

Picture credits: picture on the right bottom: Fukuyama Recycle Power Plant, Hiroshima, Japan, with kind permission of JFE Engineering Corporation.

Waste to Energy

The Worldwide Market for Waste Incineration Plants 2010 / 2011

Extract

Cologne / Oberhausen, April 2010

ecoprog / Fraunhofer UMSICHT

The world market for waste incineration plants

The market leaders present the world's largest survey and data collection of the growth market for thermal waste recovery – in the third edition already.

Waste incineration is still on the rise throughout the world, despite the economic crisis. Over the past ten years, the global capacities have almost doubled and increased from 180 to 350 million annual tons. One can expect a further growth up to 420 million annual tons in the coming five years. Worldwide, new plants are primarily constructed in metropolitan areas, due to the increasing shortage of land for landfill sites. The densely populated areas are not able to cope with the steadily growing amounts of waste anymore and focus on industrial waste incineration more and more.

ecoprog and Fraunhofer UMSICHT analysed the worldwide market for waste incineration plants in detail, on the basis of the previous study which was published in 2008. Once again, we involved sub-contractors and waste management industry insiders in the world's most important markets, such as Eastern Europe, North America, Japan, China and South Korea.

Based on in-depth surveys and our market knowledge, we offer an up-to-date analysis of numbers, facts, evaluations and trends of the international waste incineration operator and plant market. This study is of interest for disposal companies, suppliers, operators, associations, research institutes and consultants.

The study “The World Market for Waste Incineration Plants” 2010/2011 includes:

- A detailed presentation of pros and cons, technology and costs of waste incineration, including all the important political, economical, managerial and technical trends.
- A concrete description of the current and future market volumes by countries, up to and including 2014, based on a transparent and comprehensible methodology.
- A project list with new construction, extension and renewal projects, of which more than 160 are under construction, almost 40 have been approved and over 120 are being planned.
- A presentation of around 1,000 incineration plants worldwide, including essential technical data and contact addresses. This does also include the description of more than 2,400 incineration lines with information on capacities, manufacturers and commissionings.
- An analysis and description of the world's most important operators and plant manufacturers, including market shares.

The study is available in **German and English from 3,900,- euros plus VAT.**

Contact:

Mark Döing

ecoprog GmbH

Tel. +49 221 788 03 88-0

Fax +49 221 788 03 88-10

m.doeing@ecoprog.com

Contents

Preface	11
Management Summary	13
Part I: Background	17
1 Scope	19
1.1 Distinction by type of fuel or waste	19
1.2 Co- and mono-incinerators	20
1.3 Geographic scope	22
2 Systems engineering	25
2.1 Delivery and processing of the fuel	25
2.2 Furnace	25
2.3 Generation of energy	29
2.4 Flue gas cleaning	30
3 Costs and revenues of a waste incineration plant	31
3.1 Investment costs	32
3.2 Operating costs	33
3.3 Revenues	35
4 Underlying conditions/market factors	39
4.1 Shortage of land	39
4.2 Environmental reasons for limiting the use of landfill sites	40
4.3 Energetic use	43
4.4 Environmental critique of waste incineration	44
4.5 Recycling or incineration?	46
4.6 Mechanical-biological plants: Competition and clients	47
Part II: Market and competition	49
5 Current market development	51
5.1 German market slumps	51
5.2 Europe hopes for Great Britain	53
5.3 China is about to become the top national market	54
5.4 Waste gasification experiences a small renaissance	56

6	Plants and capacities worldwide	61
7	Market volumes worldwide, forecast 2010-2014	67
8	Operators worldwide	81
9	Plant manufacturers worldwide, market shares	85
10	National markets	97
	Belgium	97
	Brazil	104
	Bulgaria	106
	China	107
	Denmark	157
	Germany	169
	Estonia	208
	Finland	210
	France	214
	Greece	253
	India	255
	Ireland	258
	Italy	261
	Japan	280
	Canada	330
	Latvia	337
	Lithuania	338
	Luxembourg	340
	Malta	341
	Monaco	342
	Netherlands	343
	Norway	350
	Austria	358
	Poland	364
	Portugal	367
	Romania	370
	Russia	371
	Sweden	377
	Switzerland	389
	Singapore	401
	Slovakia	404
	Slovenia	406
	Spain	407
	South Korea	412
	Taiwan	423
	Thailand	431
	Czech Republic	434
	Ukraine	437
	Hungary	439
	United Kingdom	441
	United States of America	466
	Cyprus	504
	Other countries	505
	Methodology/data	509
	Appendix: Known projects worldwide	513
	Glossary	529
	Register of plants	531

Table of figures

Figure 1: World market regions involved in waste incineration	21
Figure 2: Example of a waste incineration plant	26
Figure 3: Example of a grate incinerator	27
Figure 4: Example of a fluidised bed combustion	28
Figure 5: Example of a pyrolysis process	29
Figure 6: Examples of investment sums for new construction projects*	31
Figure 7: Overview investment sum	33
Figure 8: Exemplary calculation of operating costs	34
Figure 9: Population density throughout the world	40
Figure 10: Waste hierarchy, here: EU Waste Framework Directive	41
Figure 11: Stages in the development of landfilling	42
Figure 12: Calorific values of selected fuels	44
Figure 13: Overview plasma gasification manufacturers	58
Figure 14: Number of plants worldwide	61
Figure 15: Waste incineration plants in operation throughout the world	62
Figure 16: Incineration capacities throughout the world	63
Figure 17: Incineration capacities per head	64
Figure 18: Incineration capacities as a proportion of municipal waste	64
Figure 19: Average plant size by country	65
Figure 20: The world market for waste incineration plants 2010-2014	67
Figure 21: Installed capacity 1999-2014 by region	68
Figure 22: Market development new construction and extension 2010-2014	69
Figure 23: Market development renewal 2010-2014	70
Figure 24: Market development maintenance 2008-2012	71
Figure 25: Development of capacity 1999-2014	71
Figure 26: Overall market volume forecasts 2010-2014 (in million EUR)	73
Figure 27: Market volume forecasts new construction 2010-2014 (in thousand t/a)	74
Figure 28: Market volume forecasts new construction 2010-2014 (in million EUR)	75
Figure 29: Market volume forecasts renewal 2010-2014 (in thousand t/a)	76
Figure 30: Market volume forecasts renewal 2010-2014 (in million EUR)	77
Figure 31: Market volume forecasts maintenance 2010-2014 (in thousand t/a)	78
Figure 32: Market volume forecasts maintenance 2010-2014 (in million EUR)	79
Figure 33: Percentage shares of manufacturers worldwide 2005-2010	85
Figure 34: Commissionings AE&E 2005-2010 by region	86
Figure 35: The concentration process at AE&E	87
Figure 36: Percentage shares of manufacturers in Europe 2005-2010	89
Figure 37: The concentration process at Martin/CNIM	90
Figure 38: The concentration process at Fisia Babcock 2003-2007	91

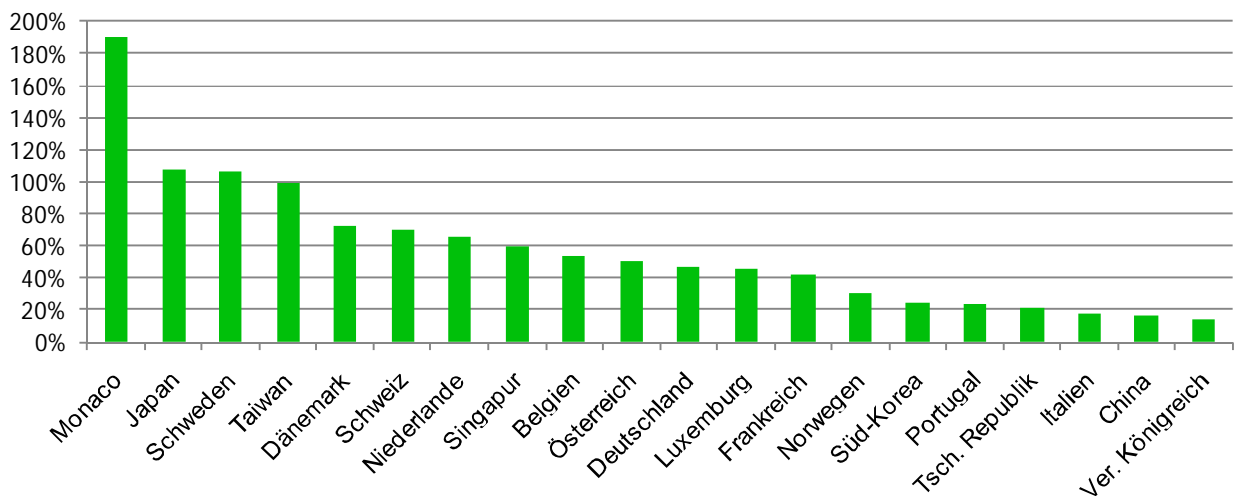
Figure 39: Percentage shares of manufacturers in Asia 2005-2010	93
Figure 40: Project outlook Belgium	97
Figure 41: Prognosis investment volume Belgium	98
Figure 42: Project outlook China	107
Figure 43: Prognosis investment volume China	113
Figure 44: Project outlook Denmark	157
Figure 45: Prognosis investment volume Denmark	158
Figure 46: Project outlook Germany	170
Figure 47: Prognosis investment volume Germany	171
Figure 48: Project outlook Estonia	209
Figure 49: Prognosis investment volume Estonia	209
Figure 50: Project outlook Finland	210
Figure 51: Prognosis investment volume Finland	211
Figure 52: Project outlook France	214
.....	
Figure 81: Project outlook Russia	371
Figure 82: Prognosis investment volume Russia	372
Figure 83: Project outlook Sweden	377
Figure 84: Prognosis investment volume Sweden	378
Figure 85: Project outlook Switzerland	389
Figure 86: Prognosis investment volume Switzerland	389
Figure 87: Prognosis investment volume Singapore	401
Figure 88: Project outlook Slovakia	404
Figure 89: Project outlook Spain	407
Figure 90: Prognosis investment volume Spain	407
Figure 91: Project outlook South Korea	412
Figure 92: Prognosis investment volume South Korea	413
Figure 93: Prognosis investment volume Taiwan	423
Figure 94: Project outlook Thailand	431
Figure 95: Prognosis investment volume Thailand	432
Figure 96: Project outlook Czech Republic	434
Figure 97: Prognosis investment volume Czech Republic	435
Figure 98: Project outlook Ukraine	437
Figure 99: Prognosis investment volume Ukraine	438
Figure 100: Project outlook United Kingdom	442
Figure 101: Prognosis investment volume United Kingdom	444
Figure 102: Project outlook USA	467
Figure 103: Prognosis investment volume USA	469

Due to their large populations, countries such as the USA or China have very large incineration capacities by international comparison – despite the fact that waste incineration has not played a major role so far in these countries. Once again, China’s development is remarkable: in 2007, the total capacity amounted to about 16 million tons. In the meantime, the amount increased up to 24 million tons. With this increase, China did even overtake Germany, although the German capacities grew considerably as well – from 18 million tons in 2007 up to 21 million tons in 2010.

In terms of incineration capacities per head, the “typical” countries, where waste incineration has a strong tradition and where the technology was essentially developed, still prevail. These countries are Belgium, Denmark, Germany, France and the Netherlands in Central Europe as well as Japan which is an independent Asian market.

Figure 18: Incineration capacities as a proportion of municipal waste

Anteil an Siedlungsabfall



Quelle: ecoprolog

The incineration capacities are larger than the total amount of municipal waste in Monaco, Japan and Sweden. In Japan, this is determined by its historical development. Here, waste incineration had been widely used even before an environmentally motivated paradigm shift towards an enforced material recovery of waste took place. A further reason is the local disposal self-sufficiency which says that the waste should preferably be disposed at the location where it has emerged. This principal results in far too large capacities in many places – as a technical minimum size is the prerequisite for a more or less functioning and independent incineration process.

A part of the Japanese incineration capacity will be shut down in the future as the recovery quota will continue to increase.

A general reason for the case that the capacities are larger than the volume of municipal waste are the additional amounts of commercial waste that are also incinerated. Sweden and Monaco additionally incinerate waste from neighbouring countries.

Finland

Population (million people)	5.3	Number of waste incineration plants	3
Municipal waste (1,000 t)	2,675	Incineration capacity (1,000 t/a)	304
Incineration rate (%)	11.6	Average age of incineration units (a)	8

In terms of waste incineration, Finland still has a lot of catching up to do. In 2007, the year with the latest statistics, about 53 per cent of the municipal waste was sent to landfill without prior treatment. Today, one can assume a slight decrease in the share of landfilling, however, no official statistics are available. The commissioning of the waste incineration plant in Kotka in 2008 has increased the waste incineration capacities in Finland up to 300,000 annual tons, which is about eleven per cent of the total amount of municipal waste.

Figure 50: Prognosis investment volume Finland

Million euros	2010	2011	2012	2013	2014	Sum
New construction/extension	0	0	65	75	160	300
Renewal/replacement	0	0	0	0	0	0
Maintenance	4	4	4	5	7	24

Additionally, efforts to increase material recovery were enhanced. However, the aim to reduce the amount of biodegradable municipal waste by 50 per cent in 2009 in comparison to the amount of 1995 was not achieved. Consequently, there is still need for action. The national strategy for the achievement of the Landfill Directive for the period 2006-2016 states the necessity to install a further 600,000 annual tons of treatment capacity by 2009 and 900,000 tons per year by 2016.

Currently, a waste incineration plant is under construction in Mustasaari. The plant is supposed to go on line in 2013 and its capacity shall amount to 150,000 annual tons. Building licences have been granted for two further projects that are supposed to be commissioned in 2012 and 2014.

Furthermore, there are various other projects that have not obtained approvals yet. Some of them have been discussed for years already. Recently, the project in Hämeenkyrö was questioned,

Figure 51: Project outlook Finland

Plant	Type of investment	Capacity (t/a)	Start	Status
Mustasaari	New construction	150,000	2013	under construction
Oulu	New construction	130,000	2012	approved
Vantaa	New construction	320,000	2014	approved
Hämeenkyrö	New construction	200,000	n/a	planned
Jyväskylä RDF	New construction	55,000	n/a	planned
Lapinlahti RDF	New construction	17,000	n/a	planned
Lohja	New construction	445,000	n/a	planned
Pori RDF	New construction	150,000	n/a	planned
Riihimäki II	New construction	160,000	n/a	planned

Canada

Population (million people)	33.6	Number of waste incineration plants	8
Municipal waste (1,000 t)	13,375	Incineration capacity (1,000 t/a)	817
Incineration rate (%)	n/a	Average age of incineration units (a)	24.8

Over the past years, waste incineration has been discussed more intensely in Canada. The last waste incineration plant went on line more than 20 years ago – now, there are concrete projects for constructing new plants. However, these advance only slowly. Only one project has been officially approved yet.

Plasco Energy is supposed to build a plant in the province of Alberta where municipal waste shall be treated with plasma gasification technology. Originally, the construction should have started in summer 2009 already, however, it has not started yet due to remaining financing issues.

Figure 1: Prognosis investment volume Canada

Million euros	2010	2011	2012	2013	2014	Sum
New construction/extension	0	32	0	100	100	232
Renewal/replacement	3	3	3	23	20	52
Maintenance	10	10	11	11	14	56

Plans for the construction of a waste incineration plant in Clarington are well advanced. The plant with a capacity of 200,000 annual tons is supposed to incinerate the waste from York and Durham counties. However, a building licence has not been granted yet. An environmental impact assessment is currently under progress. In the case of approval, US-american company Covanta Energy Corp. shall construct and operate the plant.

A further plant is being discussed in Metro Vancouver. The pressing reason for the construction plans is the fact that the Cache Creek landfill will reach its maximum capacity in 2010. In order to solve the problem of disposal, a plant with a capacity of 700,000 annual tons shall be built. However, there was a setback lately, as a 42 hectare extension of the landfill was approved in January 2010. As a result, it will be possible to operate the landfill for another 20 years. Consequently, no urgent disposal problems can be expected and it is questionable whether the plant will be built under these circumstances.

Figure 2: Project outlook Canada

Plant	Type of investment	Capacity (t/a)	Start	Status
Alberta	New construction	64,000	2010	approved
Clarington	New construction	200,000	2013	planned
Dufferin County	New construction	24,000	2012	planned
Edmonton	New construction	n/a	n/a	discussed
Gold River RDF	New construction	n/a	n/a	discussed
Norfolk County	New construction	n/a	n/a	discussed

Changshu

DYNAGREEN Holding Group Co Ltd.(Changzhou)
Wujin District Niutang Town Qingyun Villiage
- Changzhou

Status: active
Capacity (t/a): 219,000
Real throughput (t/a): 163,800
Electric power production (MWh/a): 28,120

Remarks: Operation Mode: BOO (30years), Investment sum 265 million Yuan, electricity price 0.5 Yuan per kWh

Line 1

Start of operation: 2006
Capacity (t/h): 13.75
Incineration mode: Feeder grate
Flue gas cleaning: Dry Scrubbing / Fabric Filter / Active Carbon
Manufacturer furnace: Keppel Seghers

Line 2

Start of operation: 2006
Capacity (t/h): 13.75
Incineration mode: Feeder grate
Flue gas cleaning: Dry Scrubbing / Fabric Filter / Active Carbon
Manufacturer furnace: Keppel Seghers

Changzhou 1

China EVERBRIGHT INTERNATIONAL Ltd.
Changzhou

Status: active
Capacity (t/a): 365,000

Remarks: Investor is Golen State Group. BOT. The plant receives a government subsidy of 97 Yuan per tonne and receives 0.5 Yuan per kWh.

Line 1

Capacity (t/h): 16.70
Manufacturer furnace: Keppel Seghers

Line 2

Capacity (t/h): 16.70
Manufacturer furnace: Keppel Seghers

Changzhou 2

Changzhou 2
Changzhou Xinbei

Status: planned

Remarks: Swedish EcoEnergy Scandinavia AB has signed a memorandum of understanding with Chinese

Changzhou Xinbei Government and Jiangsu Guoyu Electric Co to build a waste-to-energy plant in the Changzhou Xinbei district. As a next step, EcoEnergy will conduct an on-site feasibility study for the project.

Chengdu 1

Chengdu Luodai
Chengdu Luodai

Status: active
Capacity (t/a): 440,000
Electric power production (MWh/a): 130,000

Remarks: Investor is Shanghai Environment Investitions. Plant will be equipped by Martin / Mitsubishi. BOT. Investment sum 525 million RMB. The plant receives a government subsidy of 71 Yuan per tonne.

Chengdu 2

Status: planned
Capacity (t/a): 576,000

Remarks: in the process of environmental appraisal,planned to build at the end of 2009

Line 1 (planned)

Start of operation: 2011
Capacity (t/h): 25.00
Manufacturer furnace: Chongqing Lueng Environment Industry Co. Ltd.

Line 2 (planned)

Start of operation: 2011
Capacity (t/h): 25.00
Manufacturer furnace: Chongqing Lueng Environment Industry Co. Ltd

Line 3 (planned)

Start of operation: 2011
Capacity (t/h): 25.00
Manufacturer furnace: Chongqing Lueng Environment Industry Co. Ltd

Chengdu 3

Chongqing Sanfeng Kawanta Environmental industry Ltd.
Chengdu Shuangliu

Status: under construction
Capacity (t/a): 657,000
Electric power production (MWh/a): 110,000

Remarks: Covanta Energy Group Inc and Chongqing Iron&Steel Group have formed a joint venture which

Allerton Quarry

Allerton Quarry

Status: discussed

Remarks: Allerton Quarry is one of three possible sites for a waste treatment facility for municipal waste (the others are in Dalton Airfield, near Thirsk and Burn Wood, near Selby). The site chosen will be announced by North Yorkshire County Council in summer 2009 after tenders have been received. Planning applications will then be submitted, and approval could be gained by as early as December of 2009.

Barry Docks

Barry Docks

Status: planned
Capacity (t/a): 80,000

Remarks: BioGen Power has applied for permission to build a new gasification waste-to-energy plant for non-hazardous waste in Barry Docks

Billingham

SITA UK
Mr. John Thistlewood
Energy from Waste Plant, Haverton Hill Road
TS23 1PY Billingham
Tel.: +44 1642 202300
Fax: +44 1642 202301

Status: active
Capacity (t/a): 390,000
Electric power production (MWh/a): 30

Remarks: Sita UK announced that a major extension at the Haverton Hill energy from waste facility in Tees Valley has been handed over by contractors A&E, to the company and has officially been opened by Sita UK. The GBP 70 million plant was completed to budget and on time, according to the company. The extension was built on behalf of Northumberland County Council to provide an additional 136,000 tons capacity bringing the total plant capacity to nearly 390,000 tons per year. The plant extension is expected to yield around 10 MW of electricity giving in total over 30 MW of power from the whole facility.

Line 1

Start of operation: 2009
Capacity (t/h): 19.00
Manufacturer furnace: Von Roll

Line 2

Start of operation: 1997
Capacity (t/h): 14.00
Incineration mode: VS-Grate, air-cooled

Flue gas cleaning: Semi Dry Scrubbing / Fabric Filter
Manufacturer furnace: Ansaldo Vølund
Manufacturer flue gas cleaning: FLS Milijo
Remarks: Planned to shut down in 2020.

Line 3

Start of operation: 1997
Capacity (t/h): 14.00
Incineration mode: VS-Grate, air-cooled
Flue gas cleaning: Semi Dry Scrubbing / Fabric Filter
Manufacturer furnace: Ansaldo Vølund
Manufacturer flue gas cleaning: FLS Milijo
Remarks: Planned to shut down in 2020.

Billingham 2

Billingham 2

Status: approved
Capacity (t/a): 256,000
Electric power production (MWh/a): 161,280

Remarks: SITA UK is moving forward with its plans to build a second energy from waste facility adjacent to its Tees Valley EFW at a cost in the region of GBP 120 million by winning planning approval for the plant.

Line 1 (approved)

Start of operation: 2012
Capacity (t/h): 16.70
Incineration mode: Moving grate

Line 2 (approved)

Start of operation: 2012
Capacity (t/h): 16.70
Incineration mode: Moving grate

Binn Farm

Binn Farm

Status: approved
Capacity (t/a): 60,000

Remarks: Sita UK has applied to the Scottish Environment Protection Agency to operate the plant. Planning permission has already been granted by Perth and Kinross Council in 2007. The firm is now applying for a pollution prevention and control permit before it can begin processing solid waste into electricity. A decision about the GBP 100 million incinerator in Perth is due to be made in November 2010. Currently, the company also considers methods such as gasification and anaerobic digestion to convert the waste into energy.

Birmingham

Veolia E. S. Birmingham Ltd.

Register of plants

Aalborg	158	Aspach-le-Haut	217
Aars	158	Astria 2	217
Acerra	263	Asturias	408
Achmer RDF	172	Auburn	471
Agawam	469	Augsburg	172
Aira	284	Augusta RDF	264
Aire-la-Ville	390	Aureade	217
Akashi	284	Aurillac	217
Aki	284	Averøy	352
Akita 2	284	Avesta	378
Ål	351	Babylon	471
Albano Laziale RDF	263	Baden-Württemberg RDF	173
Alberta	331	Baicheng	113
Ålesund	351	Bainbridge	471
Alexandria (Minnesota)	469	Baishan	114
Alexandria (Virginia)	470	Balakhani	363
Alfeld RDF	172	Bali	424
Alkmaar	344	Baltimore	472
Allerton Quarry	445	Bamberg	173
Almena	470	Bangkok Nongkhaem	432
Ama- gun	284	Bangkok On Nut, Phase I	432
Amagasaki	285	Bangkok On Nut, Phase II	432
Amagi	285	Bangkok Tha Reang	432
Ames	470	Baoding	114
Amilly	216	Baotou	114
Amotfors	378	Barcelona	408
Amsdorf RDF	172	Barry Docks	445
Amsterdam	345	Basel	390
Anan City	285	Baumholder RDF	174
Andernach RDF	172	Bazenheid	390
Anderson	471	Begles	218
Annan	113	Beijing 1	114
Anqing	113	Beijing 2	114
Ansan	413	Beijing 3	114
Antibes	216	Beijing 4	115
Antwerpen 1	98	Beijing 5	115
Anyang Pyongchon	413	Beijing 6	115
Årdal	352	Beijing 7	115
Arezzo	263	Beitou	424
Argenteuil	216	Bellegarde	218
Århus	159	Bellentre	218
Arlington	471	Bellolampo- Palermo RDF	264
Arnoldstein	359	Belo Horizonte	104
Arques	217	Bénesse Maremne	218
Arrabloy	217	Bergamo	264
Asan RDF	413	Berlin RDF	174
Askar	363	Berlin-Ruhleben	174

Order Form

Please return by fax to:

ecoprogram GmbH
+ 49 (0) 221 788 03 88 - 10

I would like to order the study “The World Market for Waste Incineration Plants”

- on paper for 3.900,- euros plus VAT
- as a PDF file for 7,800,- euros plus VAT
- Language: German English

Company

Contact person (title / first name / last name)

Position

Address (street / post code / city)

VAT identification number (only for companies within the EU, without Germany)

Other invoice number or address, if wanted

Telephone

Fax

e-mail

Date

Signature / stamp

The order is subject to the general terms of business of the ecoprogram GmbH.

ecoprogram GmbH
Unter Krahenbaeumen 6
50668 Cologne / Germany
Tel. +49 221 788 03 88-0
Fax. +49 221 788 03 88-10

Place of justification:
Local court Cologne, company number: HRB 56660
VAT ID: DE814576618