

# Country profile – Brazil

Second issue

November, 28th, 2006

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SECRETARIA DE ESTADO  
DO MEIO AMBIENTE



### Brazilian Country Profile

Five years ago, in the country there were less than ten initiatives related with biogas use, including experiments in landfills, wastewater treatment plants and farms.

Today there is a remarkable project with a generating capacity of 20MW in Sao Paulo. There are also more than ten energetic recoveries (100 to 500kW steam) of biogas in breweries and dozens of small scale (50 to 200kW) of electric generation with biogas in farms.

More than forty projects of biogas recovery are being designed and submitted, with electric capacities ranging between 1, 5, 10 until 20MW (in the State of Sao Paulo) and 60MW (in the State of Rio de Janeiro).

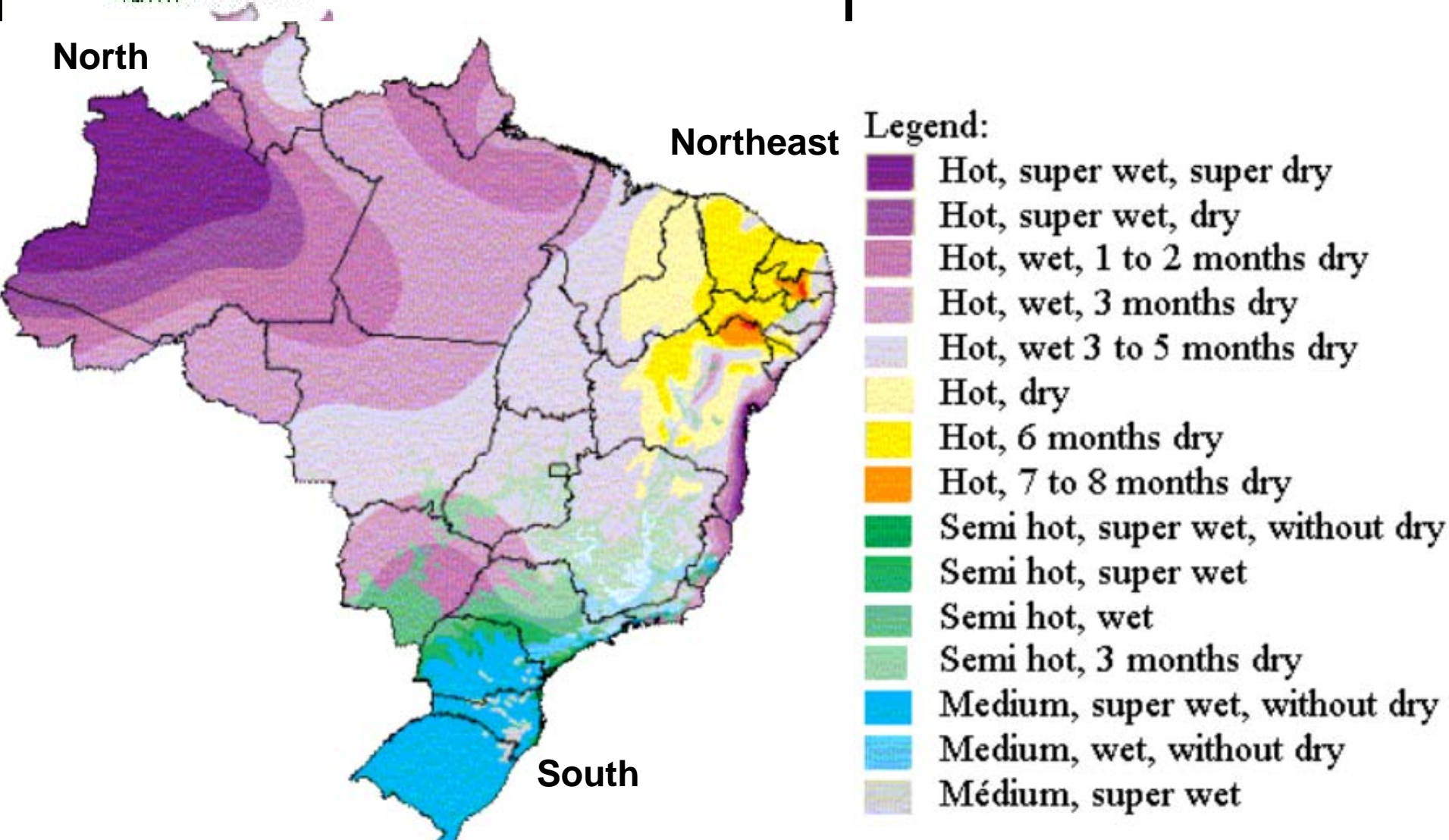
In Rio de Janeiro, the World Bank has supported a project replacing of a large open dump by a landfill. There are many other opportunities like that in the country, attracting interest and research on their feasibility.

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§ SMA – SP, Secretary of Environment of the State of Sao Paulo – [osvaldo@smas.sp.gov.br](mailto:osvaldo@smas.sp.gov.br)

Figure 1. Brazilian climate



CENBIO - São Paulo (applied research in use with energy); UFPEJ - Rio de Janeiro (energy use of mineral oil waste).

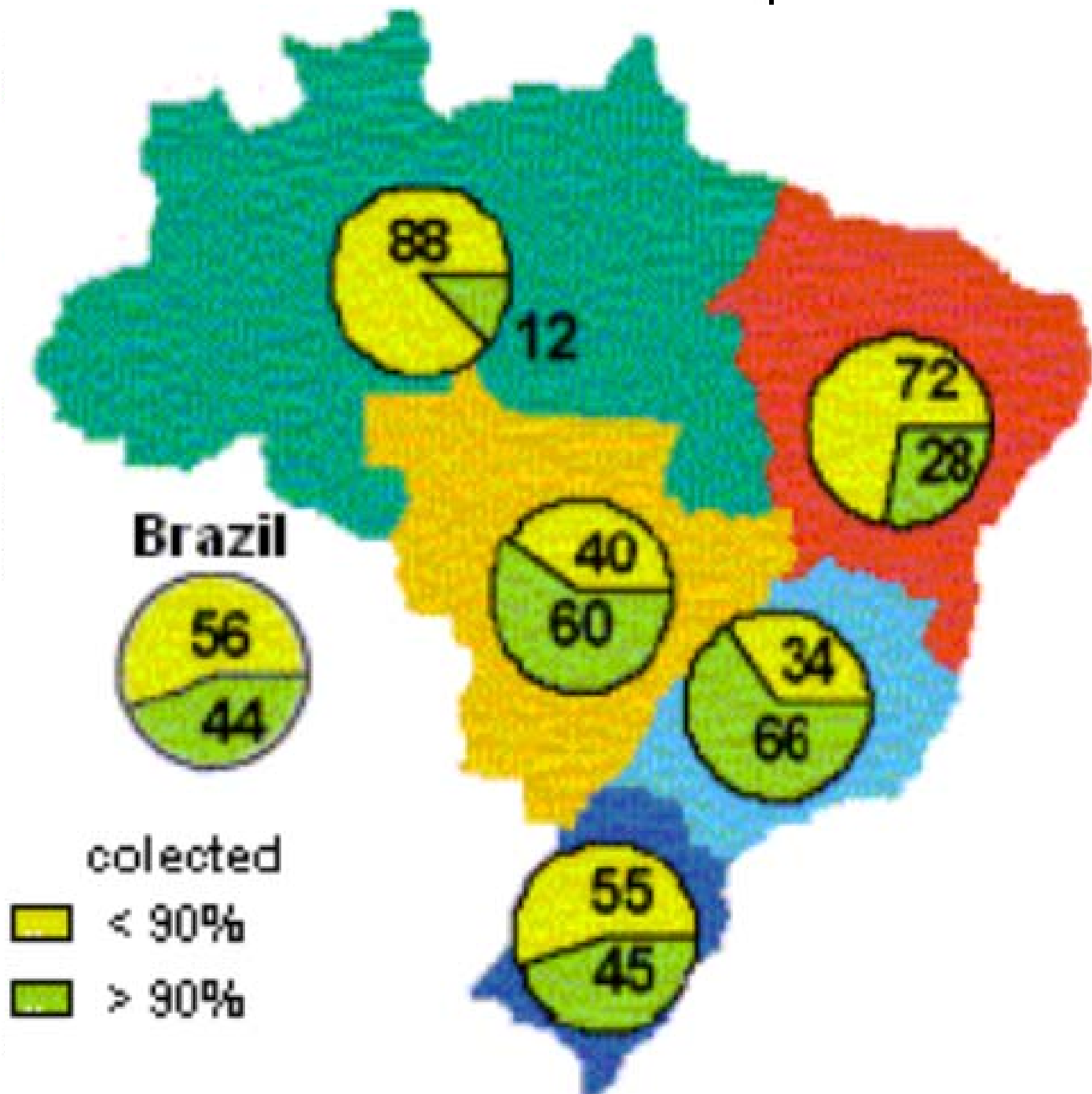


Table 1. Sanitary landfills operated by the private sector in Brazil.

Owner	Municipality	State	Medium amount of waste landfilled (t/d)	Year of start
ANACONDA	Santa Isabel	SP	850	2002
CORPUS	Indaiatuba	SP	140	2002
EPPO	Itú	SP	100	2001
ESSENCIS	Caieiras	SP	5.000	2003

Owner	Municipality	State	Medium amount of waste landfilled (t/d)	Year of start
ANACONDA	Santa Isabel	SP	850	2002
CORPUS	Indaiatuba	SP	140	2002
EPPO	Itú	SP	100	2001
ESSENCIS	Caieiras	SP	5.000	2003
ESTRE	Guarulhos	SP	2.000	2004
ESTRE	Itapevi	SP	800	2005

<sup>1</sup> Source: National Network of Sanitation Data (RENIS) <http://www.sanis.gov.br/#>



## NEWS in the report

### Synthesis of CDM projects on biogas recovery in Brazilian Landfills

Name	State	Waste (t/day)	Opening	Closing	Use/Methodology
Canabrava Landfill	BA	2.800	1974	2001	Flaring/ACM0001
Vega Landfill	BA	900	1997	2010	Flaring/ACM0002
Marca Landfill	ES	1.000	2002	2017	Flaring/ACM0001
Aurá Landfill	PA	402	1990	2010	Flaring/ACM0001
Nova Gerar Landfill	RJ	2.000	2003	2023	Flaring/ACM0001
Sil Landfill	RS	n.a.	2001	2014	Flaring/ACM0001v3
Lages Wood Waste	SC	746	2005	2015	Burning Biomass/AMSIII E
Anaconda Landfill	SP	419	2000	n.a.	Flaring/ACM0001v3
Bandeirantes Landfill	SP	7.500	1979	2006	20MWe/ACM0001
Caieiras Landfill	SP	2.000	2002	2020	Flaring/ACM0001
Embralixo/Araúna Landfill	SP	148	1990	2013	Flaring/ACM0001
Estre/Itapevi Landfill	SP	900	2001	2014	Flaring/ACM0001v3
Estre/Paulínia Landfill	SP	1.637	2000	2010	Flaring/ACM0001v2
Estre/Terrestre Landfill	SP	n.a.	2003.	2023	Flaring/ACM0001v3
Lara Landfill	SP	566	1987	2014	Flaring/ACM0001
Onyx Sasa Landfill	SP	493	1996	n.a.	Leachate Evaporating/AM0011
Quitaúna Landfill	SP	1.000	2007	2014	Flaring/ACM0001v3
São João Landfill	SP	5.479	n.a.	n.a.	20MWe/ACM0001
18 CDM projects	BR	27.990			

Source: [www.mct.gov.br/clima](http://www.mct.gov.br/clima) (CDM projects)

# NEWS in the report

## Synthesis of CDM projects on biogas recovery in Brazilian farms

Name	State	(Pigs)	MDL project		Use/ MDL Methodology
			Opening	Closing	
Becker farm	MG	n.a	2003	2010	Flaring/AM0016
Farms (8 units)	MG	14.550	2005	2015	Flaring/AM0016v2
Farms (4 units)	BA	15.550	2005	2015	Flaring/AM0016v2
Farms (10 units)	PR	32.530	2005	2015	Flaring/AM0016v2
	RS				
Sadia Associated Farms (2 units)	PR	44.850	2004	2014	Flaring/AM0016
	SC				
Farms (15 units)	PR	51.491	2005	2015	Flaring/AM0016v2
	RS				
	SC				
Farms (10 units)	ES	61.140	2005	2015	Flaring/AM0016v2
	MG				
	SP				
Farms (14 units)	MG	62.700	2005	2015	Flaring/AM0016
	GO				
Farms (49 units)	ES	78.777	2005	2015	Flaring/AM0016v2
	MT				
	MS				
	MG				
Farms (24 units)	PR	88.580	2005	2015	Flaring/AM0016v2
	SC				
	RS				
Farms (24 units)	MG	90.270	2005	2015	Flaring/AM0016v2
	GO				
	MS				
	MT				
Farms (22 units)	BA	93.009	2005	2015	Flaring/AM0016v2

Source: [www.mct.gov.br/clima](http://www.mct.gov.br/clima) (CDM projects)

Federal Law 9.386/97;  
Federal Law 9.401/96 and its  
State of São Paulo Law 11.300/06.

Technical Information

The Ministry of Cities is conducting an assessment for LFG to energy projects in the following municipalities<sup>8</sup>:

Gravataí RS; Porto Alegre RS; Passo Fundo RS; Florianópolis SC; Curitiba PR;  
Londrina PR; Maringá PR; Goiânia GO; Distrito Federal DF; Campo Grande MS;  
Americana SP; Santos SP; Guarulhos SP; Santo André SP; Belo Horizonte MG;  
Nova Iguaçu RJ; Duque de Caxias RJ; São Gonçalo RJ; Mesquita RJ; Niterói RJ;  
Recife PE; Olinda PE; Maceió AL; São Luís MA; Caucaia CE; Laura de Freitas  
BA; Camaçari BA; Manaus AM; Fortaleza CE; Belém PA

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Recife PE; Olinda PE; Maceió AL; São Luís MA; Caucaia CE; Laura de Freitas  
BA; Camaçari BA; Manaus AM; Fortaleza CE; Belém PA.



8 In Portuguese:  
<http://www.cities.gov.br/brasil/comunicacao/assessoria/assessoria%20legal%201991%20-%20Fed%209386.pdf>  
<http://www.cities.gov.br/brasil/comunicacao/assessoria/assessoria%20legal%201996%20-%20Fed%209401.pdf>  
<http://www.abo.org.br/legisla/legislacao/legislacao%20-%20SP%20-%2011300%20-%201906>  
Source: Ministry of Cities, 2008



Also, a software to study alternatives of biogas recovery and utilization was developed in partnership between CETESB, MMA-SP and Ministry of Science and Technology; the software "Biogas, generation and energy use", is an open source, with two versions: one to landfill and other to wastewater and rural waste. This financial software makes a draft project with investment cost and net of Carbon Credit, cost of generated energy and more.

Some projects of Clean Development Mechanism in landfills include electric generation. Until 2005, one with 20MW is installed.

Breweries are converting boilers that burn natural gas or oil to burn also biogas, with payback of conversion in 4 months.

Farms are generating electricity with biogas (50 to 200kW), with payback of 10 months.

A barrier to be considered is the monopoly on gas pipeline transport and trade. Also the transport in bottles is controlled.

(LAW 10730/03), WITH MINIMUM GENERATION OF 1,000 MW OF ELECTRICITY FROM RENEWABLES (plus other 2,000 MW from wind and small hydro)

The energy sector's reformulation process, conceived at federal level, has accorded special status to renewable energy sources, through the Law 10438/02 that created the Incentive Program for Alternative Electric Generation Sources (PROINFA – *Programa de Incentivo a Fontes Alternativas*). Such program provides incentives to wind, small hydro and biomass thermoelectric plants, to be connected to the national grid. Producers can be either independent or even those with the conditionment of contract of no more than 25% of

- ✧ [http://www.bancoreal.com.br/campanha/campanha\\_2005/nao/nao\\_inf\\_credito.htm](http://www.bancoreal.com.br/campanha/campanha_2005/nao/nao_inf_credito.htm)
- ✧ <http://www.carbonBrasil.com/home.asp?id=ma-2>
- ✧ <http://www.bndf.com.br/index.asp>
- ✧ [http://www.bndf.com.br/2004/nao/nao\\_inf\\_2/](http://www.bndf.com.br/2004/nao/nao_inf_2/)

annual gas planning and without preference over an independent producer. Contracting is upon public bidding, taking into account environmental permits. Equipment suppliers are allowed to join in, if their supplies are at least 50% national. Contracted capacity will be equally distributed amongst all energy sources and electricity purchasing price will have as a lower limit 30% of national final tariff. After the attainment of the targeted capacity of 3,300 MW until 2004, the second phase of PROINFA aims at achieving share of 10% of alternative renewable sources for electricity production in the next 20 years. The 15 years guaranteed electricity purchasing contract with ELETCOBRAS (the federal electricity utility) will have the price based upon the weighted average cost of generation from natural gas, thermoelectric plants and hydro plants above 30 MW. Price paid for energy will be equally distributed to final consumers. To compensate the difference between the contracted and actual generation of firm and flexible producers will be granted with

Current international cooperation in Brazil include the agreement with the Japanese Government to develop studies and evaluation of biogas potential (US\$979.300,00) and the agreement with UNDP to develop a new edition of National Inventory of GHG from waste management and a network related (US\$100.000,00).

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#### References and Sources

Quoted in the text. Not the full reference is given.

<sup>10</sup> Goldenberg, Celso and Lora, "How adequate policies can push renewables," *Energy Policy* 31 (2003) 101-104.

ANNEX 1: Key stakeholders in the solid waste disposal sector

- Ministry of Cities (MCidades) [www.cidades.gov.br](http://www.cidades.gov.br)
- Ministry of Environment (MMA) [www.mma.gov.br](http://www.mma.gov.br)
  - o National Fund of Environment (FNMA)  
[www.mma.gov.br/port/fnma/index.cfm](http://www.mma.gov.br/port/fnma/index.cfm)
- Ministry of Science and Technology [www.mct.gov.br/clima](http://www.mct.gov.br/clima)
  - o Interministerial Commission of Global Climate Change  
[www.mct.gov.br/clima/cimgc/default.htm](http://www.mct.gov.br/clima/cimgc/default.htm)
- National Statistics Foundation [www.ibfe.gov.br](http://www.ibfe.gov.br)
- National Bank of Economic and Social Development (BNDES)  
<http://www.bndes.gov.br/empresa/default.asp>

<http://www.pf.gov.br/assessoria/assessoria/assessoria.html>

# Annex 1

## Ministry of Cities's Synthesis of some Brazilian landfills

Name/ State	Landfills									
	Name or the unit	Municipality	Amount of waste						Trees and grass	other
			Total	Dom+Pub	Medical	Industrial	Construction			
<b>Alagoinhas/BA</b>	Sanitary Landfill	Alagoinhas/BA		24.616,6						
<b>Anápolis/GO</b>	Landfill	Anápolis/GO	60.936,9	60.049,2	887,7					
<b>Aparecida de Goiânia/GO</b>	Sanitary Landfill	Aparecida de Goiânia/GO	84.462,0	75.120,0			9.342,0			
<b>Aracaju/SE</b>	Open dump	Aracaju/SE	235.328,3	137.654,9			100.984,8	759,7		
<b>Aracaju/SE</b>	Small Sanitary Landfill	Aracaju/SE	1.189,2		1.189,2					
<b>Aracruz/ES</b>	AMBITEC	Aracruz/ES	60.550,0	22.500,0	50,0		30.000,0	8.000,0		
<b>Araçuaí/MG</b>	Landfill	Araçuaí/MG	2.210,0							
<b>Araguaína/TO</b>	Controlled Landfill	Araguaína/TO	25.819,0	25.312,6	506,5					
<b>Araguaína/TO</b>	Controlled Landfill	Araguaína/TO	186.336,0				124.244,0	32.000,0		30.112,0
<b>Arapiraca/AL</b>	Sanitary Landfill	Arapiraca/AL	64.980,0	64.480,0	180,0					
<b>Arcos/MG</b>	Landfill Amâncio Alves	Arcos/MG	4.300,0	3.500,0				500,0		300,0
<b>Arcos/MG</b>	Landfill of inerts	Arcos/MG	9.600,0				9.600,0			

## Annex 2

### Ministry of Cities's Synthesis of some Brazilian landfills

Name/State	Name of landfill	Type, according municipality	municipality responsible	Operator	Start of operation	Total of waste in place	Waste from other municipalities
						ton	
<b>Alagoinhas/BA</b>	Sanitary Landfill	Sanitary Landfill	the same	Municipality	2000		no
<b>Anápolis/GO</b>	Landfill	Controlled Landfill	the same	Private company	1999	60.936,9	no
<b>Aparecida of Goiânia/GO</b>	Sanitary Landfill	Open Dump	the same	Municipality	2002	84.462,0	no
<b>Aracaju/SE</b>	Open Dump	Controlled Landfill	the same	Municipality	1986	235.328,3	no
<b>Aracaju/SE</b>	Vala séptica	Sanitary small scale technology of RSS	the same	Municipality		1.189,2	no
<b>Aracruz/ES</b>	AMBITEC	Sanitary Landfill	the same	Private company	1999	60.550,0	no
<b>Araçuaí/MG</b>	Landfill	Controlled Landfill	the same	Municipality	2003	2.210,0	no
<b>Araguaína/TO</b>	Controlled Landfill	Controlled Landfill	the same	Private company	1998	25.819,0	no
<b>Araguaína/TO</b>	Controlled Landfill	other	the same	Municipality	2003	186.336,0	no
<b>Araguari/MG</b>	Controlled Landfill	Sanitary Landfill	the same	Private company	2001		no
<b>Araguari/MG</b>	Incinerator	Unit of treatment incineration	the same	Private company	2001		no
<b>Arapiraca/AL</b>	Sanitary Landfill	Sanitary Landfill	the same	Municipality	1997	64.980,0	no
<b>Araraquara/SP</b>	Controlled Landfill	Controlled Landfill	the same	Private company	1975		Yes
<b>Araraquara/SP</b>	Bolsão	other	the same	Private company	2003		
<b>Araraquara/SP</b>	Incinerator	Unit of treatment incineration	the same	Private company	1990		Yes



# Annex 3

## Ministry of Cities's Synthesis of some Brazilian landfills

Name/State	Name of the landfill	Characteristics															
		Environmental Licence	Limits	Office	Impermeabilization	Cover of waste	Gas drain	Gas recovery	Leachate recirculation	Leachate drain	Internal Leachate Treatment	External Leachate Treatment	Security	Environmental Monitoring	Waste burning	Animals present (exc. birds)	People living in site
Alagoinhas/BA	Sanitary Landfill	Not licenced	Yes	Yes	Yes		Yes		No	Yes	Yes	No	Yes	Yes	No	Yes	10
Arápolis/GO	Landfill	Not licenced	Yes	No	Yes	Daily	Yes	No	No	Yes	No	No	Yes	No	No	No	No
Aparecida de Goiânia/GO	Sanitary Landfill	Operation licence	Yes	Yes	Yes	Weekly	Yes	No	No	Yes	Yes	No	Yes	No	No	No	No
Aracaju/SE	Open dump	Not licenced	Yes	Yes	Yes	Daily	No	No	No	No	No	No	Yes	No	No	Yes	No
Aracruz/ES	AMBITEC	Operation licence	Yes	Yes	Yes	Daily	Yes	No	Yes	Yes	No	No	Yes	Yes	No	No	No
Araguaína/MT	Landfill	Not licenced	Yes	Yes	No	Daily	No	No	No	No	No	No	Yes	No	No	No	No
Araguaína/TO	Controlled Landfill	Operation licence	Yes	Yes	No	Daily	Yes	No	No	No	No	No	Yes	Yes	No	No	No
Araguari/MT	Controlled Landfill	Operation licence	Yes	Yes	No	Weekly	No	No	No	No	No	No	Yes	Yes	Yes	No	No
Arapiraca/AL	Sanitary Landfill	Operation licence	Yes	Yes	Yes	Weekly	Yes	No	No	Yes	No	No	No	No	No	Yes	
Araraquara/SP	Controlled Landfill		Yes	Yes	No	Daily	Yes	No	Yes	Yes	No	No	Yes	No	No	No	No
Arcos/MT	Old Open dump																
Arcos/MT	Landfill Amâncio Alves	Operation licence	Yes	Yes	Yes	Daily		No		Yes	Yes	No	Yes	Yes	No	No	No
Barbacena/MT	Controlled Landfill	Not licenced	Yes	Yes	No	Daily	No	No	No	No	No	No	Yes	No	No	No	No
Barra do Piraí/RJ	Open dump Municipal	Not licenced	No	No	No		No	No	No	No	No	No	No	No	No	Yes	No
Bauru/SP	Sanitary Landfill de Bauru	Operation licence	Yes	Yes	Yes	Daily	Yes	No	Yes	Yes	No	No	Yes	Yes	No	No	No
Belém/PA	Sanitary Landfill do Aurá	Operation licence	Yes	Yes	Yes	Daily	Yes	No	Yes	Yes	No	No	Yes	Yes	No	No	No
Belmonte/BA	Open dump	Operation licence	Yes	No	No		No	No	No	No	No	No	No	No	Yes	Yes	No

# Annex 4

## NEWS in the report

### Ministry of Environment's Synthesis of some Brazilian landfills

Municipalities included in 2001's Ministry of Environment research

City	Population	Situation	Environmental Licence	Operation	wells	Leachate flow	Area	Waste (t/d)
Belém	1.280.614	Sanitary Landfill	Preliminar	Private		0,2 l/s summer 1 to 2 l/s winter	1.370.000	
Natal	712.317	Controlled Landfill	Operation	Mixed	5		300.000	1.541,00
Jaboatão Dos Guararapes	581.556	Controlled Landfill		Municipal	16		5 620.000	2.800,00
Olinda	367.902	Controlled Landfill	Preliminar	Private				478,20
Recife	1.422.905							
Salvador	2.443.107	Sanitary Landfill	Operation	Private	50		8 2.500.000	3.306,00
Belo Horizonte	2.238.526	Sanitary Landfill	Operation	Municipal			6 1.440.000	4.500,00
Betim	306.675	Sanitary Landfill	Operation	Municipal	24	0,033	59.600	160,00
Contagem	538.017	Sanitary Landfill	Operation	Municipal	24	0,139	585.000	450,00
Ribeirão Das Neves	246.846	Open Dump	Without	Municipal	3	2,95	100.000	200,00
Serra	321.181	Sanitary Landfill	Operation	Private	28	2,95	155.025	240,00
Vitória (Cariacica, Vitória)	292.304	Sanitary Landfill	Operation	Private	8	0,108 dry 0,208 wet season	1.172.000	715,00
Belford Roxo	434.474	Open Dump	Without	Municipal	0			304,00
Niterói	459.451	Controlled Landfill	Preliminar	Municipal	34	0,416	200.000	600,00
Rio De Janeiro	5.857.904	Sanitary Landfill	Preliminar	Private	236	7	1.300.000	7.000,00
Carapicuíba	344.596	Open Dump	Without	Municipal	0	0,31	106.420	
Diadema	357.064							293,00
Embu	207.663	Sanitary Landfill	Without	Municipal	4	0,231	45.000	140,00
Itaquaquecetuba	272.942	Sanitary Landfill	Operation	Private	30	2	128.000	1.000,00
Jandira	91.807							-
Osasco	652.593	Sanitary Landfill	Without	Private	101	4	300.000	590,00
*Rio Grande Da Serra (Mauá)	37.091							16,60
São Bernardo Do Campo	703.177							
São Paulo B	10.434.252	Sanitary Landfill	Operation	Private	400	12	1.350.000	7.000,00
São Paulo Sj	10.434.252	Sanitary Landfill	Operation	Private	125	15	800.000	7.000,00
Guarujá	264.812	Sanitary Landfill	Operation	Private	70	0,3	240.000	270,00
Santos	417.983	Controlled Landfill	Operation	Municipal	123		75.000	600,00
São Vicente	303.551	Open Dump	Without	Municipal	19	2,95	47.268	240,00
Americana	182.593	Sanitary Landfill	Without	Municipal	20		160.000	157,00
Campinas	969.396	Controlled Landfill	Operation	Municipal	100	2	800.000	850,00
Paulínia	51.326	Sanitary Landfill	Operation	Private	59		705.000	2.300,00

## Annex 5 – Text in Portuguese

### NEWS in the report

From Ministry of Environment research –Anex IV – Illustrated technical reports of selected landfills

#### ANEXO VI –RELATÓRIOS DAS VISITAS TÉCNICAS REALIZADAS

##### Relatório de Visita Técnica – Gravataí

A cidade de Porto Alegre gera ao redor de 1.200 t/d de lixo, onde cerca de 400 t são destinadas ao aterro municipal de Porto Alegre e o restante vai para o aterro de Gravataí. Porto Alegre possui uma Usina de compostagem e diversos galpões de reciclagem que são fruto do bem estruturado programa de coleta seletiva existente no município.

No dia 17 de julho de 2002, foi realizada a visita ao aterro de Santa Tecla, no município de Gravataí. O aterro recebe o lixo de Gravataí (150 t/d), Cachoeirinha (70 t/d), Esteio (50 t/d) e principalmente de Porto Alegre (800 t/d), que formam um consórcio para a disposição dos resíduos.

**Foto 1.** Área lateral do aterro de Gravataí.



**Foto 2.** Visão das células do Aterro Santa Tecla, em Gravataí.

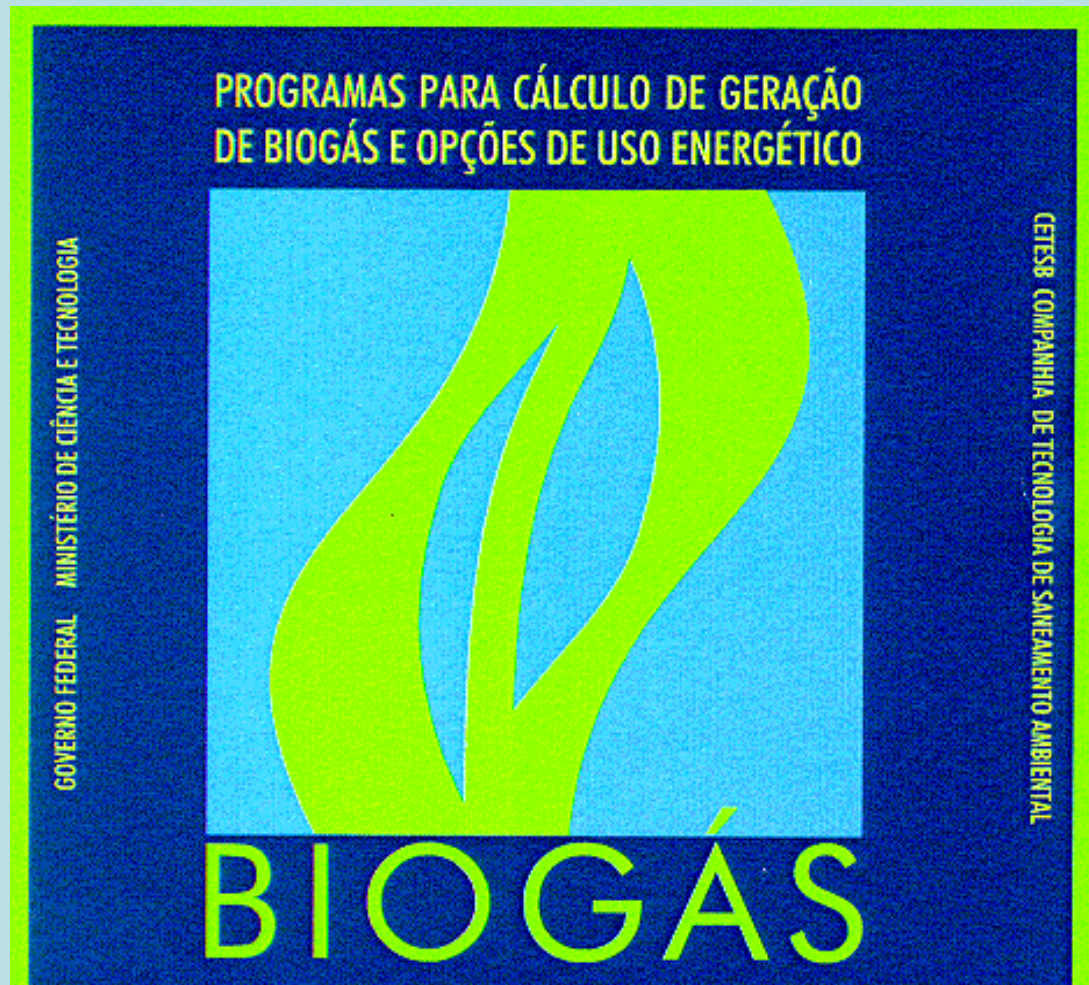


O Consórcio começou a operar em julho de 1998, iniciando a remediação do “lixão” que existiu por um período de 10 a 15 anos. No início, a previsão para o aterro era de 7 anos, quando Porto Alegre depositava no convênio aproximadamente 250 t/d. Atualmente, com 1.360.590 habitantes, Porto Alegre envia para o aterro ao redor de 800 t/dia, das 1.100 t/dia recebidas no local. Essa elevação na quantidade enviada pela cidade reduziu o tempo de funcionamento do aterro, que agora é de aproximadamente 1 ano.

## Extra

Open Source Software to estimate methane emissions and costs to energetic use in landfills, wastewater treatment and farms.

Until this moment only in Portuguese.





**Thank you!**

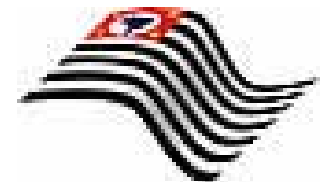
joaoa@cetesbnet.sp.gov.br

josilenef@cetesbnet.sp.gov.br

55 11 31333653



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GUIDANDO DE GENTE