

**White goods foundation
Brown goods foundation
IT~Environment foundation
Metalektro Recycling foundation
LightRec foundation
Recycling Centre Ventilators
foundation
Removal Electrical Appliances
foundation**

**Appendix report to:
Research into complementary
waste streams for e-waste in the
Netherlands**

Witteveen+Bos Willemstraat 28

P.O. Box 3465

4800 DL Breda

telephone + 31(0)76 523 33 33

fax + 31 (0)76 514 44 42

White goods foundation
Brown goods foundation
IT-Milieu foundation
Metalektro Recycling foundation
LightRec foundation
Recycling Centre Ventilators
foundation
Removal Electrical Appliances
foundation

**Appendix report to:
Research into complementary waste
streams for e-waste in the
Netherlands**

reference VB45-1/albs/005	Project code	status final
Project manager R.J.J. Eijsbouts B. Sc	Project director A.M. Schakel B.	date 14th of April 200B

Authorisation Approved	Name A.M. Schakel B.Sc	Initials
---------------------------	---------------------------	----------

Witteveen+Bos Willemstraat 28

P.O. Box 3465

4800 DL Breda

telephone + 31(0)76 523 33 33

fax + 31 (0)76 514 44 42

The quality management system of Witteveen+Bos is certified in accordance
with ISO 9001:2000

© Witteveen+Bos
Nothing from this specification/printing may be copied and/or made public by
way of print, photocopy, microfilm or in any other way without requesting the
express permission of Witteveen+Bos Raadgevende Ingenieurs b.v. first. Nor
can any such permission be used for any other work than which it specifically
concerns

CONTENTS	page
APPENDIX I PRODUCT CATEGORIES E-WASTE, IN ACCORDANCE WITH WEEE-DIRECTIVE	2
APPENDIX II RESULTS FIELD RESEARCH AT ENVIRONMENTAL WASTE AREAS	5
APPENDIX III CONVERSION POSSESSION MEASUREMENT GFK TO E-WASTE PER PRODUCT	8
APPENDIX IV CHAIN ANALYSIS DIRECT SUPPLY RECYCLING AND CONSUMERS	10
last page	11

APPENDIX I PRODUCT CATEGORIES E-WASTE, IN ACCORDANCE WITH THE WEEE-DIRECTIVE

APPENDIX IA from the WEEE-Directive

Categories of electrical and electronic appliances to which the guideline applies

1. large household appliances;
2. small household appliances;
3. IT and telecommunication appliances;
4. consumer appliances;
5. lighting appliances;
6. electrical and electronic equipment (excluding large, non-movable industrial installations);
7. toys, equipment for sports and relaxation;
8. medical aids (except all implanted and infected products)
9. measuring and control appliances;
10. vending machines.

APPENDIX IB from the WEEE-Directive

List of products belonging to the categories in appendix I A

1. Large household appliances

- large refrigerators;
- refrigerators;
- freezers;
- other large appliances for cooling, keeping and storing food;
- washing machines;
- tumble driers;
- dishwashers;
- cookers;
- electric ovens;
- electric cooking ring;
- microwave;
- other large appliances for the preparation or other treatment of food;
- electric heating appliances;
- electric radiators;
- other large appliances for heating rooms, beds and seats;
- electric ventilators;
- air conditioners;
- other ventilation, cooker hoods and air conditioning appliances.

2. Small household appliances

- vacuum cleaners;
- carpet sweepers;
- other cleaning appliances;
- appliances for sewing, knitting and weaving and other textile treatment;
- irons and other appliances for ironing and pressing and other treatment of clothes;
- toasters;
- frying pans;
- coffee grinders, coffee makers and appliances for opening of sealing recipients or packaging;
- electric knives;

- trimmers, hair dryers, electric toothbrushes, shaving appliances, massage and other personal hygiene appliances, clocks, measuring appliances for time indication or time registration;
- weighing scales.

3. IT and telecommunication appliances

Centralized data processing:

- Main frames;
- Mini computers;
- Printing units;

Personal computer use:

- personal computers (including processor, mouse, screen and keyboard);
- laptop computers (including processor, mouse, screen and keyboard);
- notebook computers;
- notepad computers;
- printers;
- copiers;
- electrical and electronic typewriters;
- pocket and office calculators and other products and appliances for electronic storage, processing, presentation or communication;
- facsimile machines;
- telex machines;
- telephones;
- coin and card phones;
- wireless phones;
- mobile telephones;
- answering machines and other products or appliances for telecommunication of sound, images or other information.

4. Consumer appliances

- radio equipment;
- television sets;
- video cameras;
- video recorders;
- Hi-Fi recorders;
- sound amplifiers;
- musical instruments or other products or appliances for recording or playing sounds or images, including signals or other techniques for playing images and sound besides telecommunication;

5. Lighting appliances

- armatures for fluorescent lamps, except armatures in households;
- fluorescence lamps (fluorescent tubes);
- compact fluorescent lamps;
- high intensity discharge lamps, including high-pressure sodium discharge lamps and metal halogen lamps;
- low-pressure sodium lamps;
- other lighting or appliances for spreading or managing light, excluding light bulbs.

6. Electrical and electronic equipment (except large, non-moveable industrial installations)

- drills;
- saws;
- sewing machines;
- equipment for turning, milling, sanding, grinding, sawing, cutting, cutting off, drilling, making holes, punching, folding, bending or similar treatment of wood, metal or other material;
- equipment for riveting, hammering, screwing, removal of rivets, nails or screws or similar use;
- equipment for spraying, spreading, dispersing or any other treatment of liquids or gasses;
- equipment for mowing or other garden activities.

7. Toys, relaxation and sports equipment

- electrical trains and car racetracks;
- handheld consoles for videogames;
- videogames;
- bicycle-, diving-, running-, rowing computers and similar sports equipment with electrical or electronic parts;
- slot machines.

8. Medical aids (except implanted and infected products)

- radio therapeutic equipment;
- cardiac equipment;
- dialysis equipment;
- breathing equipment;
- equipment for nuclear medicine;
- laboratory equipment for in-vitro diagnostics;
- analysis equipment;
- freezers;
- equipment for fertility tests;
- other equipment for tracking, preventing, managing, treating and relief of illness; injury or handicaps.

9. Measurement and control appliances

- smoke alarms;
- heat regulators;
- thermostats;
- measuring, weighing and control devices for household or laboratory use
- other measuring and control appliances, for industrial installations (for example control panels).

10. Vending machines

- vending machines for hot drinks;
- vending machines for warm/cold bottles/cans;
- vending machines for solid food products;
- ATMs
- all vending machines for all sorts of products.

APPENDIX II RESULTS FOR FIELD RESEARCH AT ENVIRONMENTAL WASTE AREAS

Size of the random test carried out by Witteveen+Bos			
Number of environmental waste areas (collection points)		36	
Total volume service area of these environmental waste areas		4,064,497	
PRODUCT CATEGORIES E-WASTE, IN ACCORDANCE WITH THE WEEE-DIRECTIVE		% of environmental waste areas that is recycled through the NVMP and IT-Environment collection structure	Average recycling through NVMP and IT-Environment (%). Weighted in relation to the inhabitants
1a. Large household appliances (containing iron)		responsible foundation	
Washing machines	White goods	37	35
Tumble drier	White goods	37	35
Dishwashers	White goods	44	37
Cookers	White goods	45	35
Electric ovens	White goods	45	34
Electric Cooking ring	White goods	48	40
Microwave	White goods	52	39
Electric heating appliances	White goods	52	39
Electric heating appliances; old central heating boilers	White goods	28	27
Boilers, boiling water tap, electrical water heaters, hot water pump boiler	White goods	28	27
Electric radiators	White goods	31	32
Other large appliances for heating rooms, beds and seats	White goods	36	33
Electrical fans	White goods	55	40
Central ventilation fans	Recycling Centre Ventilators	55	40
total product group 1a		42	35
1b. Large household refrigeration/freezing appliances		responsible foundation	
Large refrigerators	White goods	100	99
Refrigerators	White goods	100	99
Freezers	White goods	100	99
Other large appliances for cooling, keeping and storing food	White goods	100	99
Air conditioners	White goods	100	99
Other ventilation, cooker hoods and air conditioning appliances except central ventilation	White goods	100	99
total product group 1b		100	99
2. Small household appliances		responsible foundation	
Vacuum cleaners	White goods	86	62
Carpet sweepers	White goods	85	81
Other cleaning appliances	White goods	97	96
Appliances for sewing, knitting and weaving and other textile treatment	Metalektro	97	96
Irons and other appliances for treatment of clothing	White goods	89	86
Toasters	White goods	54	51
Frying pans	White goods	47	54
Coffee grinders, coffee makers and appliances for opening of sealing recipients or packaging	White goods	93	86
Electric knives	White goods	71	61
Trimmers, hair dryers, electric toothbrushes, shaving appliances, hair dryers, electric toothbrushes, shaving appliances, massage and other personal hygiene appliances	White goods	91	82
Clocks, measuring devices for time indication or time registration	White goods	89	81
Weighing scales	White goods	86	80
total product group 2		82	76

PRODUCT CATEGORIES E-WASTE, IN ACCORDANCE WITH THE WEEE-DIRECTIVE		% of environmental waste areas that is recycled through the NVMP and IT-Environment collection structure	Average recycling through NVMP and IT-Environment (%). Weighted in relation to the inhabitants
3a. IT and telecommunication appliances	responsible foundation		
Centralized data processing:	IT Environment	81	59
Main frames	IT Environment		
Mini computers	IT Environment	78	56
Printing units	IT Environment	76	58
Printers	IT Environment	78	58
Copiers	IT Environment	71	53
Electric and electronic typewriters	IT Environment	84	65
Pocket and office calculators and other products and appliances for electronic storage, processing, presentation or communication	IT Environment	81	59
Facsimile machines	IT Environment	71	54
Telex machines	IT Environment	81	59
Telephones	IT Environment	88	72
Coin and card phones	IT Environment	88	72
Wireless telephones	IT Environment	88	71
Mobile telephones	IT Environment	81	67
Answering machines and other products or appliances for telecommunication of sound, images or other information	IT Environment	88	72
total product group 3a		81	63
3b: Personal computer use	responsible foundation		
Personal computers (including processor, mouse excluding excl. screen and keyboard)	IT Environment	62	47
Monitor	IT Environment	88	70
Laptop computers (including processor, mouse, screen and keyboard)	IT Environment	57	47
Notebook computers	IT Environment	76	53
Notepad computers	IT Environment	76	53
total product group 3b		72	54
4. Consumer appliances	responsible foundation		
Radios	Brown goods	78	79
Televisions sets	Brown goods	100	99
Video cameras	Brown goods	74	61
Video recorders	Brown goods	86	90
Hi-Fi recorders	Brown goods	79	85
Sound amplifiers	Brown goods	78	79
Musical instruments	Metalektro	86	90
And any products or appliances for recording or playing sounds or images, including signals or other techniques for playing images and sound apart from telecommunication ¹	Brown goods	83	41
total product group 4		83	78
5. Lighting appliances	responsible foundation		
Armatures for fluorescent lamps, except armatures in households	LightRec	75	60
Fluorescence lamps (fluorescent tubes)	LightRec	100	96
Compact fluorescent lamps	LightRec	100	96
High intensity discharge lamps, including high-pressure sodium discharge lamps and metal halogen lamps	LightRec	100	96
Low-pressure sodium lamps	LightRec	100	96
Other lighting or appliances for spreading or managing light, except light bulbs	LightRec	100	96
total product group 5		96	90

¹: The information regarding other products or appliances for recording or playing sound or images is relatively unreliable because only 4 locations indicated that they regularly receive these appliances

PRODUCT CATEGORIES E-WASTE, IN ACCORDANCE WITH THE WEEE-DIRECTIVE		% of environmental waste areas that is recycled through the NVMP and IT-Environment collection structure	Average recycling through NVMP and IT-Environment (%). Weighted in relation to the inhabitants
6. Electrical and electronic equipment (except large, non-moveable industrial installations)	responsible foundation		
Drills	Removal Electrical	100	99
Chain saws	Removal Electrical	100	99
Sewing machines	Removal Electrical	100	99
Equipment for turning, milling, sanding, grinding, sawing, cutting, cutting off, drilling, making holes, punching, folding, bending or similar treatment of wood, metal or other material	Removal Electrical Appliances	100	99
Equipment for riveting, hammering, screwing, removal thereof	Removal Electrical Appliances	100	99
Equipment for welding, soldering or similar use	Removal Electrical	100	99
Equipment for spraying, spreading, dispersal or any other treatment of liquids or gasses	Removal Electrical Appliances	100	99
Equipment for mowing or other garden activities	Removal Electrical	100	99
total product group 6		100	99
7. Toys, relaxation and sports equipment	responsible foundation		
Electrical trains and car racetracks	Metalektro	100	100
Handheld consoles for videogames	Metalektro	100	100
Videogames	Metalektro	100	100
Bicycle-, diving-, running-, rowing computers and similar sports equipment with electrical or electronic parts	Metalektro	100	100
Slot machines	Metalektro	100	100
total product group 7		100	100

COMBINED PRODUCT CATEGORIES E-WASTE			
% of environmental waste areas that is recycled through the NVMP and IT-Environment collection structure			
Other white and brown goods (product category 2 + product category 4)		83	
IT (product category 3a + product category 3b)		76	
Average recycling through NVMP and IT-Environment (%). Weighted in relation to the inhabitants			
Other white and brown goods (product category 2 + product category 4)		77	
IT (product category 3a + product category 3b)		57 ²	

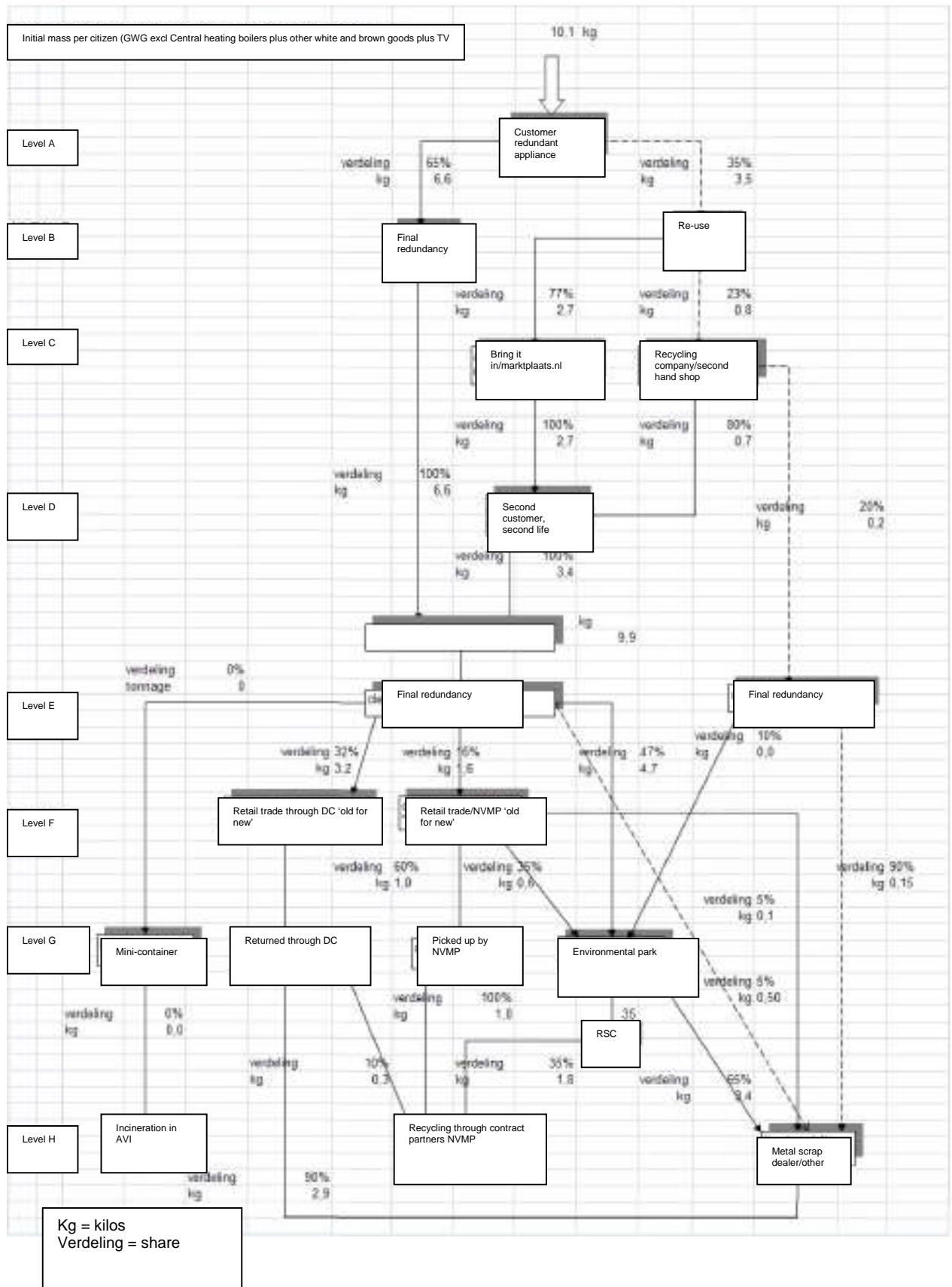
2: Average recycling IT is weighted in accordance with the average weights of the GIK questionnaire. 3a is calculated as 1/3, and 3b as 2/3.

APPENDIX III CONVERSION POSSESSION MEASUREMENT GfK TO E-WASTE PER PRODUCT

Appendix 1: conversion possession GfK to AEEA per product (final 2 April 2008)	Average weight per household	Average weight in the Netherlands (tonnage)	Average life span up to recycling	Tonnage AEEA in the Netherlands	Total per product group	AEEA per inhabitant per year (kilos)
1a. Large household appliances (containing iron)						
Washing machines	58.0	415338	14.1	29459		
Tumble driers	14.4	102861	14.1	7296		
Dishwashers	13.0	93064	14.1	6601		
Cookers	10.8	76981	14.1	5460		
Oven	16.2	116295	14.1	8249		
Electric cooking ring	3.0	21483	14.1	1524		
Microwaves and other large appliances for preparation and other treatment of food	9.0	64449	14.1	4571		
Heating appliances: central heating boiler, other provisions	100.0	716100	15	47744		
Boilers, boiling water-tap, electric radiators	4.4	31508	15	2101		
Electric fans and central ventilation	36.0	257796	14.1	18285		
	264.8	1895875			131288	8.0
1b. Large household refrigerators/freezers						
Refrigerators, cooling appliances	48.0	343370	14.1	24354		
Freezers	10.5	75191	14.0	5333		
Other large appliances for cooling, keeping and storing food	0.5	3581	14.0	254		
Air conditioners other ventilation, cooker hoods and air conditioning appliances	59.0	422141			29941	1.8
2. Small household appliances						
Vacuum cleaners	11.6	83200	11.4	7299		
Carpet sweepers	1.0	7161	11.4	628		
Other cleaning appliances	2.5	17903	11.4	1571		
Sewing machine	3.0	21483	11.4	1885		
Irons and other appliances for the treatment of clothes	1.6	11700	11.4	1026		
Toasters	1.5	10742	11.4	942		
Frying pans	1.5	10742	11.4	942		
Coffee grinders, coffee makers and appliances for opening of sealing packaging	4.5	32225	11.4	2827		
Electric knives	0.5	3222	11.4	283		
Trimmers, hair dryers, electric toothbrushes, shaving appliances, massage and other personal hygiene appliances	1.6	11458	11.4	1005		
Clocks, measuring devices for time indication or time registration	0.4	2864	11.4	251		
Weighing scales	0.5	3287	11.4	288		
	30.2	215985			18948	1.2

3. IT and telecommunication appliances						
Centralized data processing:	0.0	0	7.7	0		
Mini computers	0.0	0	7.7	0		
Printing units	0.0	0	7.7	0		
Printers	7.0	50127	7.7	6511		
Copiers	0.0	0	7.7	0		
Electric and electronic typewriters	2.0	14322	7.7	1860		
Pocket and office calculators and other products and appliances for electronic storage, processing, presentation or communication	0.2	1432	7.7	186		
Facsimile machines	0.6	4297	7.7	558		
Telex machines	0.6	3581	7.7	465		
Telephones	0.6	3581	7.7	465		
Coin and card phones	0.0	0	7.7	0		
Wireless telephones	0.3	1790	7.7	233		
Mobile telephones	0.5	3600	3	1200		
Answering machines and other products or appliances for telecommunication of sound, images or other information	0.4	2864	7.7	372		
	12.0	85593			11849	0.7
3b. Personal computer use						
Personal computers (including processor, mouse excluding excl. screen and keyboard)	12.7	91120	7.7	11835		
Monitor	20.1	144200	7.7	18729		
Main frames	0.0	0	7.7	0		
Laptop computers (including processor, mouse, screen and keyboard)	1.9	13600	7.7	1766		
Notebook computers	0.0	0	7.7	0		
Notepad computers	0.0	0	7.7	0		
	34.8	248920			32330	2.0
4. Consumer appliances						
Radios	9.0	64449	10.9	5913		
Televisions sets	50.1	358800	10.9	32920		
Video cameras	0.2	1450	10.9	133		
Video recorders, DVD-players	12.8	91840	10.9	8426		
Hi-Fi recorders	3.0	21483	10.9	1971		
Sound amplifiers	18.1	129960	10.9	11924		
Musical instruments	3.1	22378	10.9	2053		
And any products or appliances for recording or playing sounds or images, including signals or other techniques for playing images and sound apart from telecommunication ¹			10.9			
	96.4	690360			63341	3.9
5. Lighting appliances						
Armatures for fluorescent lamps, except armatures in households	0.0	0	6	0		
Fluorescence lamps (fluorescent tubes)	0.3	2148	6	358		
Compact fluorescent lamps	0.8	5371	6	895		
High intensity discharge lamps, including high-pressure sodium discharge lamps and metal halogen lamps	0.0	0	6	0		
Low-pressure sodium lamps	0.0	0	6	0		
Other lighting or appliances for spreading or managing light, except light bulbs	0.2	1074	6	179		
	1.2	8593			1432	0.1
6. Electrical and electronic equipment (except large, non-moveable industrial installations)						
Clothing excluding Sewing machine (see product group 2)	0.6	4125	12	344		
Electrical household equipment (drilling, sawing, welding, sanding/GfK)	14.2	101400	12	8451		
Garden equipment (mower, grass trimmer, hedge clipper)	5.0	36091	12	3008		
	19.8	141616			11802	0.7
7. Toys, relaxation and sports equipment						
Electrical trains and car racetracks	0.2	1432	5	286		
Handheld consoles for videogames	0.3	2148	5	430		
Videogames	0.2	1432	5	286		
Bicycle-, diving-, running-, rowing computers and similar sports equipment	0.0	286	5	57		
Sports equipment with electrical or electronic parts	1.5	10742	5	2148		
Slot machines	0.0	0	5	0		
	2.2	16041			3208	0.2
	520	3725124			304141	18.5

APPENDIX IV CHAIN ANALYSIS DIRECT SUPPLY RECYCLING AND CONSUMERS



Starting points:

The quantities of product group 1 (excluding central heating boilers) and product groups 2 and 4 amounts to 10.1 kilos per inhabitant per year.

Approx 10% (depending on the product type) within the GfK questionnaire is given with destination "other". Our starting point is that half of this group is sent to a scrap dealer. From the recycling companies and second hand shops our starting point is that 20% is broken and will need to be thrown away. Thus, our starting point is that 90% of these broken items are sent to the scrap dealer.

The complementary stream amounts to 0.50 kilos plus 0.15 kilos = 0.65 kilos (see highlighted arrows), for product category 1 this is rounded off to 0.3 kg (0.65 kg/ 2) and for product categories 2 and 4 (also rounded off) 0.3 kilos (0.65 kg/ 2).