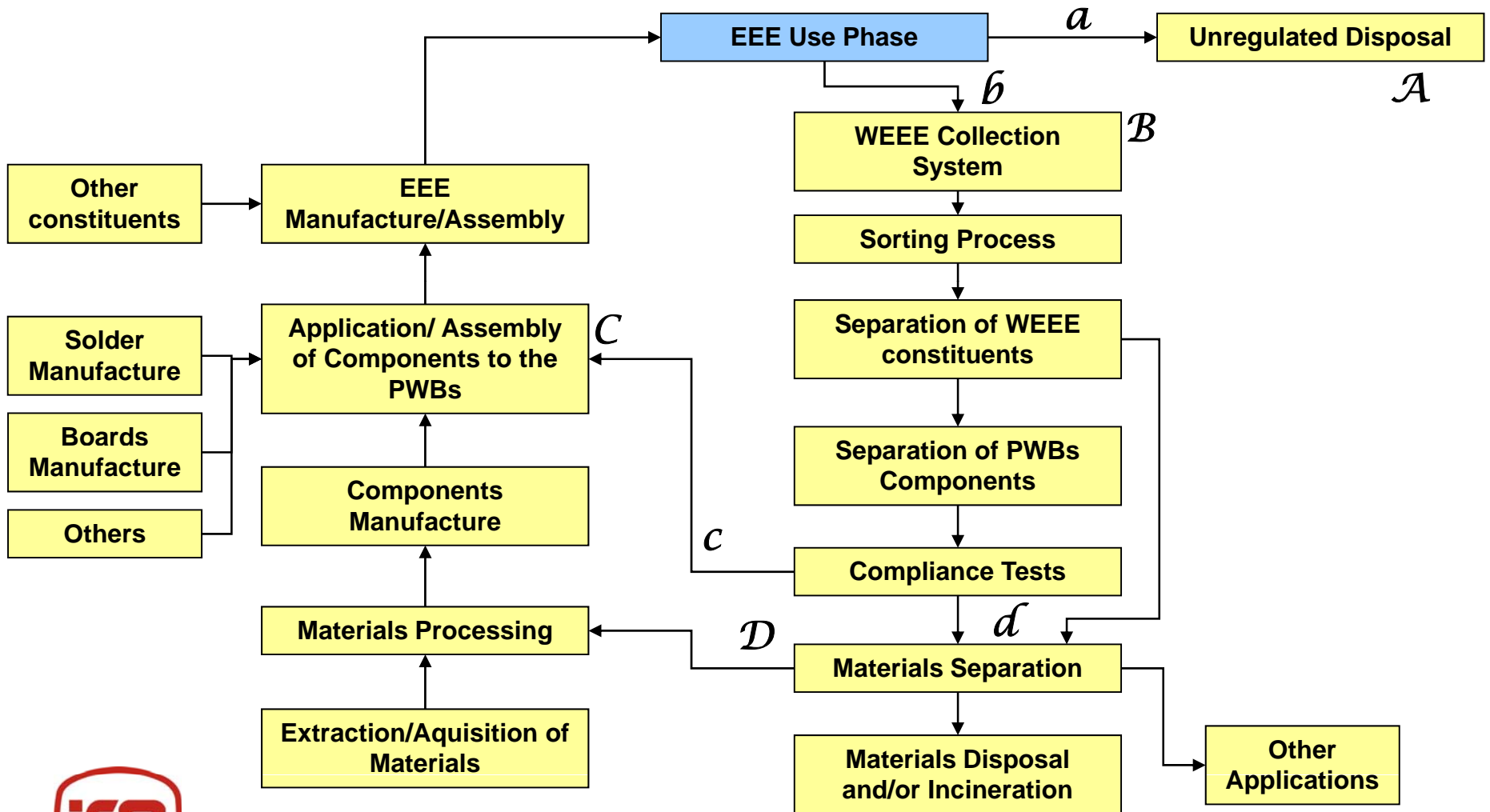


Impact category	Unit	LFS Scenario Incineration	LFS Scenario Landfill	LFS Scenario Recycling	SnPb Scenario Incineration	SnPb Scenario Landfill	SnPb Scenario Recycling
Total	Pt	201	207	189	399	407	384
Carcinogens	Pt	3,72	9,99	2,87	30,9	39,2	29,8
Respiratory organics	Pt	0,00773	0,00935	0,00671	200	200	200
Respiratory inorganics	Pt	27,9	27,6	25,6	23,4	23,1	20,4
Climate change	Pt	3,03	2,02	3,39	3,48	2,15	3,96
Radiation	Pt	0,084	0,084	0,0647	0,0644	0,0645	0,0389
Ozone layer	Pt	0,000628	0,000632	0,00105	0,00047	0,000475	0,00103
Ecotoxicity	Pt	5,28	6,15	-0,00191	7,73	8,88	0,737
Acidification/ Eutrophication	Pt	1,05	1	0,978	0,927	0,858	0,825
Land use	Pt	0,79	0,82	-10,7	0,666	0,706	-14,6
Minerals	Pt	155	155	155	129	129	129
Fossil fuels	Pt	4,21	4,23	11,9	3,64	3,66	13,8





# Components Life Cycle





# Components Life Cycle



***A*** Unregulated disposal

*a* = number of components which are unregulated disposal

***B*** WEEE Collection System

*b* = number of components which are sent to WEEE collection system

***C*** Reuse

*c* = number of components which are reused

***D*** Recycling

*d* = number of components which are sent to recycling

***Allocation*** – partitioning of the inputs or output flows of a unit process to the product system under study (ISO 14040:2006)



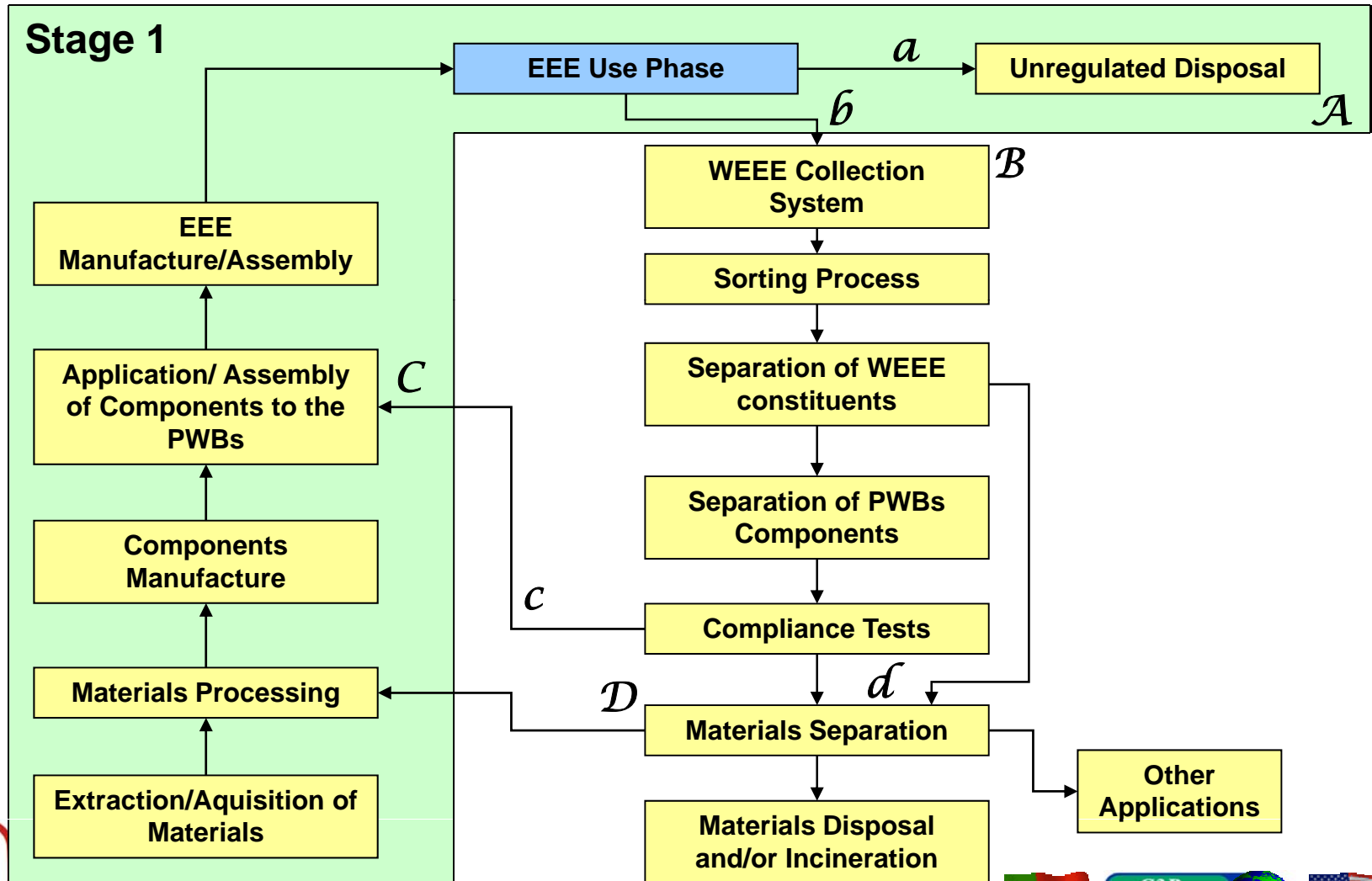
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# Results Allocation





# Results Allocation



**A** Unregulated disposal

$a$  = number of components which are unregulated disposal

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## Allocation of unregulated disposal for Stage 1

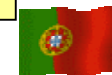
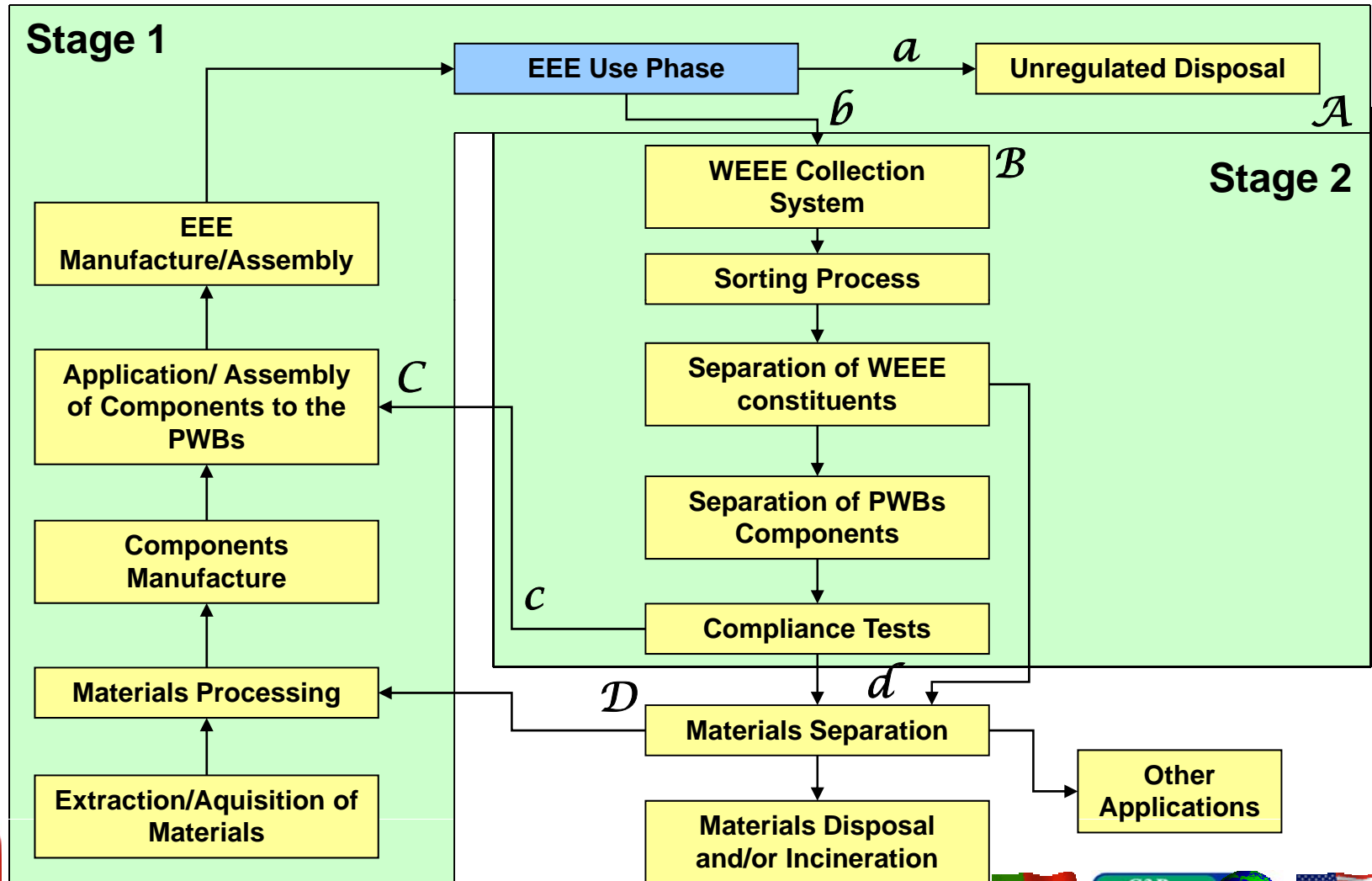
$$\mathcal{A}' = \frac{a}{a + b} \times 100 = \mathcal{X}$$





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# Results Allocation





# Results Allocation



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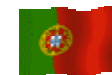
Allocation of reusing for Stage 1

$$C' = \frac{y' \times b}{a + b} \times 100 = y$$



Allocation of reusing for Stage 2

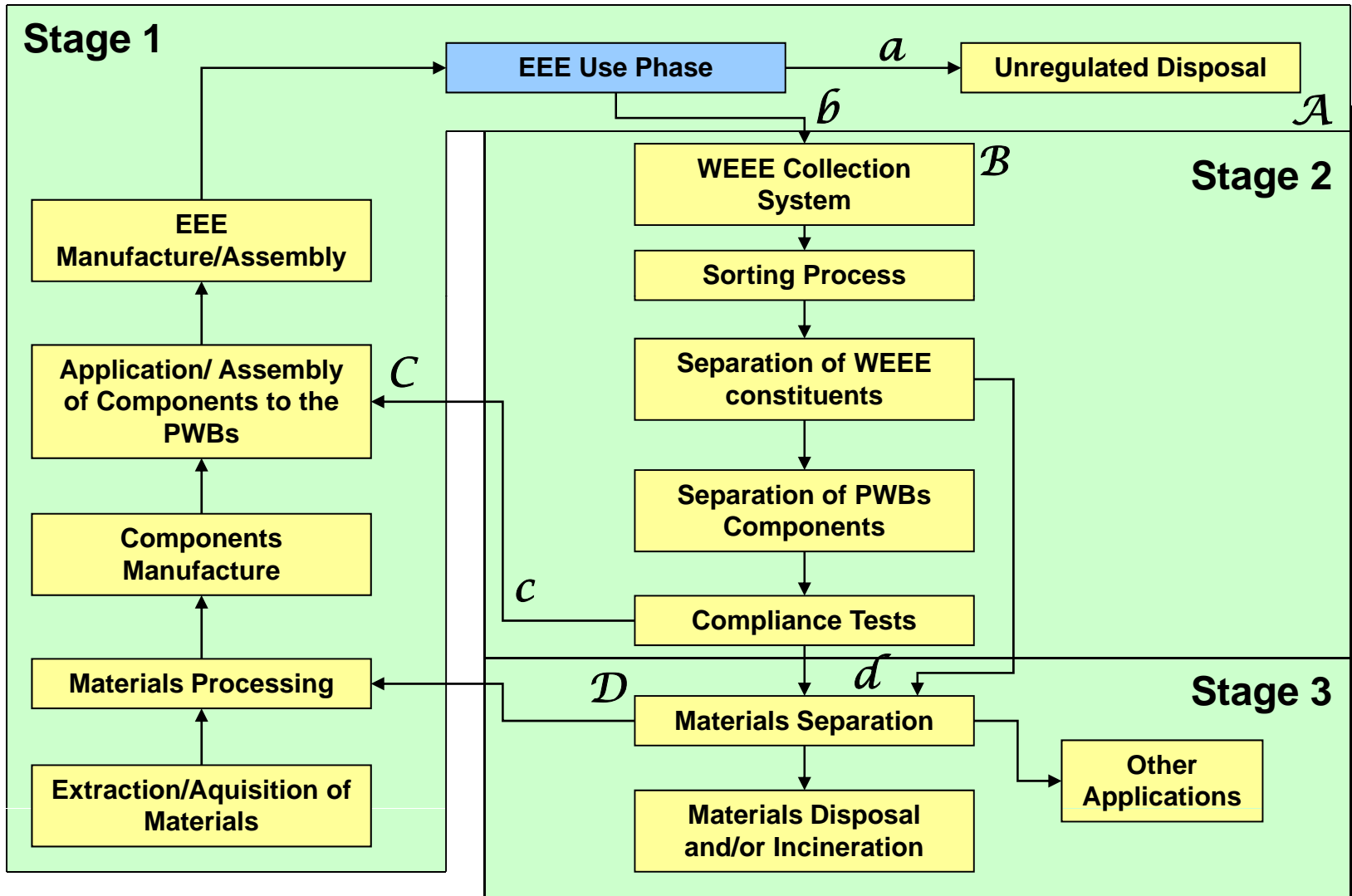
$$C'' = \frac{c}{d + c} \times 100 = y'$$





ELECTROVALUE

# Results Allocation



Prevention Program



# Results Allocation



**A** Unregulated disposal

$a$  = number of components which are unregulated disposal

**B** WEEE Collection System

$b$  = number of components which are sent to WEEE collection system

**C** Reuse

$c$  = number of components which are reused

**D** Recycling

$d$  = number of components which are sent to recycling

Allocation of recycling for Stage 1

$$D' = \frac{Z' \times b}{a + b} \times 100 = Z$$

Allocation of Recycling for Stage 2

$$D'' = \frac{d}{d + c} \times 100 = Z'$$



Allocation of recycling for Stage 3

$$D''' = \frac{c}{c} \times 100 = Z''$$





# Results Allocation



	Stage 1	Stage 2	Stage 3
Unregulated Disposal	$x$		
Reuse	$y$	$y'$	
Recycling	$z$	$z'$	$z''$
Total	100 %	100 %	100 %





# Results Allocation



## 100 components

<b><i>A</i></b> Unregulated disposal	<b>54 components</b>
<b><i>a</i></b> = number of components which are unregulated disposal	
<b><i>B</i></b> WEEE Collection System	<b>46 components</b>
<b><i>b</i></b> = number of components which are sent to WEEE collection system	
<b><i>C</i></b> Reuse	<b>10 components</b>
<b><i>c</i></b> = number of components which are reused	
<b><i>D</i></b> Recycling	<b>36 components</b>
<b><i>d</i></b> = number of components which are sent to recycling	



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## Results Allocation



	Stage 1	Stage 2	Stage 3
Unregulated Disposal	54 %		
Reuse	10 %	21,74 %	
Recycling	36 %	78,26 %	100 %
Total	100 %	100 %	100 %

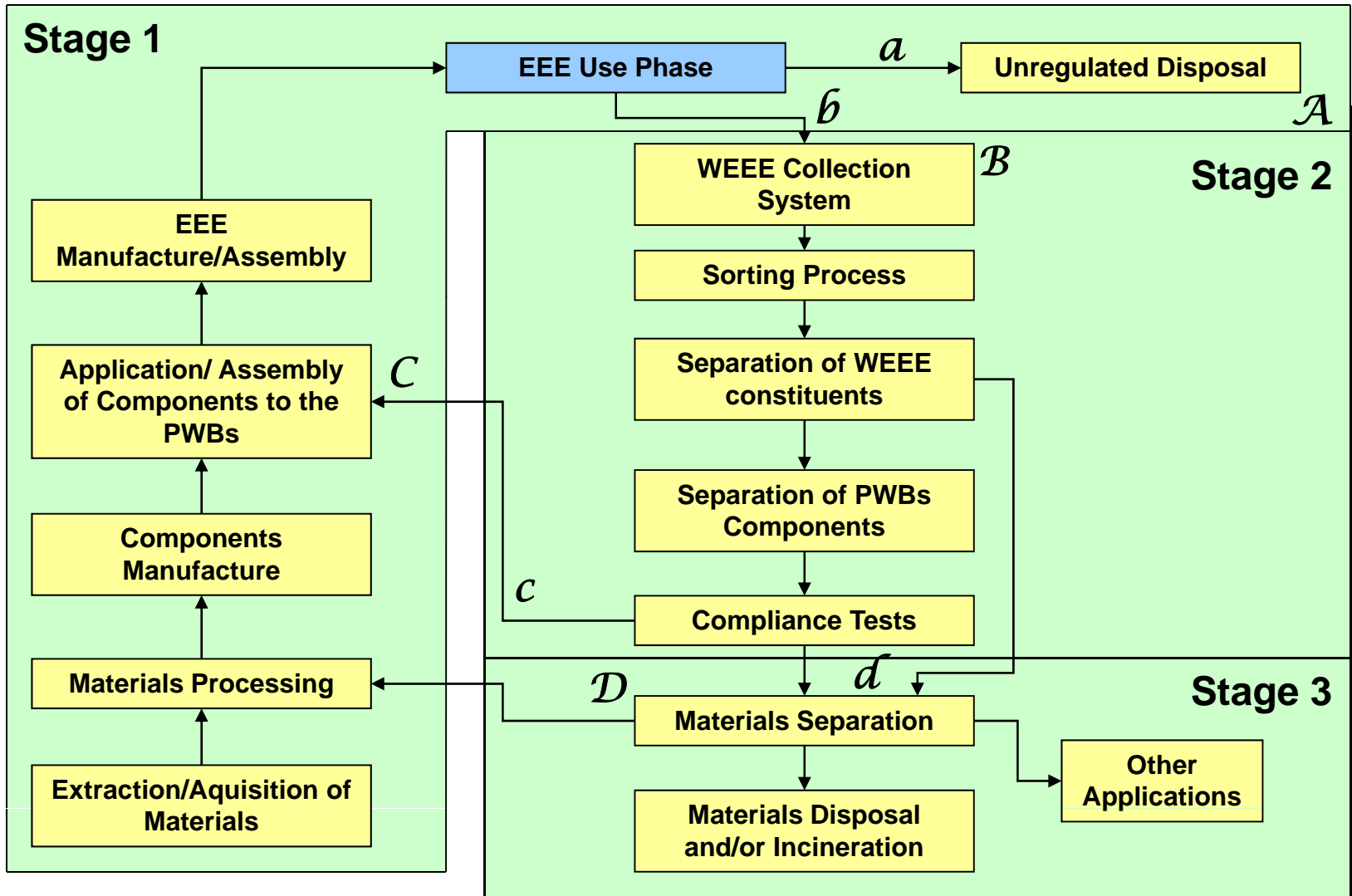


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# Results Allocation



Prevention Program



## Conclusions



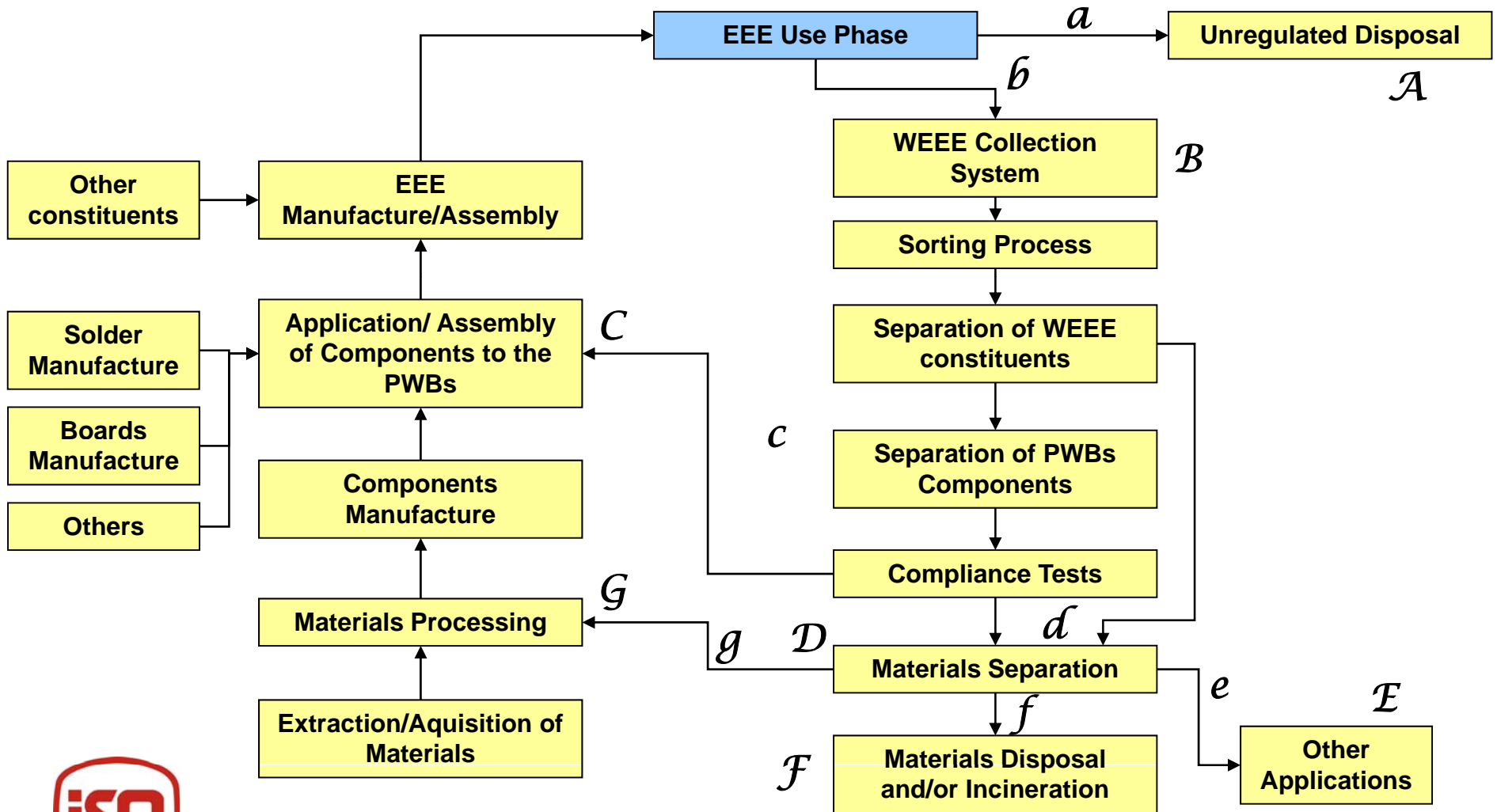
- **ELECTROVALUE will determine the environmental benefits of WEEE components reuse;**
- **Apart from the determination of environmental benefits, in ELECTROVALUE, we will try to find the major opportunities for improvement in the WEEE recovery process;**
- **The results allocation analysis will provide information on each process contribution to the overall environmental impacts;**
- **Through a sensitivity analysis of the final results we will also try to find how far is profitable the WEEE components reuse against recycling, incineration and disposal.**



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# Components Life Cycle





Add Value to the  
Electronic Waste



You can follow the on-going work and results at:

<http://www.electrovalueproject.eu/>



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Thank you for your attention!

Eduardo Silva  
ejsilva@isq.pt

[www.isq.pt](http://www.isq.pt)