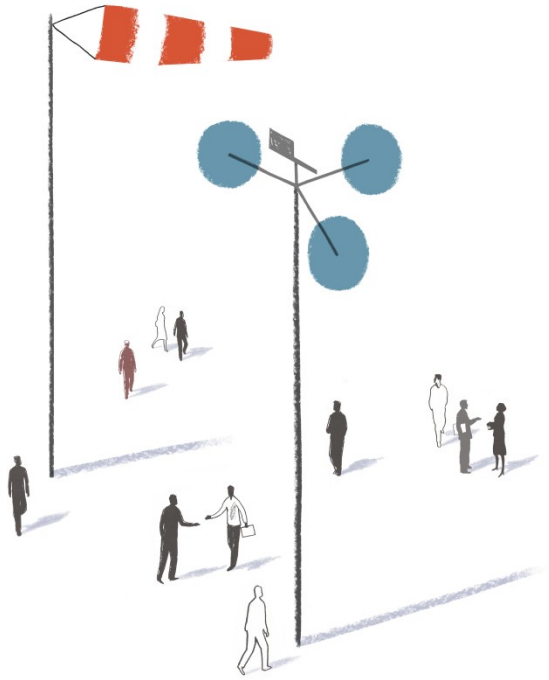
Sustainable Collection & Recycling of end-of-life lamps in Brazil.

Learnings from Europe
Towards a sector solution for Brazil



Conama, 8th June 2010

Christoph Vanderstricht , Grant Thornton

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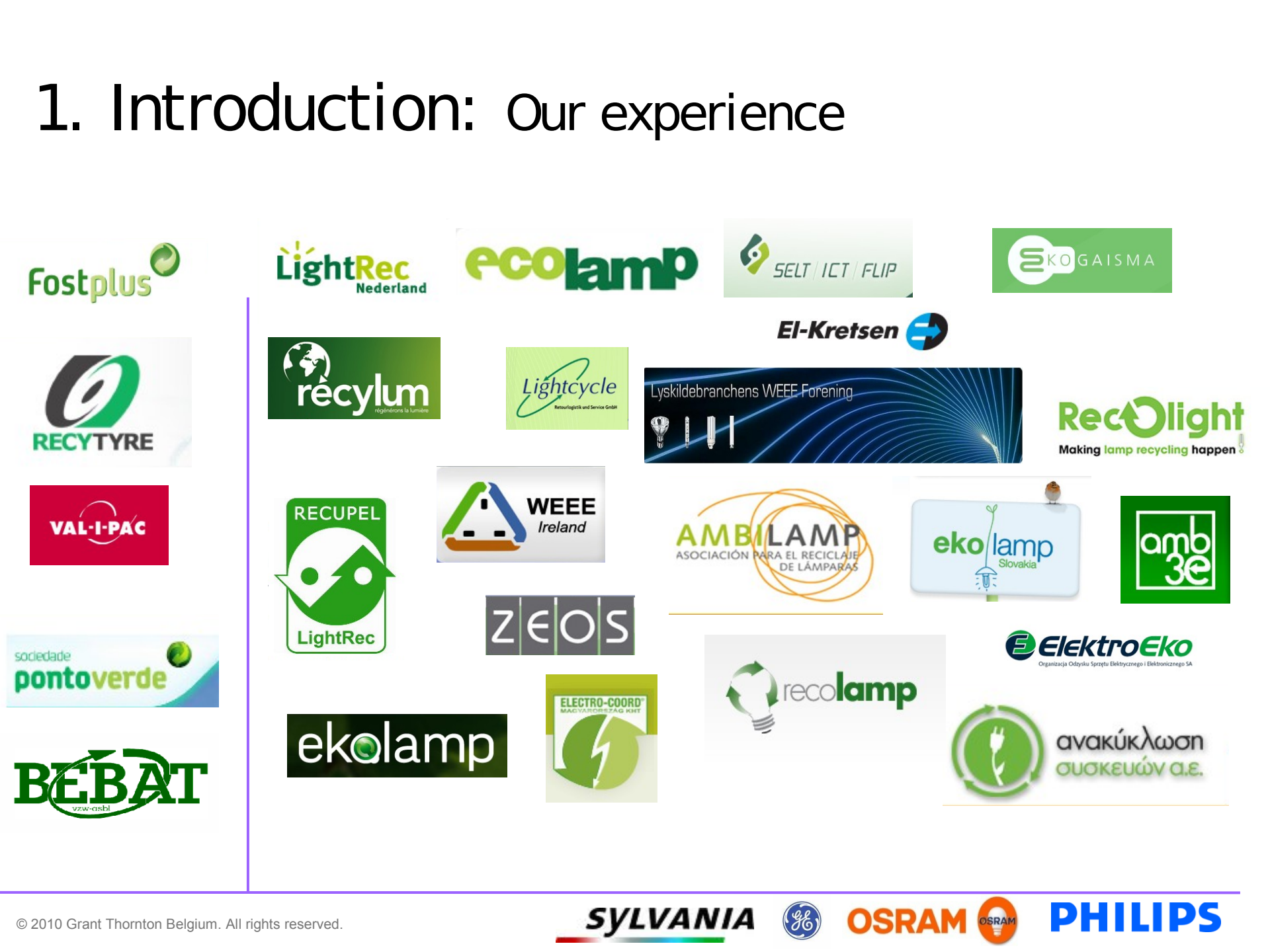
I. INTRODUCTION

1. Introduction: Our experience



SYLVANIA GE OSRAM PHILIPS

1. Introduction: Our experience

- Strategic advise, design, development and operationalisation of approx 28 EPR collective schemes in Europe for end of life lamps (2004 – 2008)
- Development and improvement of EPR and Eco-tax regulations (1994 – 2009)
- Strategic advise and complete design, development, operationalisation and optimisation of collective schemes that deal with:
  1) Household packaging waste (1993 – 2004)
  2) Industrial packaging waste (1995 – 1999)
  3) Batteries (1995 – 1998)
  4) Tyres (2004)
  5) Other categories of EEE (2001)
  6) Non woven cotton (1996; 2002)
- Governing and optimizing 29 collective schemes in Europe. (ongoing)

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1. Introduction: Our experience

South America	North America	APac	EMEA
Colombia	Canada	China	South Africa
Brazil		India	Russia
Argentina		Philippines	Turkey
Mexico		Thailand	
Chile		Malaysia	
		Australia	
		New Zealand	

Today we work together with PHILIPS and OSRAM in these countries in developing sustainable EPR solutions for the collection and recycling of lamps

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II. THE EU@WORK:
LEARNINGS FROM 5 YEARS WEEE

II. The EU@work: Learnings from 5 years WEEE

A video was developed for a meeting with the European Parliament and the European Commission in the framework of the review of the European Directive.

It gathers the views of lamp specific collection and recycling schemes in Europe: Italy, France, Germany and Spain.

The video highlights their views on several points of relevance such as clear financing rules; the visibility of the cost; producer definition; the importance of monitoring in the field; the importance of a joint responsibility; etc.

II. The EU@work: Learnings from 5 years WEEE Different structures lead to different outcomes

Model	Countries (eg)	Outcome
One separate scheme for collection of lamps	Belgium; Netherlands; France; Germany; Spain; Finland	Sustainable financing; best in class in terms of collection; acceptable level of market surveillance; aligned communication strategy; easy control for government Possibility to lower collection and recycling costs Competition at the right level (between waste management companies)
Competing schemes for collection of lamps	United Kingdom; Italy; Bulgary; Slovakia; Baltic region	Freeriding schemes; Focus on easy to collect quantities; Structural underfinancing Lack of control by government; Unequal application of the law amongst parties; operational issues (location collection points / communication to households) Seller market (higher collection and recycling costs) Competition between schemes does not lead to better and higher collection and recycling rates
Umbrella structure (lamps integral part of a one all product structure)	Ireland, Portugal; Greece; Hungary; Poland;	Cross financing across product categories; No focus on collecting lamps Non transparent financing and reporting Less focus on cost optimisation Low real collection (exception for Hu)*

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II. The EU@work: Learnings from 5 years WEEE

- Slovakia:
  - Multiple competing schemes for lamps
  - No clearing mechanism between schemes / no legal collection obligation
  - Sustainable fee would be 0,30 EUR - several schemes charge 0,03 EUR
  - Cheap schemes do not really collect or invest in communication and therefore have low/ zero costs

- Bulgaria:
  - Producers (=importers to Bulgaria) can choose between a state tax on import and the fulfillment of their WEEE obligation
  - A sustainable fee in Bulgaria would be three times as high as the state tax
  - State tax not used for proper collection and recycling
  - Producers not able to organize a sustainable scheme
- Finland: initially
  - Competing schemes of which some did not finance / collect lamps
  - No clearing system available

II. The EU@work: Learnings from 5 years WEEE

- United Kingdom:
  - Established "clearing" mechanism drives up the price and leave parts of the country without collection
  - Different rules for household and professional lead to fraud
  - 40 uncontrolled, competing schemes for lamps
  - No financial guarantee that future lamps can be financed
  - Threat for cartel due to accredited schemes with waste management companies
- Austria:
  - Producers can not take their responsibility
  - Big end users buying across the border can escape as their obligation is not regulated properly
- Netherlands: initially
  - No clearing mechanism between schemes
  - Licensed competing schemes where some did not finance and collect
  - Non aligned financing procedures

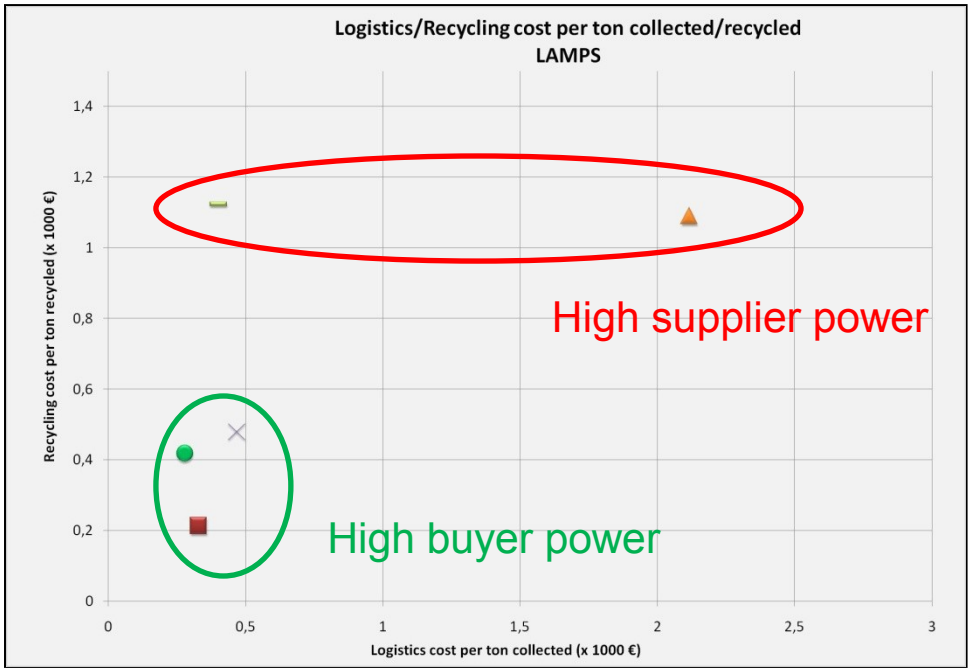
II. The EU@work: Learnings from 5 years WEEE

Collective vs individual approach

An individual approach towards managing the collection & recycling of lamps reduces the power of the producers in negotiating favorable prices.

Following graph show the actual price differences between **several European countries**. These countries vary, due to local circumstances, in the power the C&R schemes have to negotiate the Logistic and Recycling prices.

Prices are **up to 3 times** higher within a supplier driven market



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II. The EU@work: Learnings from 5 years WEEE

Conclusions

- Financing
  - Market share vs. share in products returning
  - Visible contribution
- Keep it simple
  - Focus should be on effective and efficient collection and recycling
  - Do not differentiate legal responsibility for the same product
  - Definition of weight is not controllable and auditable, nor relevant for producer responsibility
  - Competing schemes lead to less collection and harms the environment
  - Be real
- Keep it level (no market disturbance)
  - Definition of Producer
  - Accreditation of schemes: to ensure eco efficiency and fair competition.
  - Allocation between schemes: Ensure equal compliance between producers
  - Competition between schemes increases cost of collection and recycling
  - Guarantee financing for future obligations and orphan waste

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III. BRAZIL@WORK :

A SECTOR PROPOSAL IN CONSTRUCTION

III. Brazil@work: a sector proposal in construction

- Following the latest proposals for resolutions submitted by Abilux and Abilumi and the discussions held at Conama, several discussions were held between Abilux and Abilumi to see if there is a possibility to come to a common understanding and joint proposal for the organisation and financing of the collection and recycling of end of life lamps.
- Several important steps have been taken since then.
- We want to provide you with an update of the results so far.

III. BRAZIL@WORK :

A SECTOR PROPOSAL IN CONSTRUCTION

GOVERNANCE MODEL

COLLECTION POINTS

FINANCING

III. Brazil@work: a sector proposal in construction

Governance principles :

A joint understanding between ABILUX and ABILUMI was reached:

- The ABILUX proposed Producer definition
- Federal registration of "Producers "
- One joint Federal scheme
  - Is the best option for the environment
  - Is the best solution to organise and coordinate the collection and recycling activities of end of life lamps
  - Is the only guarantee that all waste will be collected and financed
  - Provides the best tool to fight freeriders and to maintain a level playing field
  - Allows for an optimal and fair cost allocation for all parties involved
  - Is the best option for monitoring and enforcement of compliance with the law
- There is no rationale that the necessary commercial collection points should be treated as waste management sites.
- The fact that retail and distribution should have the obligation in general to accept lamps does not imply that they will all serve as collection points.

III. BRAZIL@WORK :

A SECTOR PROPOSAL IN CONSTRUCTION

GOVERNANCE MODEL

COLLECTION POINTS

FINANCING

III. Brazil@work: a sector proposal in construction: Collection network

	Drop-off boxes at retailers	Drop-off boxes at public place	Municipal collection centre	Door-to-door (kerbside) collection	Collection events	Professional installers
>250 inh / km²	Depending on density with big or small containers					
<250 inh / km²						

- Why threshold set at **250 inh./km²**?
  - Collection points within max. 2 km
  - At least 1 small container / year per collection point
    - 250 inh. / km² * 0,39 waste / inh. in EU ~ 100 waste lamps / year per km²
    - Assumption to have collection points max 2km away

      → per 4 km² ~400 waste lamps / year ~1 small container

- Whether fixed collection point is commercial or public depends on:
  - Cost consideration / Control issues / Municipalities' opinion or imposed obligations

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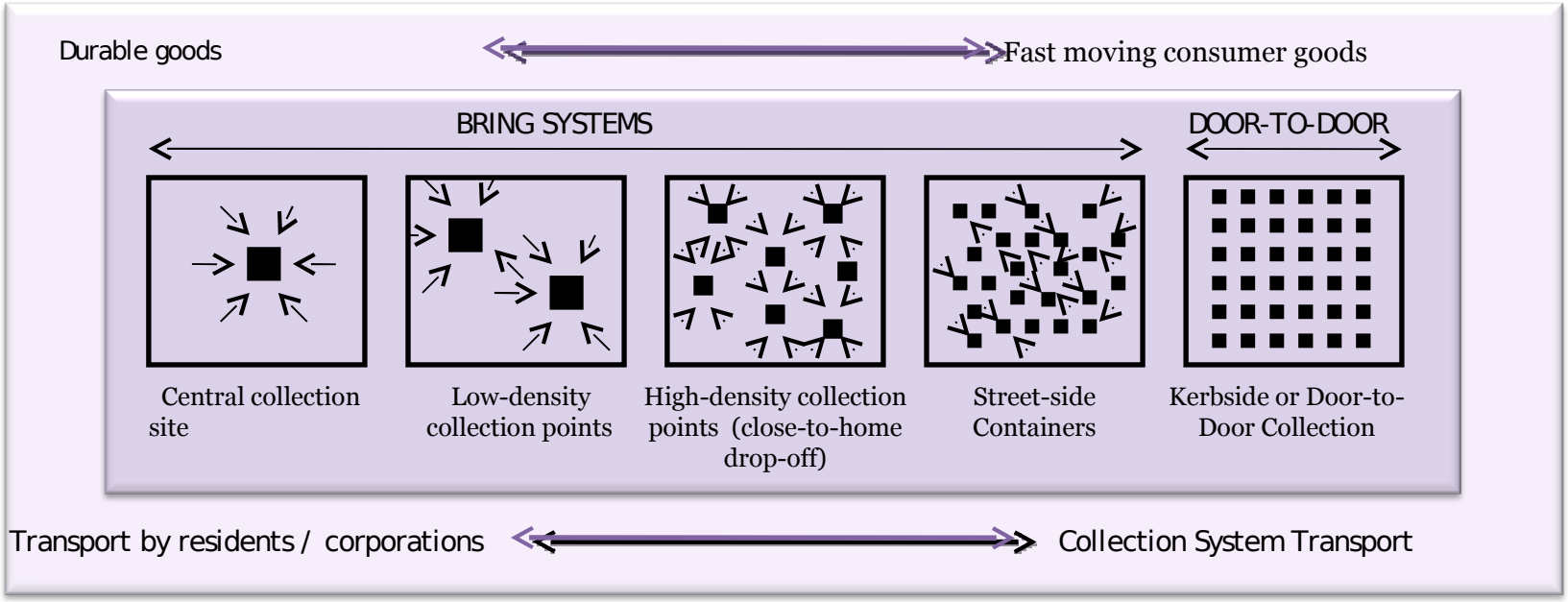
III. Brazil@work: a sector proposal in construction: Collection network



III. Brazil@work: a sector proposal in construction: Collection network

The collection and recycling strategy to be developed by each scheme

Collection Infrastructure: specific containers for different types of gas discharge lamps, etc.

Transportation modalities:

- Land: quality of roads, train connections
- Water : natural water ways, canals
- **parameters:** Transportation cost as a function of price of fuel, Km of roads/ train tracks

Collection points: (see bottom up cost calculation)

Public and private collection points ; movable collection points and collection event

(rural / schools).

parameters: - #collection points: amongst others density and volume of available lamp waste and distance between end users and collection points (not only #people)

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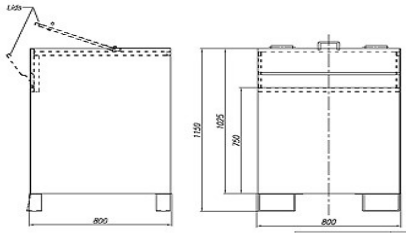
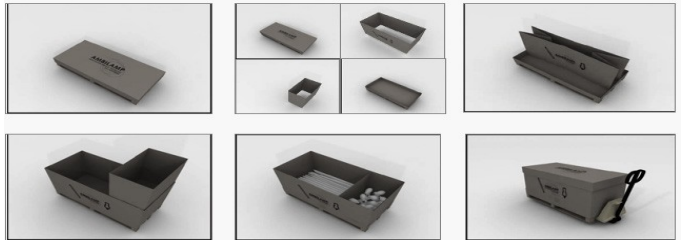
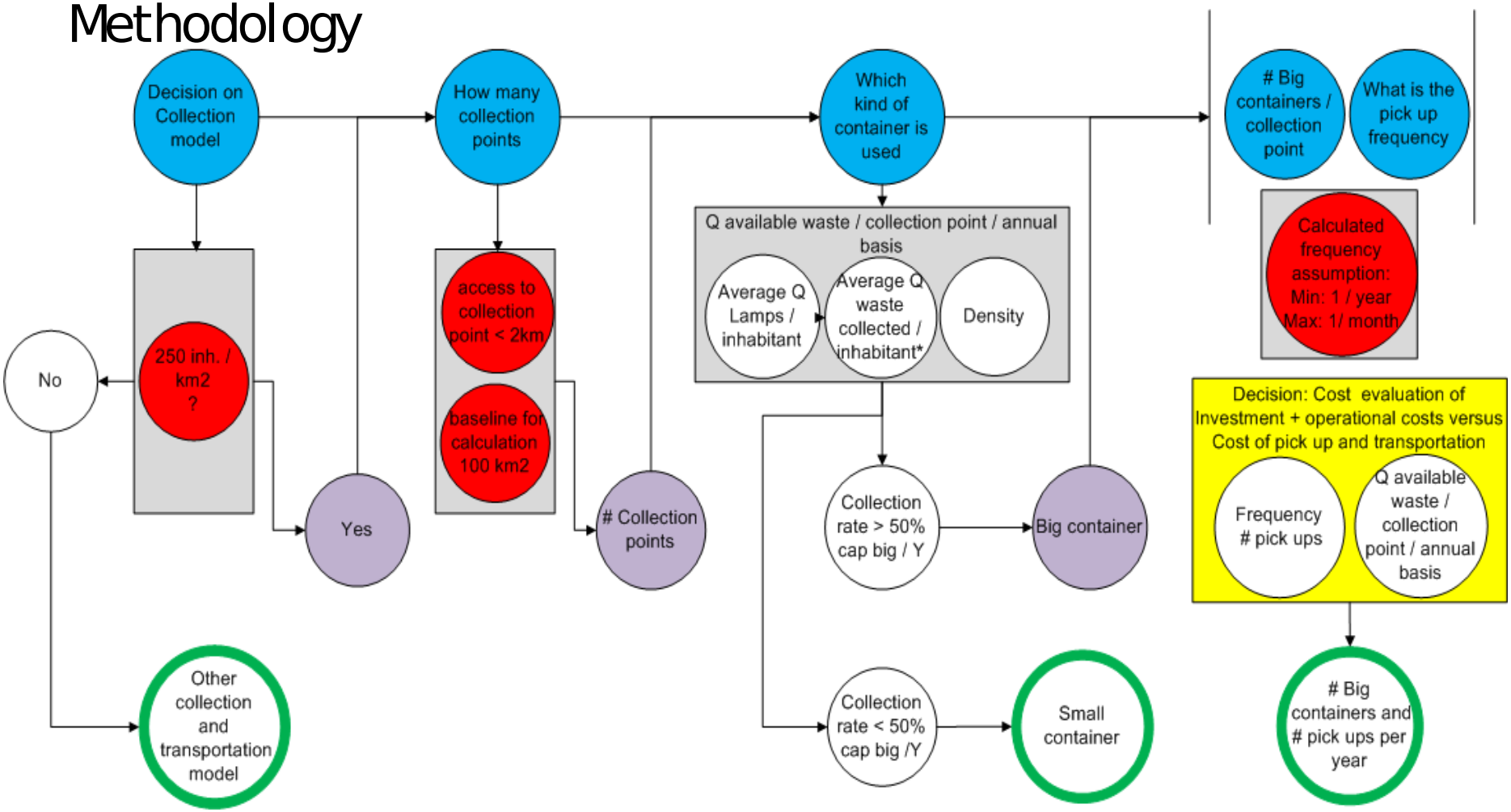
III. Brazil@work: a sector proposal in construction: Collection network





III. Brazil@work: a sector proposal in construction:
Collection network

Methodology



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III. Brazil@work: a sector proposal in construction: Collection network

Input data

- Brazilian city populations
- City surfaces
- Population density
- Mercury lamp sales per inhabitant
- Assumption: 80% of lamps within radius of 600 km of São Paulo
- Average EU waste figures per inhabitant
- Brazilian recyclers' capacities and cost / unit

→ Certain further assumptions need to be taken due to incomplete data, e.g. on collection costs / unit, container capacities, etc.

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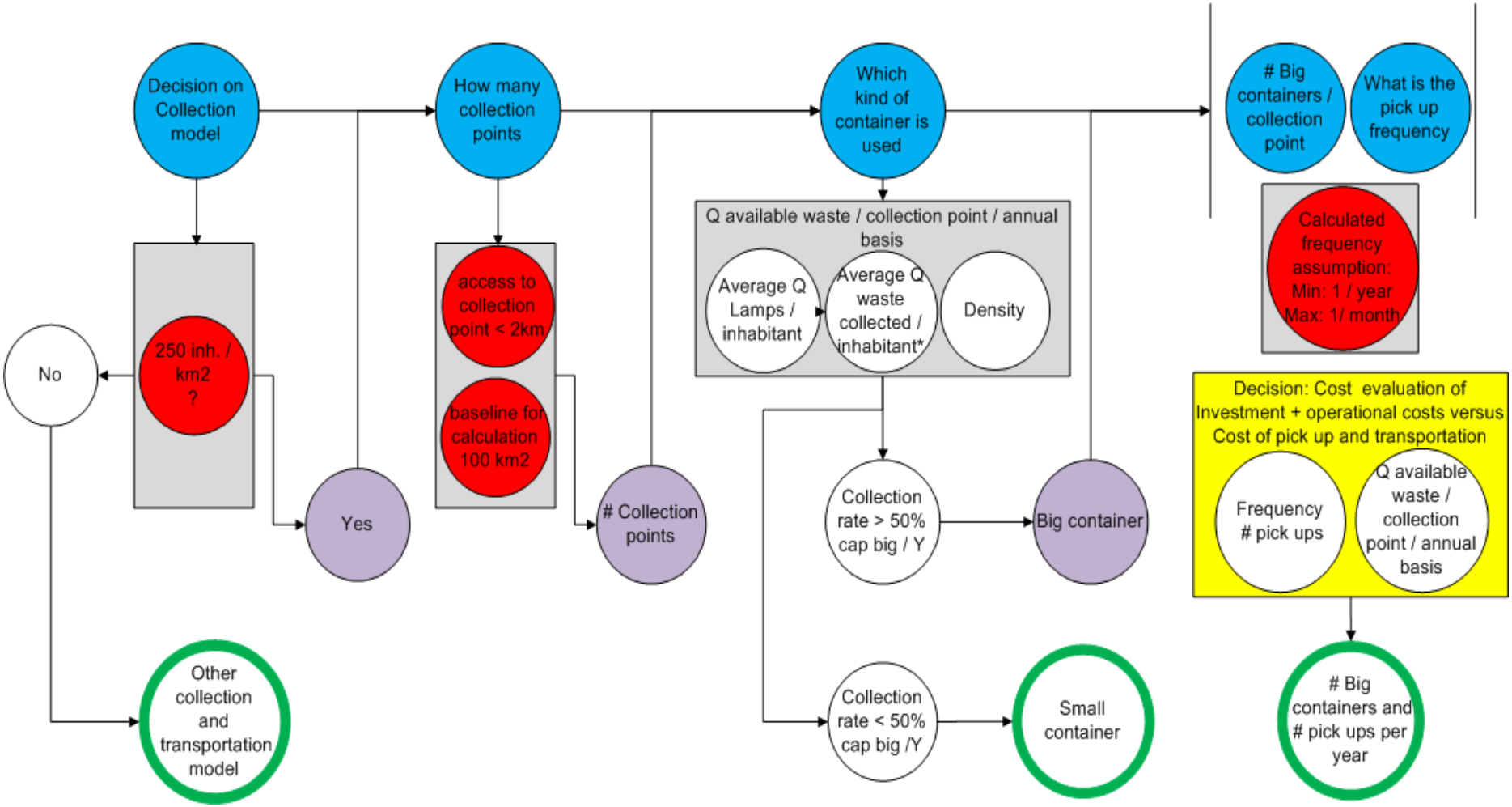
III. Brazil@work: a sector proposal in construction: Collection network



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III. Brazil@work: a sector proposal in construction: Collection network

Decision on collection model

Starting point:

929 Brazilian cities > 25 000 inhabitants = 66% of total population

Population densities

Threshold for collection point network (Variable):

currently at 250 inh/km²

> 250 inh. / km²:

Collection point network

< 250 inh. / km²:
Other system

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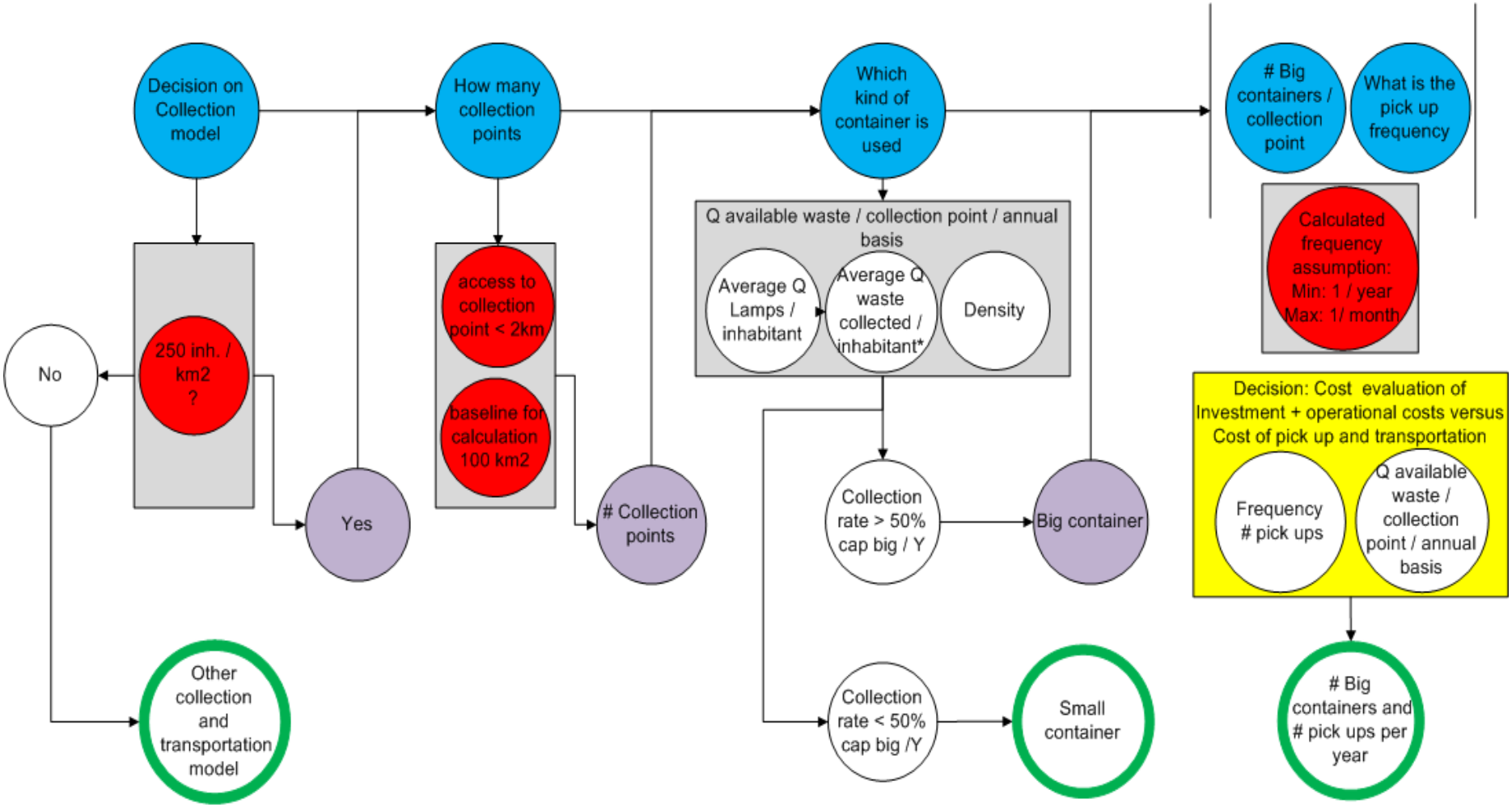
III. Brazil@work: a sector proposal in construction: Collection network



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How many collection points?

Access to collection point within max. 2 km (V):
→ set at 9 points / 100 km² :
<2 km to coll. point

City surface

Number of collection points in city (commercial/public)

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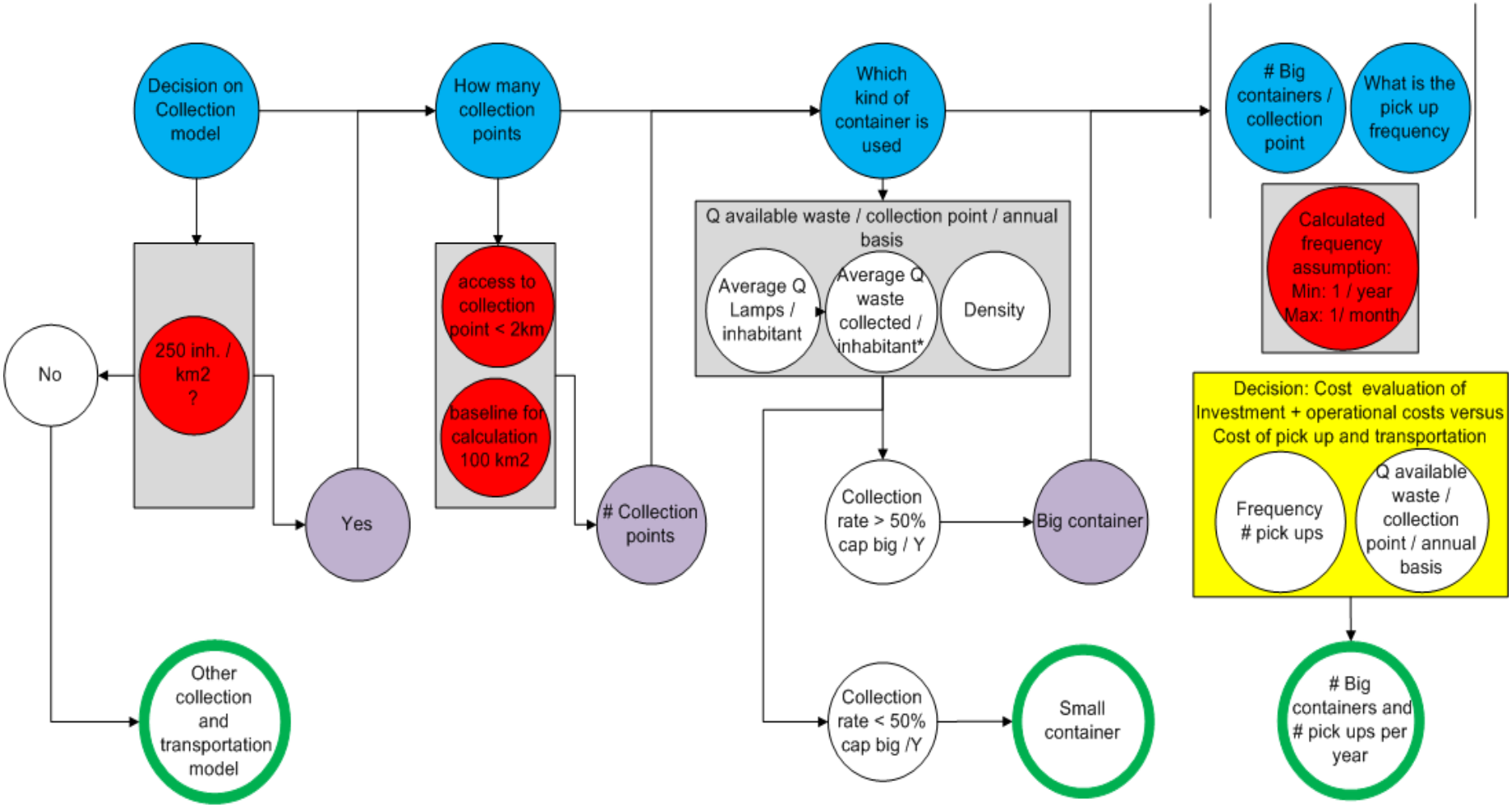
III. Brazil@work: a sector proposal in construction: Collection network



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Waste mercury lamps per inhabitant?

	Lamp sales 2002	Lamp sales per head per year	Waste lamps per inhabitant per year
EU average	388.314.000	1,21	0,41
Brazil	85.171.472	0,47	0,158

- Inhabitants: approximately 196.343.000
- 85.171.472 mercury lamp sales / 196.343.000 inhabitants → ~0,47 lamp sales per inh. per year → much lower than EU average of 1,21
- Brazilian waste lamps per inh. per year =
  EU waste lamps per inh. per year * (lamp sales per head Brazil / lamp sales per head EU) → 0,158 waste lamps per inhabitant per year

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III. Brazil@work: a sector proposal in construction:
Collection network
Which kind of containers?

Access to collection point within max. 2 km (V):
→ set at 9 points / 100km²

Waste mercury lamps per inhabitant per year (V):
→ set at 0,158 lamps per inh. / year

Population density

Average container capacity in lamp units (V):
→Set at:
1200 for big
400 for small

> 50% capacity of big containers per year / point: big containers

< 50% capacity of big containers per year / point: small containers

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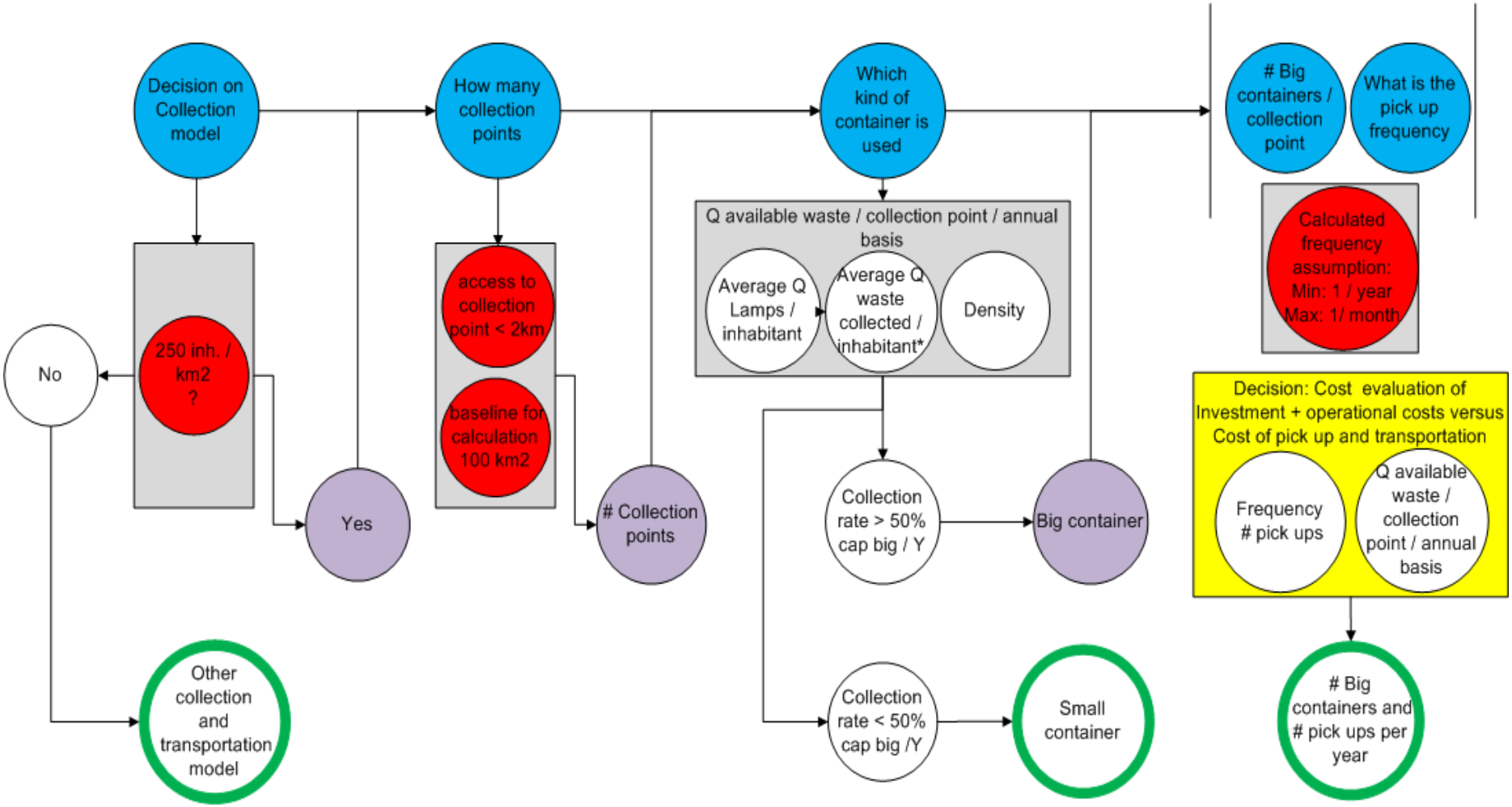
III. Brazil@work: a sector proposal in construction: Collection network



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III. Brazil@work: a sector proposal in construction:
Collection network
How many containers and pickup frequency?

- Investment analysis:
  - Container investment and operational costs
    vs. Pickup and transportation cost

- Limited available data so far:

→ 2 scenarios developed:

1. Pickup when container is full with a maximum of 1 pickup / month and minimum of 1 pickup / year
2. Pickup when container is full and minimum of 1 pickup / year

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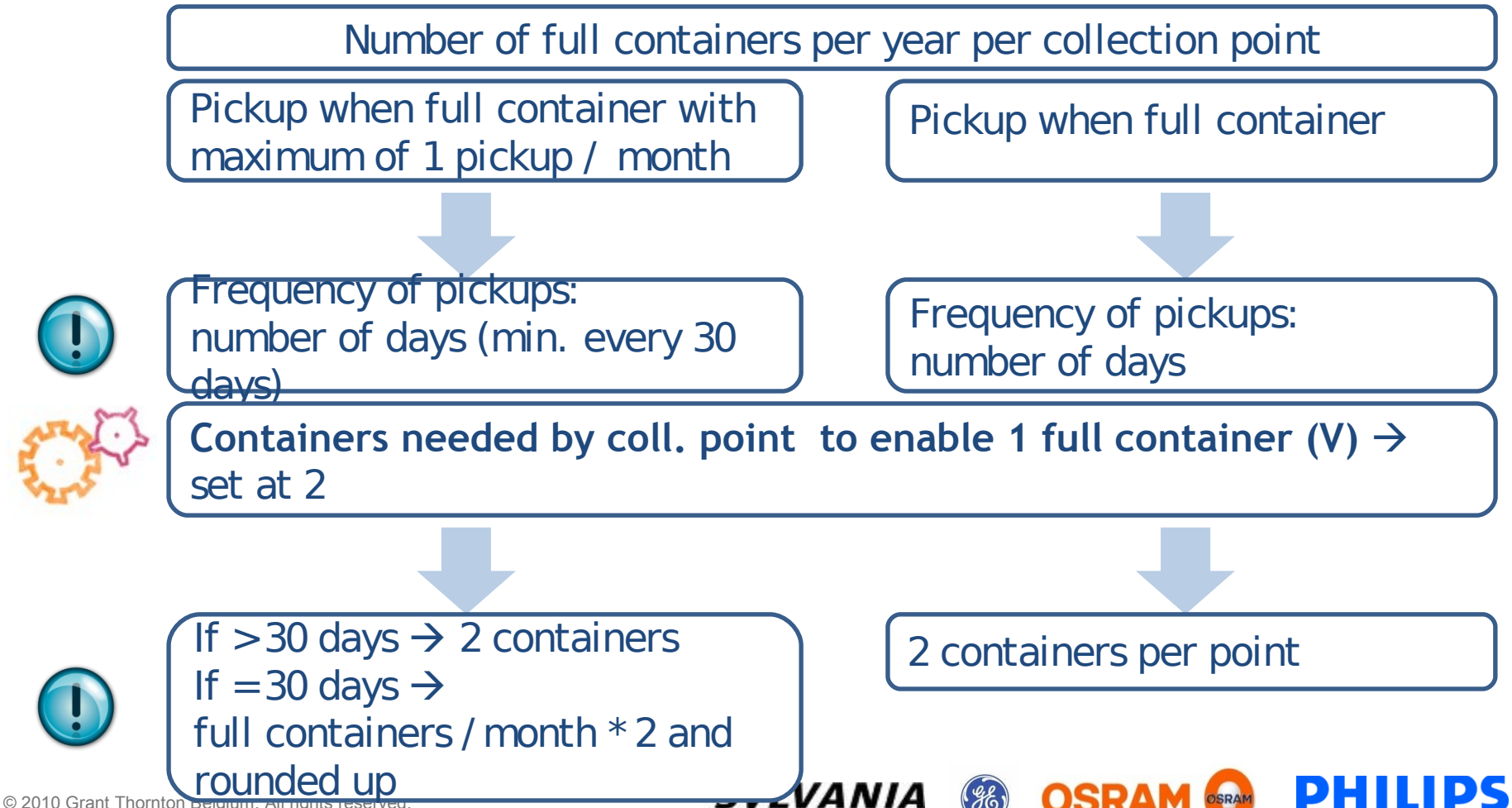
III. Brazil@work: a sector proposal in construction:

Collection network

How many containers and pickup frequency?



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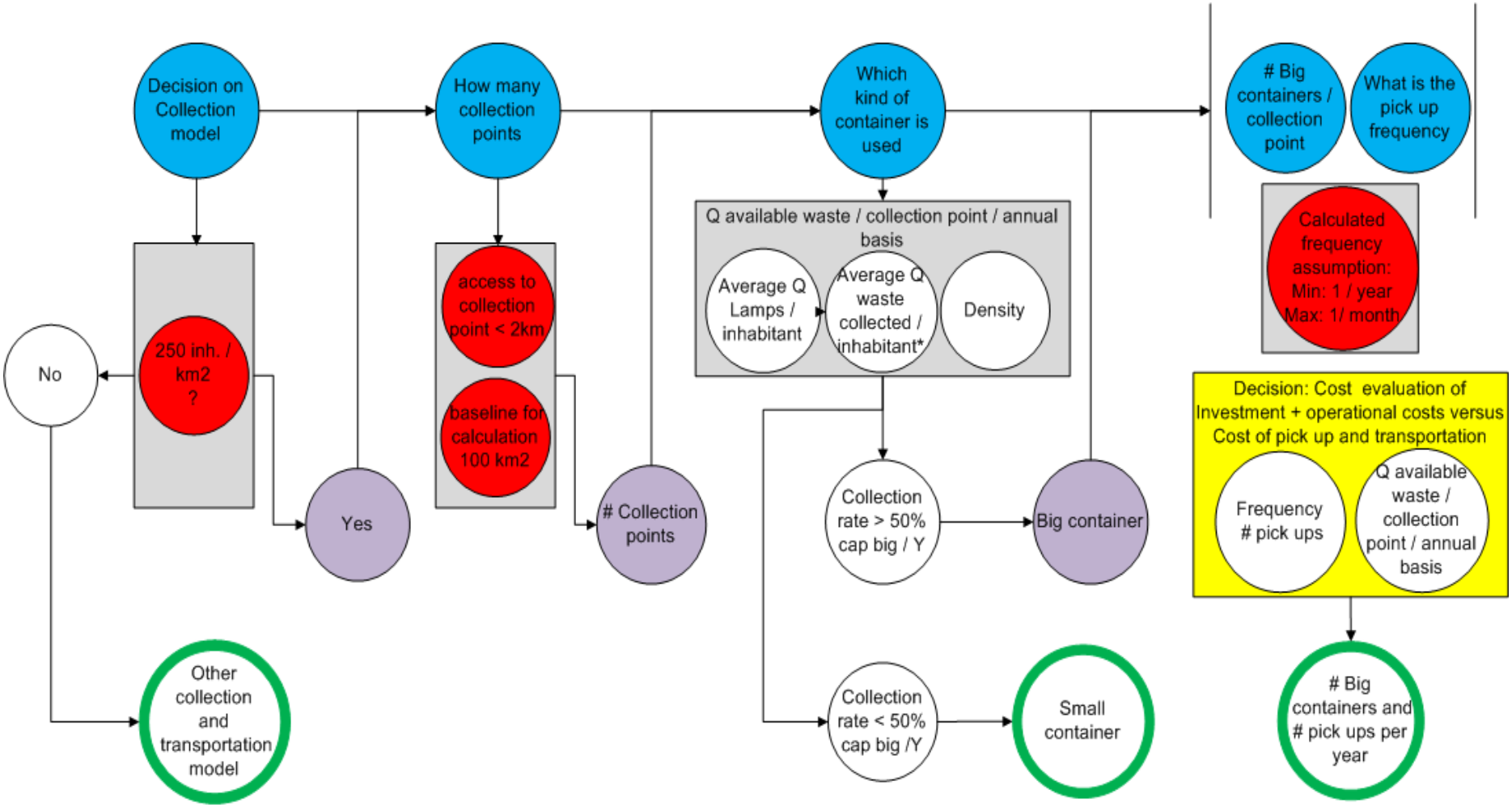

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III. Brazil@work: a sector proposal in construction: Collection network Results

MAIN ASSUMPTION: Maximum collection 1x per month: if more, then just more containers and collection 1x per month

	Average container capacity in lamp units (big cont)	Average container capacity in lamp units (small cont)	Purchasing cost big container (in BRL)	Purchasing cost small container (in BRL)	Threshold for collection point network (in inh/km²)	Collection points / 100km²	Containers needed by coll point to enable 1 full container
Assumptions for Brazil	1.200	400	BRL 699	BRL 349	350	9	2

	Brazil average waste mercury lamps per inh per year	1 collection point per amount of people	Waste lamps per collection point	1 container per amount of people
Assumptions for Brazil	0,1582	19.233	7.853	5.307

Departementos / partido	Region	Total Inhabitants (2009)	Cumulative % of population	Urban populatio	Rural populatio	Surface (km²)	Urban surface (km²)	Density: Inhabitants /km2	Density: Inhabitants /100km2	Collection network on or moveable or call system	Rough estimation of number of containers based on EU average of people per cont.	Number of collection points /100km²	Number of collection points in city	Number of waste lamps per year / city (based on average per inh. per yea	Big containers of waste lamps per year / city	Number of waste lamps per year / 100km² (based on average	Number of waste lamps per year / Coll. point (based on average	Big or small containers	Big containers of waste lamps per year / Coll. Print	Small containers of waste lamps per year / Coll. Print	Number of waste lamps per month / 100km² (based on average	Number of waste lamps per month / Coll. point (based on average	Big containers of waste lamps per month / Coll. Print	Small containers of waste lamps per month / Coll. Print	Frequency of collection (big containers): number of da	Frequency of collection (small containers): number of day	Big containers needed / Coll. Print	Small containers needed / Coll. Print	Big containers needed in city	Small containers needed in city	Purchasing container cost / coll. point (if big containers)	Purchasing container cost / coll. point (if small containers)	Yearly transport and collection cost for units from coll. point (incl. container) based on EU averages	Yearly recycling cost for units from coll. poi	Yearly total collection, transport and recycling cost for units from coll. point	Purchasing container cost for city	Yearly transport and collection cost for city (incl. container) based on EU averages	Yearly recycling cost for city	Yearly total transport, collection and recycling cost for city
São Paulo	<600 km of Sao Paulo	10.924.894	5,08%			1.523		6.781	678.141	Collection point network	1754	9	137	1.634.374	1.362	107.313	11.934	Big containers	9.9		8.945	994	0,83	16		2		274		BRL 1.397		BRL 5.782	BRL 7.336	BRL 13.118	BRL 191.525	BRL 791.573	BRL 1.001.914	BRL 1.825.497
Rio de Janeiro	<600 km of Sao Paulo	6.127.355	8,14%			1.256		4.958	495.850	Collection point network	1058	9	115	985.450	821	78.459	8.718	Big containers	7.3		6.598	726	0,61	50		2		165		BRL 1.397		BRL 4.228	BRL 5.510	BRL 9.737	BRL 157.949	BRL 477.884	BRL 621.805	BRL 1.100.688
Salvador	>600 km of Sao Paulo	2.948.222	9,59%			707		4.171	417.145	Collection point network	504	9	64	466.701	389	66.011	7.335	Big containers	6.1		5.501	611	0,51	59		2		127		BRL 1.397		BRL 3.557	BRL 4.635	BRL 8.192	BRL 88.939	BRL 226.322	BRL 294.555	BRL 521.277
Fortaleza	>600 km of Sao Paulo	2.513.811	10,81%			313		8.031	803.135	Collection point network	427	9	28	397.798	331	127.092	14.121	Big containers	11.8		10.591	1.177	0,98	31		2		56		BRL 1.397		BRL 6.848	BRL 8.925	BRL 15.773	BRL 39.551	BRL 192.926	BRL 251.408	BRL 444.334
Belo Horizonte	<600 km of Sao Paulo	2.506.015	12,09%			331		7.571	757.107	Collection point network	426	9	30	396.557	330	119.809	13.312	Big containers	11.1		9.984	1.109	0,93	31		2		60		BRL 1.397		BRL 6.456	BRL 8.413	BRL 14.869	BRL 41.525	BRL 182.311	BRL 259.650	BRL 442.961
Brasília	>600 km of Sao Paulo	2.492.913	13,27%			5.802		430	42.967	Collection point network	418	9	510	388.935	315	6.700	747	Big containers	0.6		560	62	0,05	365		2		1.044		BRL 1.397		BRL 362	BRL 472	BRL 834	BRL 729.631	BRL 188.080	BRL 246.410	BRL 435.320
Curitiba	<600 km of Sao Paulo	1.871.087	14,19%			435		4.301	430.135	Collection point network	318	9	39	296.051	247	68.067	7.563	Big containers	6.3		5.672	630	0,53	57		2		78		BRL 1.397		BRL 3.668	BRL 4.780	BRL 8.447	BRL 54.704	BRL 143.586	BRL 187.128	BRL 330.718
Manaus	>600 km of Sao Paulo	1.817.778	15,08%			11.401		159	15.944	Other system		Other system			287.855	240												Other system	Other system			BRL 0	Other system	BRL 158.485	BRL 181.798	BRL 321.295
Belém	>600 km of Sao Paulo	1.554.285	15,84%			1.065		1.459	145.943	Collection point network	264	9	96	245.900	205	23.095	2.566	Big containers	2.1		1.925	214	0,18	168		2		192		BRL 1.397		BRL 1.244	BRL 1.622	BRL 2.866	BRL 133.929	BRL 118.276	BRL 155.447	BRL 274.712
Recife	>600 km of Sao Paulo	1.542.678	16,60%			217		7.109	710.812	Collection point network	261	9	20	244.122	203	112.499	12.500	Big containers	10.4		9.375	1.042	0,87	35		2		39		BRL 1.397		BRL 6.063	BRL 7.900	BRL 13.962	BRL 27.289	BRL 118.984	BRL 154.285	BRL 271.269
Porto Alegre	>600 km of Sao Paulo	1.421.172	17,30%			417		3.408	340.833	Collection point network	241	9	38	224.910	187	53.935	5.993	Big containers	5.0		4.495	499	0,42	72		2		75		BRL 1.397		BRL 2.906	BRL 3.787	BRL 6.694	BRL 52.440	BRL 108.068	BRL 141.143	BRL 251.211
Guarulhos	<600 km of Sao Paulo	1.323.897	17,85%			318		4.170	416.980	Collection point network	225	9	28	209.833	175	65.985	7.332	Big containers	6.1		5.499	611	0,51	59		2		57		BRL 1.397		BRL 3.555	BRL 4.634	BRL 8.189	BRL 39.980	BRL 101.758	BRL 133.814	BRL 234.571
Goiânia	>600 km of Sao Paulo	1.267.151	18,38%			738		1.715	171.468	Collection point network	215	9	67	200.511	167	27.134	3.015	Big containers	2.5		2.261	251	0,21	143		2		133		BRL 1.397		BRL 1.462	BRL 1.905	BRL 3.367	BRL 91.593	BRL 97.141	BRL 126.726	BRL 223.970
Campinas	<600 km of Sao Paulo	1.111.854	19,13%			796		1.397	139.680	Collection point network	189	9	72	175.946	147	22.104	2.456	Big containers	2.0		1.842	205	0,17	176		2		143		BRL 1.397		BRL 1.191	BRL 1.552	BRL 2.743	BRL 100.101	BRL 85.033	BRL 111.198	BRL 196.521

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III. Brazil@work: a sector proposal in construction: Collection network

- Commercial collection network:
  - Throughout the EU, formalised commercial collection points have not been defined as hazardous waste management centres. Hence they donot fall under the application of the hazardous waste regulations.
  - The same is true for Colombia where only consolidation points fall under the application of hazardous waste regulations (depending on volume of containers).
  - There are good reasons to do so:
    - There is no difference between the new products and the end of life products
    - If not, there is little chance that there will be sufficient collection points leading to littering and direct environmental damage
    - Accepted collection points will use specific containers
    - EH&S standards as well as quality standards are to be developed in the waste management plan

III. Brazil@work: a sector proposal in construction: Collection network

- Commercial collection network:
  - It is important that there is a general obligation for distributors to accept for free end of life lamps, as well as to keep them in a safe way etc.
  - It is important that they are obliged to transfer them to identified waste management operators, contracted by the scheme(s), at no cost.
  - It is however such that the implementation of this obligation does not imply that all distributors or retailers will serve as collection point.
  - This depends on the selection by the scheme(s) to safeguard quality, effectiveness and efficiency in the collection
  - Our proposal for text of resolution creates this environment

III. BRAZIL@WORK :

A SECTOR PROPOSAL IN CONSTRUCTION

GOVERNANCE MODEL

COLLECTION POINTS

FINANCING

III. Brazil@work: a sector proposal in construction
Financing

Agreed principles

- Following principles should be safguarded as to avoid disrupture in the market: pay as you go / equal spread of the costs over the lamps put on the market in Brazil / one and the same contribution per lamp / strong controls / payment at the moment of put on the market
- The financing should be structured in such a way that eventually applicable taxes do not lead to non compliance or contrary impacts.
- One contribution for all lamps
- Financial clearing systems on basis of equal calculation methods

To be further assessed

- Tax impact on financial scenarios
- Interim period between the resolution and the federal law assuming CIDE would be accepted in the Federal law.

III. Brazil@work: a sector proposal in construction

Conclusion

- Abilux and Abilumi are in the process of discussing an alignment of their position as to how to organise and finance the collection and recycling of the end of life lamps for the whole of Brazil.
- The Brazilian regulatory framework creates hurdles to achieve directly the best optimal solution for the environment and the sector through a Resolution: eg
  - Formal obligation to join one scheme
  - Visibility of the contribution
  - Approval of a CIDE as financing basis
  - The Brazilian tax system

Conclusion:

FOCUS to formulate a text for the Resolution which will create the wanted outcome / behaviour in the market within the regulatory constraints.
We thereto need the assistance from CONAMA.
E.g. Equal criteria for all schemes in relation to the waste management plan

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IV. COST CALCULATIONS

IV. Cost calculations

→ 2 approaches followed:

1. Top down calculation

Cost calculation starting from the following parameters:

- Estimated sales and waste collection
- Collection and transport costs
- Recycling costs
- Overhead costs
- Marketing costs

2. Bottom up calculation

Cost calculation starting from the following estimations by city such as:

- Average lamp waste per inh/ year
- City populations and density
- Number of collection points
- Number of containers: capacity and pickup frequency

IV. Cost calculations

<u>3 base scenarios:</u>

- All Brazilian municipalities >25.000 inhabitants
- All Brazilian municipalities >25.000 inhabitants and
- <600km of Saõ Paulo
- All Brazilian municipalities >25.000 inhabitants and <600km of Saõ Paulo +all other cities >100 000 inhabitants

IV. Cost calculations

What will be the corresponding cost? (estimation)

- **Container costs:**
  - Number of containers per city → Container purchasing costs
    (based on variable parameter container costs big and small → so far EU costs taken)

- **Collection and transport costs**
  - EU average transport and collection cost per unit as starting point
  - Coefficient re-distributes cost according to collection efficiency of cities compared to one another (input variables):

Efficiency coefficient > 100 000	Efficiency coefficient > 25 000	Efficiency coefficient < 25 000
1	1.5	4

  - Number of waste lamps per year per city → Yearly transport and collection cost for city (incl. container)

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IV. Cost calculations

What will be the corresponding cost? (estimation)

- **Recycling costs**
  - Number of waste lamps per year per city (based on average per inh. per year)

    → Yearly recycling cost for city

    (based on Brazilian recycler rates, idem as for top down)

- **Overhead costs**
  - Estimations based on average EU countries, corrected for the Brazilian GDP index and number of inhabitants (factor only counts ½)

- **Marketing costs**
  - Estimations based on average EU countries, corrected for the Brazilian communication price index and number of inhabitants (factor only counts ½)

IV. Cost calculations

What will be the corresponding cost? (estimation)

Scope	All Brazilian municipalities > 25.000 inhabitants	All Braz. municipalities > 25.000 inh. and < 600km of Sao Paulo	All Braz. municipalities > 25.000 inh. and < 600km of Sao Paulo + all other cities > 100 000 inh.
%of population	66.94%	31.75%	56.02%
Waste lamps / year based on 0,158 waste lamps / inh.	21.548.092	10.221.704	18.032.447
Cost overview:			
Transport and collection cost incl. containers	BRL 10.449.524	BRL 4.757.718	BRL 8.155.496
Container costs from this model	BRL 8.597.569	BRL 4.108.611	BRL 8.035.317
Recycling cost	BRL 13.618.394	BRL 6.460.117	BRL 11.396.506
Overhead cost*	BRL 8.592.927	BRL 5.660.696	BRL 6.703.151
Marketing cost*	BRL 18.110.685	BRL 11.930.635	BRL 14.127.741
Total costs	BRL 50.771.531	BRL 28.809.165	BRL 40.382.894

*Overhead & recycling extrapolated: inhabitants factor counting for half

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IV. Cost calculations

2 extra cost calculation scenarios: phased approach

Phased approach in selection of coverage	Municipalities within 600km of São Paulo	Other municipalities (>600km of São Paulo)
Year 1	>350.000 inhabitants	>500.000 inhabitants
Year 2	>150.000 inhabitants	>2500.000 inhabitants
Year 3	>75.000 inhabitants	>125.000 inhabitants
Year 4	>25.000 inhabitants	>75.000 inhabitants

→ Incremental growth of population coverage

	Brazil: selection year 1 (< 600km of SP:> 350 000 > 600km of SP > 500 000)	Brazil: selection year 2 (< 600km of SP:> 150 000 > 600km of SP > 250 000)	Brazil: selection year 3 (< 600km of SP: > 75 000 > 600km of SP > 125 000)	Brazil: selection year 4 (< 600km of SP: > 25 000 > 600km of SP > 50 000)
Part of population	31,26%	42,51%	51,30%	61,31%

→ Selection of cities is done on the basis of:

- Population
- Project team information: 80%of lamps within radius of 600 km of São Paulo

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IV. Cost calculations

First extra cost calculation scenario

1) Estimations based on calculated Brazilian average waste mercury lamps per inh. per year and similar approach as in previous scenarios for transport and collection, recycling, overhead and marketing costs:

According to calculated average waste mercury lamps per inh per year (33,71% of lamp sales Y-6)	Brazil: selection year 1 (<600km of SP: >350000 >600km of SP >500000)	Brazil: selection year 2 (<600km of SP: >150000 >600km of SP >250000)	Brazil: selection year 3 (<600km of SP: >75000 >600km of SP >125000)	Brazil: selection year 4 (<600km of SP: >25000 >600km of SP >50000)
Part of population	31,26%	42,51%	51,30%	61,31%
Transport and collection cost incl. containers (based on EU average costs)	BRL 4.377.399	BRL 5.952.453	BRL 7.267.139	BRL 9.267.806
Container Costs from this model (excl. 'other system')	BRL 3.916.331	*BRL 6.212.999*	*BRL 7.554.429*	*BRL 8.481.685*
Recycling cost	BRL 6.359.612	BRL 8.647.895	BRL 10.436.790	BRL 12.473.837
Overhead cost*	BRL 5.639.471	BRL 6.122.705	BRL 6.500.480	BRL 6.930.659
Marketing cost*	BRL 11.885.902	BRL 12.904.379	BRL 13.700.587	BRL 14.607.243
Total costs	BRL 28.262.385	BRL 33.627.433	BRL 37.904.996	BRL 43.279.544

* Overhead & recycling extrapolated: inhabitants factor counting for half

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IV. Cost calculations

Second extra cost calculation scenario

2) Estimations of collection percentages on the basis of EU Member State experience:
   - In Europe, **1 lamp out of 3** (33.71%) lamps put on the market 6 years before (=average lifetime of a lamp) arises as waste and is offered for collection.
   - In general, compared to most of the EU Member States,
     - Brazil does **not** dispose of an equivalent infrastructure to collect and recycle end of life lamps
     - The Brazilian end-user **lacks awareness and incentives** for collection and recycling of lamps

   → Therefore, a 3-6-10-15 approach is more realistic:

	Collection rate			
Targets proposed	Year 1	Year 2	Year 3	Year 4
Selection Y1	3%	6%	10%	15%
Selection Y2 only		3%	6%	10%
Selection Y3 only			3%	6%
Selection Y4 only				3%

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IV. Cost calculations

Second extra cost calculation scenario

2) Estimation of costs related to 3-6-10-15 approach and similar approach as in previous scenarios for transport and collection, recycling, overhead and marketing costs:

According to 3-6-10-15 approach (on sales Y-6)	Brazil: selection year 1 (< 600km of SP: > 350 000 > 600km of SP > 500 000)	Brazil: selection year 2 (< 600km of SP: > 150 000 > 600km of SP > 250 000)	Brazil: selection year 3 (< 600km of SP: > 75 000 > 600km of SP > 125 000)	Brazil: selection year 4 (< 600km of SP: > 25 000 > 600km of SP > 50 000)
Part of population	31,26%	42,51%	51,30%	61,31%
Transport and collection cost incl. containers (based on EU average costs)	BRL 389.601	BRL 919.386	BRL 1.696.049	BRL 2.827.372
Container costs from this model (excl. 'other system')	*BRL 348.565*	*BRL 901.539*	*BRL 1.690.093*	*BRL 2.745.500*
Recycling cost	BRL 566.024	BRL 1.335.711	BRL 2.453.289	BRL 4.008.733
Overhead cost*	BRL 5.639.471	BRL 6.122.705	BRL 6.500.480	BRL 6.930.659
Marketing cost*	BRL 11.885.902	BRL 12.904.379	BRL 13.700.587	BRL 14.607.243
Total costs	BRL 18.480.998	BRL 21.282.181	BRL 24.350.405	BRL 28.374.007

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* Overhead & recycling extrapolated: inhabitants factor counting for half

IV. Cost calculations

Scenario: infrastructure not developed

Total cost	Calculation basis	2011 (POM 2005)	2012 (POM 2006)	2013 (POM 2007)	2014 (POM 2008)	2015 (POM 2009)	2016 (POM 2010)	2017 (POM 2011)	2018 (POM 2012)	2019 (POM 2013)
Estimated collection %	Based on EU experience	*1,4%*	*3,2%*	*5,6%*	*8,7%*	*12,0%*	*15,5%*	*19,2%*	*23,1%*	*27,1%*
Estimated collection in units	Coll. % * sales	1.765.363	4.211.200	9.172.800	16.573.500	24.096.000	35.572.500	50.131.200	68.491.500	91.327.000
Total transport and collection cost	Average cost per unit (EU)* Estimated Collection	BRL 856.095	BRL 2.042.178	BRL 4.448.255	BRL 8.037.148	BRL 11.685.106	BRL 17.250.516	BRL 24.310.607	BRL 33.214.245	BRL 44.288.085
Total recycling cost	Average cost per unit (BR)* Estimated Collection	BRL 1.115.709	BRL 2.661.478	BRL 5.797.210	BRL 10.474.452	BRL 15.228.672	BRL 22.481.820	BRL 31.682.918	BRL 43.286.628	BRL 57.718.664
Total overhead cost	Estimate based on comp. EU , corr. for GDP index and inh. (Inflation 2%)	BRL 8.592.927	BRL 8.764.786	BRL 8.940.081	BRL 9.118.883	BRL 9.301.261	BRL 9.487.286	BRL 9.677.032	BRL 9.870.572	BRL 10.067.984
Total marketing cost	Estimate based on comp. EU, corr. for comm. price index and inh. (Inflation 2%)	BRL 18.110.685	BRL 18.472.899	BRL 18.842.357	BRL 19.219.204	BRL 19.603.588	BRL 19.995.660	BRL 20.395.573	BRL 20.803.484	BRL 21.219.554
Total cost	Sum of the above	BRL 28.675.416	BRL 31.941.341	BRL 38.027.902	BRL 46.849.686	BRL 55.818.627	BRL 69.215.282	BRL 86.066.130	BRL 107.174.930	BRL 133.294.287

V. NEXT STEPS

V. Next steps

1. Assessment of the financing models on tax impact.
2. Finalising the alignment exercise between Abilux and Abilumi and feedbacking CONAMA on the results.
3. Development of an agreed upon proposal with CONAMA and the other respective public authorities to design and implement a sustainable solution in Brazil within the limits of the constitutional and regulatory boundaries.
4. Cooperation from CONAMA in introducing necessary dimensions towards other public authorities.
5. Construction and implementation of the final agreed upon model.

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