

THE MANAGEMENT OF

WASTE ELECTRICAL & ELECTRONIC EQUIPMENT

A Guide for Local and
Regional Authorities





AUTHOR:

The Association of Cities and Regions for Recycling
(ACRR)

CONTRIBUTORS:

AMIAT TBD, CARE Electronics, Ecological Recycling
Society, GOAB, IBGE-BIM, RAL Quality Assurance
Association, Recycle-IT!, Resource Recovery Forum,
RREUSE

EDITOR:

Jean-Pierre Hannequart
ACRR - Gulledele 100 - B-1200 Brussels - Belgium
Tel : +32 2 775 77 01
Fax : +32 2 775 76 35
e-mail : acrr@acrr.org
<http://www.acrr.org>

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AMIAT TBD, BI-TC, Ecological Recycling Society,
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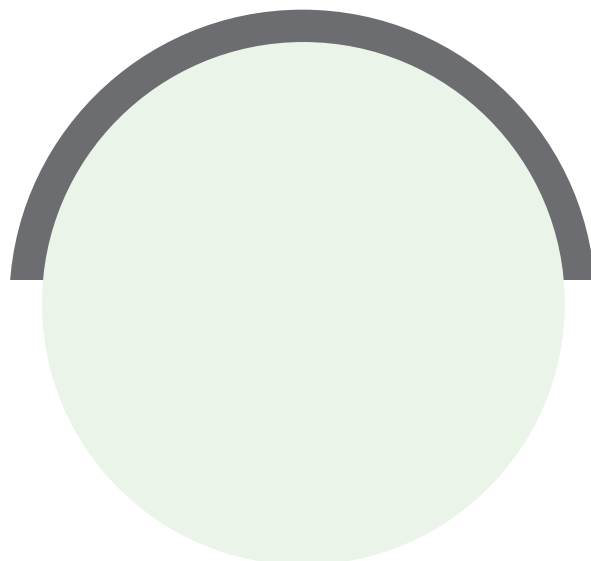
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FOREWORD

ELECTRICAL AND ELECTRONIC EQUIPMENT (EEE) has infiltrated every aspect of our daily lives, providing our society with more comfort, health and security, with easy information acquisition and exchange. But the constant technological innovations, coupled with a growing consumerism, accelerate the replacement frequency of these products. Consequently the production of waste EEE (WEEE) should double in the near future to reach 12 million tonnes p.a. in 2010. This confronts us directly with the obverse aspect of our consumption patterns : waste! Today, more than 90% of WEEE are landfilled or incinerated without any kind of pre-treatment.

The new European Directive on WEEE introduces individual producer responsibility, redistributes the roles between the actors of WEEE management and sets mandatory collection and recycling objectives. Local and Regional Authorities (LRAs) will have a significant role to play in the enforcement of the regulation. As public authorities responsible for aspects of municipal waste management, they may guarantee the participation of all possible actors, provide collection facilities, ensure proper handling and collection of appliances, encourage reuse and recycling and monitor the fulfilling of the producer's duties as regards treatment prescriptions.

The management of WEEE is a complex and multi-faceted issue. From organisation to implementation, selective collection, sorting and treatment systems, local authorities face tricky technical, legal, economic and educational questions. The ACRR has been created for the purpose of providing support to LRAs. Of course, this Guide does not pretend to be exhaustive, but we hope it will provide the reader with practical insights, experiences and guidelines for the proper organisation of WEEE management.

This report has been written by ACRR, with the support of RREUSE and CARE Electronics and the financial assistance of the European Commission.

I would like in particular to thank Caroline Saintmard for her active contribution in the writing of this Guide. I also thank all the experts and representatives of Cities and Regions for their valuable input during hearings and meetings organised for the writing of this report.



Jean-Pierre Hannequart
President of the Association of Cities and Regions for Recycling

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1. THE WEEE ISSUE





EVERY WASTE HAS A HIDDEN SIDE !

The "ecological rucksack" (the amount of waste generated in producing one unit of a good) of a :

- ▶ a computer is nearly 1.500 kg³
- ▶ a laptop 400 kg⁴
- ▶ a mobile phone 75 kg⁵.

According to the Worldwatch Institute, the semiconductor industry is one of the most chemically intensive ever known : a single plant may use 500-1.000 chemicals. Due to its extremely organised structure, the material intensity of a microchip is orders of magnitude higher than that of "traditional" goods⁶. Some researchers have calculated that producing and using a single 2-gram 32MB DRAM chip requires :

- ▶ 1.600 g of secondary fossil fuel
- ▶ 72 g of chemical inputs
- ▶ 32.000 g of water
- ▶ 700 g of elemental gases (mainly Nitrogen).

In 2001, there were 60 million transistors produced for every human being⁷.

ELECTRICAL AND ELECTRONIC EQUIPMENT occupy a steadily more important place within our daily environment, and are subject to increasing consumption demands. Their manufacture requires a huge amount of raw materials, some of them being dangerous to the environment as well as to human health.

1.1. A CONCERNING GROWTH

In 1998, six millions tons of waste electrical and electronic equipment (WEEE) was generated, that is equivalent to 4% of the municipal garbage flows. This volume is expected to grow from 3 to 5% per year, which means it will almost double every 12 years¹.

Large domestic appliances (white goods like refrigerating appliances, freezers, washing machines etc...) constitute the most important fraction (about 40%) of the total products used. They are followed by office equipment (essentially IT equipment), lighting devices and audio-video equipment².

1.2. A WASTE OF RESOURCES

The production of electrical and electronic equipment requires a complex mixture of components, among which are many precious metals whose extraction and transformation are a source of important pollution.

The environmental impact linked to their manufacture in terms both of energy and raw materials is therefore important. Not to mention that these products also need energy to function during their use phase.

1.3. RISKS FOR THE ENVIRONMENT AND FOR HUMAN HEALTH

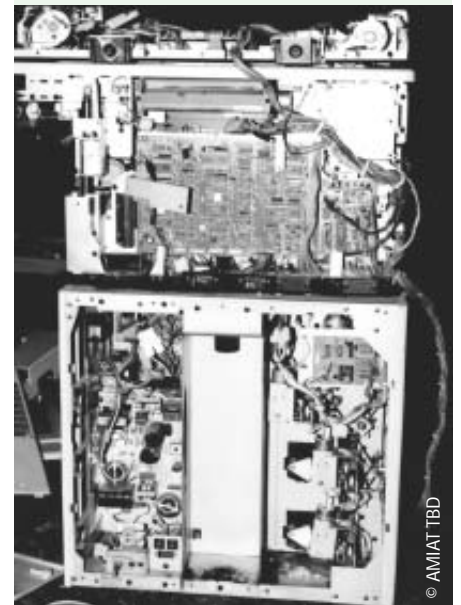
1.3.1. THE HAZARDOUS MATERIALS CONTENT OF WEEE

The production of EEE uses lots of substances like heavy metals, brominated flame retardants, halogenated substances... and few people know that the screen of a television set or a computer is functioning thanks to cathode ray tubes (CRTs) that could contain about 2 kg of lead⁶. Or that the automatic shut-off electronics of a coffee machine, or an alarm clock may contain mercury switches.

Some of the materials you can find for instance in a typical desktop computer, may jeopardize human health and most of them present potential dangers for the environment if they are not properly treated or disposed of.

The following materials are of concern with regard to environmental and health risks; their adverse impacts have been largely documented⁹:

	Potential damages for Human health	Potential damages for the Environment
Brominated flame retardants	Carcinogenic and neurotoxic, they may also have negative effects on reproduction	Soluble in landfill leachates, volatile to a certain extent, bioaccumulative and persistent. Their incineration may lead to the generation of dioxins and furans
Cadmium (Ca)	Can have irreversible effects on the kidneys, provoke cancers or induce skeletal demineralisation.	Bioaccumulative, persistent and toxic for the environment
Chromium VI	Can cause allergic reactions, is caustic when in contact with the skin, and genotoxic as well	Easily absorbed into cells, with toxic effects
Lead (Pb)	Can damage the nervous systems, the endocrine and cardiovascular systems, the kidneys	Accumulating in the environment, it has high toxic effects on plants, animals and micro-organisms.
Nickel (Ni)	Can affect the endocrine and immune systems, the skin, and the eyes	
Mercury (Hg)	Can cause damage to the brain and has cumulative impacts	Spread in the water, is accumulated by living organisms



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¹Proposal for a Directive of the European Parliament and of the Council on Waste Electrical and Electronic Equipment and Proposal for a Directive of the European Parliament and of the Council on the Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment – Explanatory Memorandum, COM (2000) 347 Final, Brussels, 13 June 2000.

² ICER, 2000 (UK).

³ "Internet : virtuell = umweltfreundlich", by Türk V., Ritthof M., von Geibler J. and Kuhndt M., in "Jahrbuch Ökologie 2003", Beck, München, p. 110-123.

⁴ Digital Europe, "Making the NetWork – Steps towards a sustainable networked world", Forum for the Future, June 2003.

⁵ "LCA of Telecommunication Systems - Material Input per Unit Service (MIPS) of the Italian Mobile Telephone Network", by Ing. Antonio Federico, Dr. Fabio Musmeci, Dr. Daniela Proietti Mancini, ENEA, 13th Discussion Forum on Life Cycle Assessment, Lausanne, EFPL, 25 April, 2001

⁶ The 1.7 Kilogram Microchip : Energy and Material Use in the Production of Semiconductor Devices, Environmental Science & Technology, Vol.36, N° 24, 2002, p. 5504-5510.

⁷ Vital signs 2002, Worldwatch Institute, p. 110-111.

⁸ Computer & Peripherals Material Project, prepared by Meinhardt Infrastructure & Environment Group for Environment Australia October 2001 ISBN 0642547734

<http://ea.gov.au/industry/waste/ieu/computer-report/material.html>

⁹ EIA 2000, EEB 2001, EPA 2000, OECD 2001

Composition of a Desktop Personal Computer based on a typical desktop computer, weighing about 30 kg¹⁰.

Name	Content in % of total weight	Use/Location
Plastics	22.9907	Includes organics, oxides other than silica
Lead	6.2988	Metal joining, radiation shield/CRT, PWB
Aluminum	14.1723	Structural, conductivity/housing, CRT, PWB, connectors
Germanium	0.0016	Semiconductor/PWB
Gallium	0.0013	Semiconductor/PWB
Iron	20.4712	Structural, magnetivity/(steel) housing, CRT, PWB
Tin	1.0078	Metal joining/PWB, CRT
Copper	6.9287	Conductivity/CRT, PWB, connectors
Barium	0.0315	In vacuum tube/CRT
Nickel	0.8503	Structural, magnetivity/(steel) housing, CRT, PWB
Zinc	2.2046	Battery, phosphor emitter/PWB, CRT
Tantalum	0.0157	Capacitors/PWB, power supply
Indium	0.0016	Transistor, rectifiers/PWB
Vanadium	0.0002	Red phosphor emitter/CRT
Terbium	0	Green phosphor activator, dopant/CRT, PWB
Beryllium	0.0157	Thermal conductivity/PWB, connectors
Gold	0.0016	Connectivity, conductivity/PWB, connectors
Europium	0.0002	Phosphor activator/PWB
Titanium	0.0157	Pigment, alloying agent/(aluminum) housing
Ruthenium	0.0016	Resistive circuit/PWB
Cobalt	0.0157	Structural, magnetivity/(steel) housing, CRT, PWB
Palladium	0.0003	Connectivity, conductivity/PWB, connectors
Manganese	0.0315	Structural, magnetivity/(steel) housing, CRT, PWB
Silver	0.0189	Conductivity/PWB, connectors
Antimony	0.0094	Diodes/housing, PWB, CRT
Bismuth	0.0063	Wetting agent in thick film/PWB
Chromium	0.0063	Decorative, hardener/(steel) housing
Cadmium	0.0094	Battery, glu-green phosphor emitter/housing, PWB, CRT
Selenium	0.0016	Rectifiers/PWB
Niobium	0.0002	Welding allow/housing
Yttrium	0.0002	Red phosphor emitter/CRT
Rhodium	0	Thick film conductor/PWB
Platinum	0	Thick film conductor/PWB
Mercury	0.0022	Batteries, switches/housing, PWB
Arsenic	0.0013	Doping agents in transistors/PWB
Silica	24.8803	Glass, solid state devices/CRT,PWB

Microelectronics and Computer Technology Corporation (MCC). 1996. Electronics Industry Environmental Roadmap. Austin, TX: MCC.

Note : Plastics contain polybrominated flame retardants, and hundreds of additives and stabilizers which are not listed separately here above.



1.4. THE ENVIRONMENTAL IMPACTS OF WEEE MANAGEMENT

1.4.1. THE INCINERATION OF WEEE

It is estimated that emissions from waste incineration account for 36 tonnes per year of mercury and 16 tonnes per year of cadmium in the European Community¹¹. The introduction of (small) WEEE into incinerators results in high concentrations of metals, including heavy metals, in the slag, the flue gas or the filter cakes. Substantial quantities of PVC are also contained in WEEE, which is not suitable for incineration in view of the hazardous nature of the flue gas residues.

On another side, pilot tests have shown that common appliances such as TVs result in energy losses during the incineration process, due to the screen's cathode ray tubes (CRT) : the energy loss resulting from feeding glass into an incinerator is estimated at approximately 400 kJ/kg¹².

1.4.2. THE LANDFILLING OF WEEE

Of particular danger is the **leaching** of hazardous substances, as no landfill site is completely watertight : mercury from destroyed printed circuit boards, PCBs from condensers, polybrominated diphenylethers (PBDEs) and cadmium from specific plastics may leach into the soil and groundwater. Significant amounts of lead ions may also be dissolved from the cone glass of cathode ray tubes by the acidic groundwater often found in landfills.

Another concern is the **vaporisation** of mercury also found in WEEE.

In addition, **uncontrolled fires** may arise at the landfills emitting extremely toxic dioxins and furans due to the presence of a range of hazardous substances¹³.

1.4.3. THE RECYCLING OF WEEE

Without proper disassembly, hazardous substances, such as PCBs contained in capacitors, may be dispersed into the recovered metals and the shredder waste. Recovery processes using incineration may also lead to hazardous emissions due to the presence of heavy metals (lead, cadmium), or halogenated substances. Due to the lack of proper identification techniques for plastic containing flame retardants for instance, most recyclers do not process any plastic from WEEE.

The recycling of WEEE calls thus at least for a proper pre-treatment stage and if possible for the substitution of some hazardous materials and substances by less polluting ones.



RECYCLING CAN BE DANGEROUS AND POLLUTING

In February 2002, the Basel Action Network (BAN) together with the Silicon Valley Toxics Coalition (SVTC) published the report "Exporting Harm : the High-Tech Trashing of Asia"¹⁴. This revealed that 80% of electronic waste collected in North America for "recycling" where actually shipped to Asia, where populations make their livelihood by the sorting and recovery of these waste in the most dangerous conditions. In Guiyu and other Chinese towns, workers rip to scrapped hardware and look for every reusable part, melting sometimes components to extract precious metal. The remaining parts are burned or dumped near rice paddies and waterways¹⁵.

¹⁰ *Just Say No to E-Waste : Background Document on Hazards and Waste from Computers, Silicon Valley Toxic Coalition,* <http://www.svtc.org/cleancc/pubs/sayno.htm#etoxics.htm>

¹¹ *Explanatory Memorandum WEEE and ROHS Directives, COM (2000) 347 Final, Brussels, 13 June 2000, p.9.*

¹² *Ibidem, p. 10.*

¹³ *Ibidem, p. 12.*

¹⁴ *Exporting Harm: The High-Tech Trashing of Asia,* <http://www.svtc.org/cleancc/pubs/technotrash.pdf>

¹⁵ For more information : <http://www.ban.org>



2. THE EUROPEAN WEEE DIRECTIVE





2.1. OVERALL EUROPEAN APPROACH OF THE WEEE ISSUE

The European Community policy in the environment sectors aims at a high level of protection, taking into account the diversity of situations in the various regions of the Community. It should be based on a hierarchy of four principles:

- the precautionary principle
- the principle that preventive action should be taken
- that environmental damages should as a priority be rectified at source
- and that the polluter should pay¹⁶.

Waste Electrical and Electronic Equipment (WEEE) has been identified as a priority area to take specific measures on a European scale¹⁷, and today the European regulation on Electrical and Electronic Equipment is going to be made up of several parts covering respectively:

► The management of WEEE

through the Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on Waste Electrical and Electronic Equipment (WEEE)¹⁸.

► The restriction of the use of certain hazardous substances in EEE

with the Directive 2002/95/EC of the European Parliament and the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS)¹⁹. This directive is a "single market directive" based on article 95 of the EC Treaty whose scope of application is quite similar to that of the WEEE directive. It mainly entails that from 1st July 2006, four heavy metals (lead, mercury, cadmium, hexavalent chromium) and flame retardants PBB and PBDE will be banned from the manufacturing of new electrical and electronic appliances, excepted :

- some applications defined in a comprehensive way (ex : mercury in fluorescent lamps or tubes, lead in cathode ray tubes, or alloying elements, chromium for anti-corrosion applications...);
- spare parts for the repair or reuse of EEE put on the market before 1st July 2006. If the market for new components requires the phasing out of certain substances, the availability of old components will be limited in time and the availability of spare parts is important to stimulate the repair of equipment.

► Ozone Depleting Substances (chlorofluorocarbons, etc...)

EC regulation N°2037/2000 of the European Parliament and the Council of June 29, 2000 is of direct application in national law, and requires to recover and to treat ozone depleting substances like CFC and HCFC from cooling circuits and insulating foams in refrigeration, air-conditioning and heating pumps equipments, when cleaning or before disassembling or eliminating them.

► The ecodesign of energy-using appliances

The European Commission has proposed on 8th August 2003 a **framework directive²⁰ to promote the eco-design of energy-using appliances (EUP)**. This draft law aims to set a framework for general and specific design requirements for energy-using products "with a significant volume of sales, and which represent a significant environmental impact and significant

¹⁶art. 174, al 2, EC Treaty, O.J. n°C325 of 24th December 2002.

¹⁷Resolutions of the Council of 7th May 1990, O.J. n° C122 of 18th May 1990 and of 14 November 1996 (A4-0364/96), cited in Explanatory Memorandum on WEEE, European Commission, June 2000, p. 7.

¹⁸ O.J. n° L37 of 13th February 2003

The text of Directive of the European Parliament and of the Council of 27 January 2003 on Waste Electrical and Electronic Equipment (WEEE) can be downloaded on the DG Environment website, at the following address : http://www.europa.eu.int/comm/environment/waste/weee_index.htm

¹⁹ O.J. n° L37 of 13th February 2003

²⁰ Proposal for a Directive of the European Parliament and of the Council on Establishing a framework for the setting of Eco-design requirements for Energy-Using Products and amending Council Directive 92/42/EEC, COM(2003) 453 final. The text of the proposal can be found at :

http://europa.eu.int/eur-lex/en/com/pdf/2003/com2003_0453en01.pdf

potential for improvement". Standards would be drawn up to implement the requirements, with manufacturers able to demonstrate conformity through an "internal design control" or via environmental management systems. Products in conformity with the standards would be guaranteed access to the EU market. The draft directive itself creates no legal obligations for manufacturers : these will only arise once the EU adopts separate implementing measures for different product groups.

The energy-using products (EUP) proposal of directive can be considered as the result of a merger between several proposals from the European Commission - DG Enterprises, for a law on the design of electrical and electronic equipment (EEE), and initiatives to set energy efficiency goals on end-use equipment (EUE) from DG energy. It is a first attempt to achieve environmental protection goals with a new approach based on standardisation.

Beyond the harmonization of national regulations on the management of the WEEE, the European aim seems to bring the market forces to an integrated approach, including every aspects from the design of products to the management of waste.

2.2. SCOPE OF THE DIRECTIVE

The directive applies to 10 categories of electrical and electronic appliances, without prejudice to specific Community regulation concerning health, security, or the management of waste.

Categories of Annex 1A	Products to be considered (Annex 1B)	Common Classifications
1. Large household appliances	Ex : refrigerators, freezers,... Ex : washing machines, dishwashers, cookers, electric heating appliances...	Large white goods - with CFC - without CFC
2. Small household appliances	Ex : vacuum cleaners, toasters, irons...	Small white goods
3. IT and telecommunication equipment	Ex : computers, printers, fax, phones, copying equipment...	Grey goods
4. Consumer equipment	Ex : television sets Ex : radio sets, video recorders,...	Brown goods - with cathode ray tubes - without cathode ray tubes
5. Lighting equipment	Ex : fluorescent lamps, discharge lamps...	Others
6. Electrical and electronic tools (with the exception of large-scale stationery industrial tools)	Ex : drills, saws, sewing machines...	
7. Toys, leisure and sport equipment	Ex : video games, coin slot machines...	
8. Medical devices (with the exception of all implanted and infected products)	Ex : pulmonary ventilators, radiotherapy and cardiology equipment...	
9. Monitoring and control instruments	Ex : smoke detectors, thermostats,...	
10. Automatic dispensers	Ex : automatic dispensers for money, hot drinks...	

2.3. GENERAL AIMS OF THE DIRECTIVE

Based on article 174 of the EC Treaty, the WEEE Directive aims to improve the environmental performance of WEEE management and to close the « waste-resources » loop through notably:

- **a selective collection** of WEEE by suitable systems, which preserves the integrity of the appliances and their recovery potential and ensure a free service for households
- **a collection rate** to be achieved by Member States of 4kg WEEE/inhab./year by 31st December 2006
- **an individual producer responsibility** : reuse, recycling and recovery rates ranging from 50% to 80% according to the category of equipment considered, must be achieved by producers of EEE by 31st December 2006 : these shall finance the treatment, recovery and environmentally sound disposal of their waste
- **the provision of information to end-users** (whose participation is essential for the achievement of high collection and recycling rates), through the marking of packaging notably; **and to treatment facilities** (regarding the structure and composition of EEE).

Being an environmental directive, Member States are allowed to go beyond the minimum requirements set.

2.3.1. ECODESIGN OF PRODUCTS

There is currently a lack of financial drivers to design products with a long life span or to manufacture them in a way that takes into account, their future management as waste.

Member States are required to encourage the conception and manufacturing of EEE that facilitates their dismantling and recovery - in particular their reuse and recycling, either of the whole appliance, their components or materials.

Reuse is explicitly protected : it won't be possible to prevent products to be reused by a conception or particular manufacturing processes, except if they present decisive advantages, for example regarding environment or security and hygiene (art. 4).



²¹ Source : Stena Metall Group, Presentation at the Green Week, Brussels, Tuesday 3rd June 2003.
<http://europa.eu.int/comm/environment/greenweek/docs/presentations/session8b.pdf>

²² Explanatory Memorandum WEEE and ROHS Directives, COM (2000) 347 Final, Brussels, 13 June 2000, p.23.

²³ Ibidem p. 34 – It corresponds to an average collection rate achieved by several countries of the European Union in the setting up of collection pilot programs, and to the results achieved when implementing the Dutch legislation. Ökopol, "Collection targets for waste from electrical and electronic products", Germany 1998, European Commission DG XI, p. 13.

2.4 COLLECTION OF WEEE

One of the present restraints to the recycling of the WEEE is insufficient quantities collected susceptible to allow large-scale recycling. Member States must therefore set up selective collection schemes, and encourage the involvement of end-users in these systems.

As many EU specific waste regulations, the WEEE Directive articulates around the two streams of waste management, that are linked with the end-users of discarded products:

- ▶ **WEEE from private households**, meaning according to article 3, k) *WEEE which comes from private households and from commercial, industrial, institutional and other sources which, because of its nature and quantity, is similar to that from private households.*
- ▶ **WEEE from users other than private households**, to be considered for lack of definition, as a residual category.

2.4.1. COLLECTION RATES

The Directive aims at high selective collection rates for WEEE, though only sets a quantitative target for WEEE from private households : Member States shall ensure that by 31st December 2006 a separate collection rate of at least 4 kg on average per inhabitant per year of WEEE from private households is achieved.

The rate of 4 kg collection per capita per year would only cover, according to various evaluations, 25% of the WEEE effectively generated every year²². It seems obviously defined as a rough guide until precise data on WEEE generated by households are gathered²³.

4 kg of
WEEE

- = 1/7 TELEVISION
- = 1/2 PRINTER
- = 1 VIDEO RECORDER
- = 8 PHONES
- = 40 CELLULAR PHONES²¹





2.4.2. COLLECTION SCHEMES

The setting up of efficient collection schemes is necessary to ensure the achievement of the Directive's targets. The collection and transport must be carried out in a way which optimises reuse and recycling of those components or whole appliances capable of being reused or recycled (art. 5, §4).

For clear reasons of efficiency, the examination of the reuse potential should take place as much as possible upstream, in order to send reusable appliances to the adequate reuse channels without damages.

Following the subsidiarity principle, the European directive only defines general requirements. The modalities of the logistic and the organisation of take-back schemes are left to the choice of Member States, depending on their geographical characteristics and on the different WEEE streams.

2.4.2.1. WEEE FROM PRIVATE HOUSEHOLDS

An efficient collection scheme has to motivate citizens to take part in it.

Regarding household waste, the directive does not prescribe who will manage and/or finance the first stage of the collection logistics chain, from households to "collection points" (from which producers would be required to pick up the WEEE for treatment)²⁴.

« Collection points » will be a key element of the system, but these are not defined. From a practical point of view, the directive leaves some room for manoeuvre to Member States to define the number, the capacity, the location and the organisation within management schemes of these «collection points», from which producers will bear the financing of collected WEEE. Are they recycling parks, sorting facilities, regional transfer stations... ? The notion will have to be agreed between the Industry and Local and Regional Authorities.

Distributors are also included in WEEE collection schemes (art. 5, §2, al. 1, a) et b)) :

1. they have to offer to consumers the possibility of returning their WEEE at least free of charge and on a « one-to-one » basis when buying new equipments of equivalent type and fulfilling the same functions ; nonetheless, Member States may depart from this provision, provided that the chosen solution does not make it more difficult for the final holders, and that the system remains free of charge for them.
2. distributors' free access to collection schemes is also guaranteed.

Collection facilities have to be (art. 5, §2, a)) :

- ▶ **adapted to the density of the population ;**
- ▶ **accessible for consumers and distributors, which should be able to return their WEEE**
- ▶ **at least free of charge.**

²⁴ Directive 2002/96/EC, art. 8 §1

²⁵ Directive 2002/96/EC, art. 5, §4

2.4.2.2. WEEE OTHER THAN WEEE FROM PRIVATE HOUSEHOLDS

Producers or third parties acting on their behalf must provide for the collection of WEEE other than WEEE from private households (art. 5, §3).

2.5. THE TREATMENT OF WEEE

"Treatment" following the Directive is to be understood as any operation carried out for the depollution, disassembly, shredding, recovery or disposal of WEEE.

2.5.1. GENERAL PROVISIONS

Separately collected WEEE should be transported to approved treatment facilities unless appliances are reused as a whole²⁵.

Member States shall ensure that producers organise (collectively or individually) the treatment of collected WEEE in order to achieve the directive recovery and recycling rates.

The achievement of high quality standards as regards the protection of the environment requires the setting up of modern and efficient facilities. So that :

- ▶ WEEE treatment shall as a minimum include the removal of all fluids (substances which could complicate or prevent subsequent recovery or recycling stages), and the selective treatment of some components (PCB, cathode ray tubes, batteries and capacitors, asbestos waste...) or substances (mercury, CFC, hydrocarbons,...) in accordance to the Annex II of the Directive WEEE (art. 6 §1).
- ▶ Sites for storage or treatment of WEEE must also comply with the technical requirements of the Annex III (art. 6, §3) : notably impermeable surfaces, appropriate containers for the storage of hazardous waste etc...

TIMETABLE





Any establishment or enterprise carrying out treatment operations must necessarily obtain a permit (under the form of an authorisation or a registration (art. 6, §2))²⁶ which must not only ensure the compliance with :

- ▶ the treatment conditions
- ▶ the conditions for sites for storage or treatment
- ▶ but also the conditions necessary for the achievement of the recovery targets (art. 6 §4).

Inspections shall be carried out at least once a year in waste treatment facilities (art. 6 §2, al. 3), which should use the best available treatment, recovery and recycling techniques (art. 6§1, al. 1). Member States may also set up minimum quality standards for the treatment of collected WEEE (art. 6§1, al. 3). Establishments or enterprises which carry out treatment operations should be encouraged to introduce certified environmental management schemes (EMAS), notably through agreements with the sectors (art. 6 §6 et 17 §3).

Treatment operations may also be undertaken outside the respective Member State or the Community as far as the transport of WEEE complies with Council Regulation (EEC) N°259/93²⁷ applying to the shipment of waste within, into and out of the European Community, and ancillary legislation regarding the shipment of waste.

WEEE exported out of the Community will only count for the fulfilment of obligations and targets if the exporter can prove that the operations took place under equivalent conditions to the requirements of the WEEE Directive (art. 6 §5, al. 2). Member States will be responsible for the definition of the detailed technical requirements and for the proper monitoring thereof.

2.5.2. REUSE, RECYCLING AND RECOVERY TARGETS

Article 7 sets recovery rates for the different **categories of separately collected WEEE** to be achieved by **producers**, on an individual or collective basis, **by 31st December 2006 at the latest** (new objectives should be set for 31st December 2008).

Producers may off-load their responsibilities onto third parties, local authorities or private enterprises for instance. They nonetheless remain individually responsible for financing all the operations regarding the treatment of their own products when put onto the market after 13th August 2005 (see 2.7. here after).

The setting of recovery and recycling rates by categories of appliances and not by material might notably be problematic and not only for small appliances made of plastic : a microwave and a cooker are both large household appliances, one of which is mainly made of plastic and the other mainly made of metal, but both will have to be recycled at 75%.

²⁶ In compliance with articles 9 to 11 of Directive 75/442/CE.

²⁷ O.J. n° L 30 of 6th February 1993.

For the purpose of calculating these targets, producers or third parties acting on their behalf are required to keep records on the mass of WEEE when entering and leaving the treatment, recovery or recycling facility (art. 7 §3). This will require the setting up of efficient logistic and track systems.

Ireland and Greece, because of their geographical particularities, a low level of equipment and a low population density may apply for an extension of the deadline to reach the targets up to 24 months (art. 17, §4, a)).

Categories of appliances	Reuse and recycling targets	Recovery targets
	(% by average weight per appliance sent for treatment)	(% by average weight per appliance sent for treatment)
Large household appliances and automatic dispensers (categories 1 and 10 of Annex 1A)	75%	80%
Small household appliances, lighting equipment, electrical and electronic tools, toys, leisure and sport equipment (categories 2, 5, 6, 7 and 9 of Annex 1A)	50%	70%
IT and telecommunications equipment, and consumer equipment (categories 3 and 4 of Annex 1A)	65%	75%
Discharge lamps	80%	-

Table : Recovery targets set by article 7 of Directive 2002/96/EC

2.5.3. REUSE

Priority is clearly given to the reuse of whole appliances (art. 7 §1) ; but this should not lead to a circumvention of the provisions relating to the treatment or recovery of WEEE (art. 5 §4).

Up to 31st December 2008, whole appliances which are reused won't be taken into account for the calculation of the recovery and recycling targets described here above (art. 7 §1). But the reuse of **components, materials and substances will be taken into account** for the achievement of these targets.

This provision does not really create a drive for producers to favour the reuse of their products, and LRAs will have their role to play in paying attention to the protection of existing reuse systems, and try to direct appliances capable of being reused as a whole, to the appropriate channels, which will preserve their potential.

Reuse will be dependent on :

- ▶ sorting efforts as soon as possible at the collection stage
- ▶ and suitable logistic equipment.





LRA could be the adequate "go-between" to forward this information to end-users/ consumers and treatment facilities.

2.6. INFORMATION & MARKING OF PRODUCTS

2.6.1. INFORMATION FOR USERS

The active participation of users and consumers is essential for the efficiency of collection systems ; this is why they must be encouraged to participate in the collection schemes of WEEE and to facilitate their treatment, recycling and recovery process (art. 10 §2); especially, they must receive information about (art. 10 §1) :

- the requirement to sort and separately collect WEEE
- the return and collection systems available to them
- their role in contribution to reuse, recycling and other forms of recovery of WEEE
- the potential effects of WEEE on the environment and human health
- the meaning of the symbol of the wheeled bin (Annex IV), which producers are required to print on the packaging, on the instructions for use or on the warranty of the equipment (art. 10§3).

Member States may require that all or part of this information is provided by producers and/or distributors, if necessary in the scope of agreements with the sectors (art. 10 §4 et 17 §3).

2.6.2. INFORMATION FOR TREATMENT FACILITIES

Producers are required, within one year after the equipment is put on the market, to provide in the form of manuals or by means of electronic media, information susceptible of facilitating the reuse and treatment of their appliances, as for instance about the components and materials and the localisation of dangerous substances (art. 11 §1).

2.6.3. IDENTIFICATION OF THE PRODUCER

Any **producer** of an electrical or electronic appliance put on the market after 13th August 2005 shall be clearly **identifiable** on the appliance, and a **mark** on the appliance shall specify that the latter was put on the market after 13 August 2005 (art. 11 §2).

²⁸ Explanatory Memorandum WEEE and ROHS Directives, COM (2000) 347 Final, Brussels, 13 June 2000, p.23.

²⁹ Directive 2002/96/EC, art. 5 §3

³⁰ Proposal for a Directive of the European Parliament and of the Council amending the Directive 2002/96/EEC on waste electrical and electronic equipment, COM(2003)219 http://europa.eu.int/lex/en/com/pdf/2003/com2003_0219en01.pdf

2.7. THE FINANCING

2.7.1. WEEE FROM PRIVATE HOUSEHOLDS

Producers have to guarantee **at least** the financing of the transport from collection points, as well as the recovery, treatment and environmentally sound disposal of WEEE from private households.

The **producers' individual financial responsibility** created by the Directive (art. 8§2) means that:

- every producer has to bear the costs related to the management of the waste from its own brand,
- but does not prevent producers cooperating within collective take-back systems.

There is a clear distinction to be made between the charging of the responsibility (which is individual) and the implementation of this responsibility, which can be either collective or individual (art. 8§2, al. 1).

As a financial responsibility for the collection of WEEE from private households is unlikely to have an impact on the ecodesign efforts, the producer responsibility implemented by the directive does not involve the financing of the collection costs – or only from "collection points"²⁸. But the WEEE Directive is not a "single market" directive (Member States may adopt more stringent regulations), and producers may set up and operate individual or collective take-back schemes for WEEE from private households (art. 5§2 al. 1, c).

2.7.2. WEEE FROM USERS OTHER THAN PRIVATE HOUSEHOLDS

The financing of the costs for the collection, treatment, recovery and environmentally sound disposal of WEEE from users other than private households is to be provided for by producers as regards products put on the market after 13 August 2005²⁹.

As regards historical waste, the Commission was submitted on 29th April 2003 a proposal of Directive of the European Parliament and the Council modifying Article 9 of the WEEE Directive³⁰ (see here below).

The **individual responsibility of producers** is one application of the « polluter-pays » principle. The economic responsibility of producers is to understand as a driver to internalise the management costs of their products once they have become waste - these costs should otherwise only be born by citizens / taxpayers. The aim of this individual producer responsibility is given by Article 4, as it should lead **to efforts in the field of ecodesign**, in order to reduce the waste management costs associated with their products and indirectly to reduce their impact on the environment.

Indirectly, ecodesign could allow consumers to go for **ecoconsumption**, the supply of products also influencing the demand.

2.7.3. HISTORICAL WASTE AND ORPHANS

2.7.3.1. HISTORICAL WASTE

WEEE from private households

WEEE from products put onto the market before the 13th August 2005 is an exception to the individual responsibility of the producer : its management will be assumed collectively by the producers existing on the market when the respective costs occur for instance, and as the WEEE directive suggests it, *in proportion to their respective share of the market by type of equipment* (art. 8 §3).

WEEE other than from users other than private households

The financing of the costs for the collection, treatment, recovery and environmentally sound disposal of this WEEE is the responsibility of producers of new equipment except (proposal of Directive of 29th April 2003³¹) :

- regarding historical waste which is not replaced or orphans : the financing of these management costs will be ensured by end-users
- agreements stipulating other financing methods.

2.7.3.2. ORPHANS

Orphans are Waste Electrical and Electronic Equipment whose producer is not capable of being identified, or does not exist anymore when waste management costs occur.

From 13th August 2005 and in order to avoid potential « free-riders » (producers who would try intentionally or not to escape their responsibilities) and the problematic financing of the management of their waste, each producer will have to :

- mark its products so that they are clearly identifiable,
- and provide a guarantee when placing a product on the market, intended to ensure the future covering of waste management costs in case he disappears from the market. The guarantee may take the form of a recycling insurance, a blocked bank account or a participation in appropriate schemes for the financing of the management of WEEE (art. 8§2, al. 2).

2.7.4. VISIBILITY OF WEEE MANAGEMENT COSTS FOR CONSUMERS

The costs of collection, treatment and environmentally sound disposal of WEEE from private households shall not be shown separately to purchasers at the time of sale of new products (art. 8§2, al. 3) : this is precisely their internalisation in the price of products which is aimed at, in order to generate efforts in the field of eco-design.

As regards the visibility of waste management costs, an exception is granted to **historical waste**: the costs linked to its management may be shown to purchasers at the time of sale of new products,

- ▶ as far as they don't exceed the actual costs incurred
- ▶ and only for a transitional period of 8 years - 10 years for large household appliances
 - after entry into force of the directive (art. 8 §3).



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³¹Proposal for a Directive of the European Parliament and of the Council amending the Directive 2002/96/EEC on waste electrical and electronic equipment, COM(2003)219 http://europa.eu.int/eur-lex/en/com/pdf/2003/com2003_0219en01.pdf

³² Ibidem

³³ Ibidem

³⁴ Ibidem

OVERVIEW OF RESPONSIBILITIES

	SUBJECT	RESPONSIBILITY	ART.
EEE ECODESIGN	<ul style="list-style-type: none"> ▶ Design and production of EEE which facilitate the dismantling, reuse and recycling of WEEE, their components and materials ▶ Unless overriding reasons to do so, producers do not prevent WEEE from being reused 	To be encouraged by Member States	Art 4
SEPARATE WEEE COLLECTION	<ul style="list-style-type: none"> ▶ High level of separate collection 	Member States	Art 5
Management	<p>WEEE from private households</p> <ul style="list-style-type: none"> ▶ Achievement of collection rates : 4kg/inhab./year ▶ Return of household WEEE to collection points <ul style="list-style-type: none"> 1° Final holders and distributors must have the possibility to dispose of WEEE free of charge, at available and accessible collection facilities 2° Distributors are obliged to take back WEEE when a new similar product is purchased, but Member States may deviate from this provision ▶ Collection from collection points and transfer to treatment facilities in a way optimising reuse and recycling 	Member States Member States Distributors	
Financing	<p>WEEE other than from private households</p> <ul style="list-style-type: none"> ▶ Covering of collection costs of WEEE from private households deposited at collection facilities (individual responsibility - a collective responsibility is allowed for historical waste only). ▶ Covering of collection costs of WEEE from users other than private households Exceptions : <ul style="list-style-type: none"> - historical waste which are replaced by new appliances - historical waste which are not replaced and orphans 	Member States Producers Producers Producers of new appliances Final users	Art 8 Art 9 ³²
WEEE TREATMENT	<ul style="list-style-type: none"> ▶ Possible minimum quality standards ▶ Targets achievement (reuse, recycling, recovery) ▶ Organisation of systems to provide for the treatment of WEEE using best available treatment, recovery and recycling techniques ▶ Organisation of environmentally sound disposal of WEEE 	Member States Producers Producers (either collectively or individually) Producers	Art 6 Art 7 Art 6 Art 7 Art 8 Art 9 ³³
Management	<p>WEEE from private households</p> <ul style="list-style-type: none"> ▶ Covering of the costs of treatment, recovery and disposal (individual responsibility - a <i>collective</i> responsibility is allowed for historical waste only) ▶ Guarantee ensuring the financing of orphans products 	Producers Producers	Art 8 Art 8
Financing	<p>WEEE other than from private households</p> <ul style="list-style-type: none"> ▶ Covering of treatment, recovery and disposal costs of WEEE from users other than private households. Exceptions : <ul style="list-style-type: none"> - historical waste which are replaced by new appliances - historical waste which are not replaced and orphans 	Producers Producers of new appliances Final users	Art 9 ³⁴
INFORMATION AND REPORTING OBLIGATIONS	<ul style="list-style-type: none"> ▶ Register of producers ▶ Information on quantities of products sold, collected, reused, recycled, recovered within a Member State, and on collected waste exported ▶ Information to consumers ▶ Information to treatment facilities 	Member States Producers Producers Producers	Art 12 Art 7 Art 10 Art 11



3. INITIATIVES ALREADY UNDERTAKEN IN SELECTED EUROPEAN COUNTRIES



A more detailed and further updated description of European WEEE management systems is available on the ACRR website:

<http://www.acrr.org/resourcities/>

BEFORE THE ENTRY INTO FORCE OF THE WEEE DIRECTIVE,

several European countries defined national regulations and organised management schemes for WEEE. These systems respond to sometimes very different national situations and philosophies. Some will have to be adapted as European Member States must now implement the WEEE Directive into national laws.

Though, in line with the subsidiarity principle, the European Directive leaves the specific design of the WEEE management schemes to the discretion of Member States, and the national experiences under review here below illustrate a range of possibilities (regarding notably the sharing of responsibilities within the logistical organisation and the financing of WEEE).

This chapter provides short descriptions of some systems already in place in Belgium, Denmark, the Netherlands, Norway, Sweden and Switzerland. It aims at highlighting similarities and differences as regards regulations, and the distribution of responsibilities in the organisation and financing of management schemes.

3.1. COMPARATIVE OVERVIEW

3.1.1. SETTING OF TARGETS

As regards **quantitative targets**, national regulations do not set collection targets. Only in Norway, a collection target of 80% of WEEE has been set for the 1st July 2004, through a sector agreement with the Ministry of Environment. In Denmark, there is an agreement between the Ministry of Environment and Energy and the relevant associations, aiming to collect a minimum of 90% of the total amount of discarded refrigerators for environmentally sound treatment.

In Belgium, recycling rates are set by the regulation for ferrous metals, non-ferrous metals and plastics, and for four categories of appliances. In the Netherlands recycling targets have been defined by a common agreement between the Environment Ministry, local authorities and manufacturers / importers.

It must be emphasised that "**recycling**" has not the same meaning in the different countries. For instance, in Norway, recycling includes reuse and both material recycling and energy recovery. In the Netherlands, recycling rates are defined as the proportion of materials not going to landfill or incineration.

Various **qualitative provisions** are set for the management of WEEE. These include :

- ▶ "environmentally sound treatment" (Denmark)
- ▶ "proper treatment in accordance with the regulation" (Norway)
- ▶ "no landfill without previous treatment" (Sweden, Switzerland)
- ▶ the prohibition of the incineration of products which have been taken back separately (the Netherlands)
- ▶ minimum standards for treatment like separated elimination of pollutants, recovery of metal and incineration of chemicals that cannot be recovered (Switzerland)
- ▶ the separation between re-usable and non-usable equipment (Belgium)

3.1.2. STATUS OF REUSE

... within the regulations or as a result of the established systems.

Belgium	The first stage after collection is to separate reusable and non-reusable appliances, through social economy enterprises or other companies.
The Netherlands	Reuse is ruled out for refrigerating and freezing equipment containing CFCs or HCFCs.
Norway	EEE reused in its original form and for its original purpose is not to be considered as scrap, and is not embraced by the regulation.
Switzerland	The regulation defines a central role for retailers networks, which offer strong reuse possibilities.

3.1.3. ROLE OF ACTORS IN THE MANAGEMENT OF WEEE

Most countries under review have developed mixed WEEE management systems based on the existing municipal management schemes in which municipalities organise collection of WEEE from households as well as the management of container parks and other collection points, while producers recycle and treat them.

The role of retailers and of distributors can vary largely between countries. The trade chain is for example the main channel for taking back WEEE in Switzerland, where retailers are recognised as specialists to assess returned equipments regarding their reparability or recyclability. In Norway, retailers and distributors are assigned an important collection role by the regulation. Consequently EI-Retur (like NVMP in the Netherlands) uses payments as an incentive for retailers but also to cover their handling costs from the taking back of WEEE.

In Belgium, 80% of collection points are points of sale, but they only capture 25% of the volume of waste collected, while municipal collection points (20%) capture 75% of WEEE. In the Netherlands, distribution channels (retailers and distribution centres) collect about 13% of all the WEEE collected. In both countries, retailers have an access to recycling parks and RTS for small quantities of WEEE.

PREFERRED CHANNELS FOR COLLECTION

	Municipal recycling points	Retailers/ trade
Belgium	x	
Denmark	x	
The Netherlands	x	
Norway		x
Sweden	x	
Switzerland		x





3.1.4. FINANCING METHODS AND COSTS OF THE SYSTEMS

Except in Switzerland, these systems are financed by :

- citizens' local taxes for municipal collection infrastructures
- consumers as far as further sorting, recycling and disposal costs are concerned.

3.1.4.1. WHAT DO MUNICIPALITIES FINANCE IN THE DIFFERENT COUNTRIES ?

This table shows the sharing of responsibilities between producers and public bodies in the European Countries under review.

COUNTRIES UNDER REVIEW	COLLECTION AND SORTING UP TO "COLLECTION POINTS"		RECYCLING	
	Management	Financing	Management	Financing
Denmark	Municipalities	Municipalities	Municipalities	Municipalities
Belgium / The Netherlands / Sweden	Municipalities	Producers/ Municipalities	Producers	Producers
Norway	Municipalities Distribut./retailers ³⁵	Municipalities Distribut./retailers	Producers	Producers
Switzerland	Producers/retailers	Producers/retailers	Producers	Producers

In Belgium, Sweden and in the Netherlands, collection costs are covered to diverse extents by producers through negotiated agreements with LRAs. Producers finance part of municipal WEEE facilities (e.g. by providing specific containers), or a part of costs for transportation of WEEE from municipal collection points to Regional Transfer Stations - RTS (e.g. in the Netherlands).

3.1.4.2. RECYCLING FEES

If one considers recycling fees established by different producers' schemes, the part borne by final consumers appears to be higher in Switzerland (where producers set up their own management schemes), than in the Netherlands, where LRAs (compelled by the regulation) have put their collection facilities and RTS network at the disposal of manufacturers.

PRODUCT TYPE	BELGIUM (RECUPEL)	THE NETHERLANDS (NVMP)	SWEDEN (El-Kretsen)	SWITZERLAND (SWICO/SENS) Advanced Recycling Fee (VAT included)
	Fee VAT included	Fee VAT included	Fee VAT not included	
Washing machine	10,00 €	5,00€	9,33 €	17,06 €
Coffee maker	1,00 €	1,00€	0,44 €	0,68 €
Television	11,00 €	8,00€	8,80 €	10,24 €
Refrigeration appliances	20,00 €	17,00€	26,40 €	27,30 €

Comparison between the recycling fees of 4 EEE categories in different national producers schemes (2003)

3.1.4.3. VISIBILITY OF RECYCLING FEES

Internalisation of the entire management costs into the price of products calls for an invisible recycling fee, but Sweden is the only country where the fee is completely invisible due to the regulation. In Norway where the choice is left to actors for making the fee visible or not, about 70% have adopted a visible fee. In the other management schemes under review, the fee is made visible to consumers when buying a new appliance.

3.1.4.4. FINANCING OF FUTURE WASTE

All the producers' organisations under review operate collective WEEE management schemes, which up to now have essentially established solutions in order to manage historical WEEE within the scope of a collective responsibility. ICT Milieu in the Netherlands, which originally opted for the complete "internalisation" of WEEE management costs, and thus for the invisible fee, has adopted in 2003 a collective system where WEEE treatment costs are shared between producers in accordance with their market share. So that nothing is planned until now for a collective management of individual producers responsibilities.

3.1.5. ACHIEVEMENTS

The table below presents the achievements of the selective collection schemes in five European countries in accordance with the origin of the WEEE collected. The management systems in Denmark, Norway, Sweden and Switzerland are common to all WEEE, whether they originate from private households or not.

	BELGIUM	THE NETHERLANDS	NORWAY	SWEDEN	SWITZERLAND
Collection rate (in weight /inhab.)	3,5 kg (2002)	4,13 KG (2000)	7,9 KG (EL-RETUR 2001 / EURO VIRONMENT 2002)	7 KG (2001)	8 KG (2002)
Origin of WEEE collected	HH	HH	HH	HH/NH	HH/NH

HH = households / NH = non households

These data are generally communicated by the existing national schemes, and are not easy to compare as they are linked to :

- the age of the systems
- the kind of electrical and electronic appliances covered : except in Norway where the data are these of consumers goods, systems which collect both households and non households WEEE like Sweden and Switzerland easily double the rates achieved
- the logistics in place
- the geographic area covered
- the socio-economic characteristics within these areas (essentially the number of appliances put on the market)
- ...

³⁵Norwegian retailers have got a more important role than in other systems, where retailers and distributors are only obliged to take-back WEEE on a 1/1 basis.



3.2. GENERAL DESCRIPTION OF SELECTED NATIONAL WEEE MANAGEMENT SCHEMES

3.2.1. BELGIUM

REGULATION

The 3 regional regulations for the management of WEEE, were implemented through three Environmental Policy Agreements, come into force in February 2001 within whole Belgium.

SCOPE

These agreements determine 7 main categories of appliances

- ▶ freezing and refrigerating equipment
- ▶ large white goods
- ▶ small white goods
- ▶ brown goods
- ▶ small household appliances
- ▶ IT- and Telecommunication Equipment
- ▶ gardening tools

RESPONSIBILITIES

Producers

Producers bear an individual take-back duty for their own products or for similar products tendered to them.

Trade

Retailers/distributors must take-back WEEE free of charge when selling a similar product.

MANAGEMENT PRINCIPLES

Promotion of reuse : the first stage after collection is to separate reusable appliances from non reusable ones, through social enterprises or trough other companies.

RECYCLING TARGETS

	RECYCLING RATES	FERROUS METALS	NON FERROUS METALS	PLASTICS
Large white goods	90%	95%	95%	20% RECYCLING (100% RECOVERY)
Refrigerating and freezing appliances	70%			
TV and PC screens	70%			
Others	70%			

MANAGEMENT

PRODUCERS' MANAGEMENT SCHEME

Recupel Asbl ³⁶ is an executive management scheme gathering currently 5 sector associations, covering respectively large household appliances, consumer electronics, small household appliances, IT - Telecommunication and office equipment, and electrical tools and gardening equipment.

COLLECTION INFRASTRUCTURE

Recupel collection scheme is organised through 20 social economy enterprises, 530 municipalities' containers parks and 1600 registered retailers. It will be further organised around about 30 Regional Transfer Stations (RTS) covering large collection areas, and where WEEE collected from municipal recycling facilities will be gathered and sorted.

In 2002, container parks captured 75 % of the WEEE collected, while the share of social enterprises was 10% and retailers and distributors gathered 15 % of the total amount collected³⁷.

LRAs leave their recycling parks and RTS at the disposal of Recupel, which provides these with collection bins. They remain the only responsible for the financial and logistic management of the collection facilities.

Thanks to forthcoming agreements between RECUPEL and local authorities, retailers should benefit from an extended access to containers parks and RTS for their WEEE. Sellers of EEE may register as collection points on RECUPEL website and have their appliances directly collected by RECUPEL.

Financing is borne by the consumers through a visible fee which is levied on the products, worked out by sampling at recycling plants, and managed per sector to cover the take back and treatment costs of appliances : transport from the container parks, sorting, and recycling. RECUPEL is currently negotiating with the distributors to remunerate the costs from the space taken up by discarded appliances.

In 2002, RECUPEL collected 35.875 tons of WEEE (= 3,5 kg per inhabitant) and achieved a global 80% recycling rate.

Role of LRAs

Role of retailers

FINANCING

ACHIEVEMENTS

³⁶<http://www.recupel.be>
³⁷RECUPEL Asbl, Rapport 2002, p.10



3.2.2. THE NETHERLANDS

REGULATION

Decree of 21 April 1998, entered into force partly on 1st June 1998 and completely on 1st January 1999

SCOPE

14 categories of Electrical and Electronic Equipment, including CFC products, which were regulated in two steps (large goods from 1st January 1999, and the remaining categories one year later).

RESPONSIBILITIES

Producers

Producers/importers have to take back and recycle :

- WEEE **of their own brand** from Local Authorities' collection points
- WEEE **of their own brand** tendered to them by a repair company
- WEEE **tendered to them by a retailer when supplying a new "similar" product.** (From January 1, 2005, this "old for new" duty will become a "brand-related" one).

Manufacturers and importers can be exempted from their individual duties by the signature of a Covenant with the Ministry of Environment and by joining a collective scheme.

LRAs

Since July 1999, **Local Authorities** must provide for household WEEE separate collection (either kerbside collection, or collection on sites), and for the creation and maintenance of a site within the municipality or the municipalities' association they are part of, where suppliers can leave a product taken back from a private household. As a corollary of the producers' obligations, municipalities are responsible for orphan products, and have to sort WEEE by brand to leave them at manufacturers' disposal.

Trade

Retailers have to take back WEEE coming from consumers on the "old for one" basis. It is prohibited to retain for commercial purposes freezers or refrigerators discarded after use.

RECYCLING TARGETS

The decree prohibits to incinerate products that have been taken back or collected separately. Recycling rates were defined on the basis of a pilot's outcomes conducted in 1996 by the Ministry, local authorities and manufacturers/importers.

	Recycling rates
TV sets	69%
Large white goods appliances	73%
Refrigerating and freezing equipment	75%
"Small" appliances	53%

Recycling rates are measured as weight % of **material not going to landfill or incineration** (or weight % of material processed).

MANAGEMENT

PRODUCERS' MANAGEMENT SCHEME

For white goods, 5 main producers' sector organisations have joined within NVMP³⁹ (Netherlands Association for Disposal of "Metalelectro" Products) while V-ICT⁴⁰ (or ICT-Milieu) has been set up for the management of grey goods (IT equipment, paper printing equipment and telecommunication goods).

Both take, through official carriers, goods discarded by consumers from RTS, retailers and repair companies, to their recycling partners.

Associated within the NVRD (Dutch Association for Refuse and Cleansing management) since 1996, local authorities ensure the collection and the transport of WEEE to one of the 69 Regional Transfer Stations where WEEE are sorted out and put to the disposition of manufacturers and importers of EEE. Since they provide manufacturers/importers with such a logistical structure, these have agreed that Local Authorities are neither obliged to sort WEEE by brand (unless they are paid for this service), nor to take care of orphan products.

Like repair companies, retailers have access to the municipal facilities. Regional Transfer Stations accept also waste tendered to them directly by retailers, but may charge them for the service.

In 2001, 87% of the products collected by NVMP originated from Regional Transfer Stations. The role of the distribution centres has stabilised at 3-4% of the total collection, while the retail sector collected directly 10% of the total amount. This channel seemed to display particular growth.

Local authorities only bear the costs for the collection and transport of WEEE until the "municipality limit"; other transport and sorting costs are financed by the manufacturers' organisations. LRAs finance WEEE separate collection by levying local taxes. Following the kind of service agreed with the Regional Transfer Station, this amounts to 0,16 € on average per inhabitant.

When buying an electrical or electronic equipment, consumers pay a removal contribution in addition to the purchase price.

With the removal fees, **NVMP** pays :

- the Regional Transfer Station : manufacturers/importers pay a fee per item that is transferred to them; this fee varies from 1,80 € to 3,40 €.
- the logistic and recycling partners.

Retailers receive also a proportional compensation for their take-back service (one-off 10% on the payment of removal fees).

ICT Milieu : ICT manufacturers and importers had originally opted for an individual producer responsibility and been paying for the real costs of treated grey goods of their own brand and of their share of orphans (individual responsibility, worked out by the recycling partners). But because of too many sorting constraints, and significant amounts of orphan products, a new financing scheme was introduced from 2003 based on a collective producer responsibility : producers will pay for the treatment of the effective items collected and processed in proportion of their current market share.

It has been estimated by the Ministry of Environmental Protection that altogether, the recovery of WEEE in the Netherlands costs about 1,00 € per inhabitant.

According to NVMP the collection results in 2001 corresponded to an amount of 4,13 kg WEEE/capita³⁹.

ROLE OF LRAs

ROLE OF RETAILERS

COLLECTION INFRASTRUCTURE

FINANCING

LOCAL AUTHORITIES

PRODUCERS' SCHEME

ACHIEVEMENTS

CFC-containing appliances management in The Netherlands

The decree contains a prohibition on the further sale of CFC and HCFC products. This means that product reuse is ruled out for refrigerating and freezing equipments.

³⁹<http://www.nvmp.nl>

⁴⁰<http://www.nederlandict.nl>

⁴¹M. Muijser, VLEHAN, "Waste Electrical and Electronic Equipment – a Dutch success story", *Jornada Internacional sobre Residuos de Equipos Eléctricos Y Electrónicos (REEE)*, CER, Octubre 2001.



3.2.3. NORWAY

With a population of about 4.554.000 inhabitants and an area of 385.155 km² (where 16% are islands and fjords), the population density in Norway is about 14 inhab. per km². The country is quite narrow, has a length of about 2000 km and counts 434 municipalities.

REGULATION

The Regulation regarding scrapped electrical and electronic products promulgated on 16 March 1998 entered into force on 1st July 1999.

SCOPE

No **categories** have been determined and all products containing electrical or electronic components are in principle embraced by the regulation with the exceptions of products permanently installed in means of transport or large devices (ex : lifts, escalators...) where only the components should be regarded as EE products.

The **re-use** of the EE product in its original form for its original purpose means that the product has not to be regarded as scrap and is not covered by the regulation requirements.

RESPONSIBILITIES

Producers

Manufacturers/importers are obliged to ensure that the EEE they introduce on the Norwegian market are collected when they end up as waste, and are recycled or otherwise properly handled. They are obliged to arrange for the collection of WEEE free of charge in geographical areas corresponding to those in which the products are sold, were sold or supplied through suitable logistic systems that do not cause "unreasonably high transport costs for any municipality". The frequency of collection points must take into account the needs of the municipality, and their capacity correspond to the share of manufacturers' sales in the area.

LRAs

Municipalities are obliged to receive all WEEE through accessible facilities (regarding number, site, opening hours...). They may demand a payment for production waste, but consumer waste have to be managed with the annual municipal tax.

Trade

All distributors/retailers in Norway are required to accept consumer WEEE free of charge. Distributors are also only obliged to accept WEEE of products belonging to the same products range they are selling at the time these discarded appliances are handed in. The "old for new" condition only applies to waste from companies.

Distributors/retailers and municipalities are responsible for a proper handling of WEEE as long as they are in their possession. This means that waste must be handled in such a way that environmentally hazardous substances can subsequently be sorted and treated, and that the opportunities for recycling are not reduced. If the municipality or the retailer does not deliver EE waste to the manufacturer/importer but forward it directly to an approved treatment facility, they are considered taking responsibility for further treatment, including the costs.

TARGETS

Collection

In 1998 a sector agreement was signed with the Ministry of Environment setting a target of 80% WEEE collection for the 1 July 2004.

National suppliers have established two management enterprises for consumers' WEEE :

- ▶ Hvitevareretur AS (large and small household appliances)
- ▶ Elektronikkretur AS (IT&T, Consumers Electronics, toys, medical...)

They have joined within El-retur in order to implement a collective logistic and recycling scheme.

In the El-retur system⁴², WEEE is collected from about 4.000 collection points:

- ▶ 350 municipal collection facilities
- ▶ 3.000 retailers
- ▶ and from about 650 other sources like workshops, offices and various waste management companies.

3 Regional collection companies are responsible for all logistic tasks, including the provision of cages and containers free of charge for collection facilities included. WEEE are then delivered to nine recycling plants dedicated to specific areas of the country.

MANAGEMENT PRODUCERS' MANAGEMENT SCHEME

LRAs finance the municipal collection facilities with local taxes.

Hvitevareretur AS levies a recycling fee per unit through the Norwegian Custom and Excise System (the fee is paid with each company's monthly taxes and duties), which forwards then the recycling fees to the system. The funds allow to pay the logistic and recycling costs as well as the kick backs to retailers and distributors.

For Consumers Electronics, **Elektronikkretur AS** members (447 businesses affiliated in 2001) pay a recycling fee per unit put on the market, through their branch associations. For brown and white goods, the recycling fee is prepaid, but for IT goods, total real management costs (for collection and treatment) are subdivided onto members' market shares (net volumes in kg) within the different product groups. Funds are managed by Elektronikkretur AS to pay the logistic and recycling partners.

Making the fee visible or not at the purchase is left to the distributor's discretion.

FINANCING

In 2001, 7,2 kg of WEEE per capita were collected and processed by **El-retur**, which following the definition of recycling within the Norwegian regulation, achieved a recycling target of 82%⁴³.

Euro Vironment, an independent system, was set up by 14 IT companies (including Compac and Dell which are together 50% of the IT Norwegian market). By collecting about 3.250.000 kg IT products in 2002 they achieved a collection rate of 0,7 kg per capita⁴⁴.

ACHIEVEMENTS

Cooling and freezing equipment

The responsibility is shared between the municipalities and manufacturers : these must deal with equipment not-containing CFCs while local authorities are responsible for CFC containing equipment. This has lead to a complex and costly situation, so that Hvitevareretur AS will now ensure the collection and recycling of CFC-containing equipment through separate agreements with municipalities.

⁴²<http://www.el-retur.no>

⁴³El-retur Environmental Report 2001

⁴⁴SUNDSTRÖM H. (Electrolux), Implementation of the WEEE Directive in the Nordic Countries, IERC 2003, Basel January 13-15, 2003.



3.2.4. SWEDEN

REGULATION

The Producer Responsibility for Electrical and Electronic Products Ordinance (2000:208) came into effect on 1st July 2001.

SCOPE RESPONSIBILITIES *Producers/ Trade*

10 categories of products are allocated to the Producer Responsibility. Refrigerators and freezers are excluded, since there is a municipal responsibility for these products.

Manufacturers, importers and retailers are jointly responsible. When selling a new product, they are obliged to take back at the place of supply or at another suitable designated place, a "similar" product handed to them and serving essentially the same purpose as the product sold. This obligation is related to the same number of products as the products sold. Producers may designate suitable collection points only after consultation with the municipality.

MANAGEMENT PRODUCERS' MANAGEMENT SCHEME

To avoid collection in shops, El-Kretsen AB⁴⁵ (service provider set up by 23 trade associations in the electrical and electronic sectors) has made agreements with all 289 Swedish local authorities to use their collection schemes.

ROLE OF *LRAs*

Households who want to dispose of electrical or electronic products without buying a new one may give it to the Local Authority, which must dispose of it properly. Either they benefit from collection facilities (free of charge), either there is a collection service for bulky and heavy products, at a fee.

Retailers

The retailer has just to refer customers to the existing facilities. If it receives electronic waste, it can deposit it free of charge at a collection point (as retailers may use municipal facilities for household waste provided that they respect a limit of 1 m³), or request El-Kretsen to collect it.

COLLECTION INFRASTRUCTURE

The collection of electric and electronic waste at recycling centres is the most common method in Sweden. It is sometimes supplemented with on-site collection at housing estates.

Collection stations are run at the own initiative and expense of local authorities (exception to the producer responsibility principle).
Producers (through EI-Kretsen) finance the further collection and the recovery of WEEE, but historical electronic waste from households is the responsibility of the municipalities.

As the Swedish law demands products show the total price, visible fees are forbidden.

Recycling fees are very complex and depend on the return rates, weight of appliances, methods and costs of treatment, material composition.

EI Kretsen uses three different financing models

- ▶ Standard : recycling fee per unit put onto the market. A preliminary cost is fixed and the accounts are settled for each product type at the end of the year.
- ▶ ICT : the real costs of collection and treatment of ICT-WEEE are charged each month to the manufacturers according to their market share.
- ▶ There exist also fixed annual fees for some products.

The funds are managed by the system to pay the different partners of the system, and the recycling costs.

On average, the costs of WEEE collected and treated are about 4,85 SEK/ kg (c.a. 0,52 €), with 74% for treatment, 14% for transport, and 12% for administration / information costs.

FINANCING

ACHIEVEMENTS

In 2001 during the first six months when producer responsibility applied, about 30.000 tons of WEEE were collected by EI-Kretsen from households and industry, equivalent to 7 kg per inhabitant.

⁴⁹<http://www.el-kretsen.se>



3.2.5. SWITZERLAND

REGULATION

Ordinance on the return, the take-back and the disposal of electric and electronic appliances (OREA), in place since 1 July 1998.

SCOPE

The OREA addresses appliances which depend on electricity and specifically mentions: consumer electronics, office, information and telecommunication equipment, and household appliances.

RESPONSIBILITIES *Producers*

Manufacturers or importers have to take back appliances of their own brand or of the brand they sell.

*LRA*s

Municipalities have no mandatory take-back obligation, and are thus not obliged to provide for separate collection or for collection points. If they are willing to, local authorities can do it on a voluntary basis, knowing that electrical or electronic appliances cannot be dealt with anymore together with bulky waste collections, and that the OREA decree states that disposal of these appliances must be financed by market actors.

Trade

Retailers must take back appliances similar to those they sell from final consumers.

MANAGEMENT

PRODUCERS' MANAGEMENT SCHEME

2 main voluntary schemes have been set up :

- ▶ SWICO⁴⁶ has been dealing with "office equipment" and consumers electronics from 2002
- ▶ SENS deals with refrigerating and freezers.

Both have been working together from 1st January 2003 within a global solution for WEEE management.

COLLECTION INFRASTRUCTURE

In Switzerland, the retailers network is considered to offer enough taking back opportunities in itself⁴⁷, and returning equipment to the dealer or the manufacturer is strongly recommended by SWICO, as they are specialists to assess the possibility to recycle the equipment or parts of it. With this approach, 5-15% of discarded equipment can be reused. Retailers take back discarded appliances from private and business users free of charge. Pick up services are organised on request by the manufacturers associations from private households, points of delivery or (re-)distribution centres.

There are 4 possibilities for Municipalities :

1. They choose not to organise WEEE collection : end-users are informed about the possibility of bringing back their WEEE free of charge to a retailer or an official SWICO collection point.
2. Municipalities propose to organise once or twice a year a separate collection of WEEE and are therefore provided with pallets and frames. The costs of transport and recycling are borne by SWICO.
3. EE discarded appliances they not "actively collect" may be brought to official SWICO collection points : this allows small municipalities to benefit from a take-back free of charge for small quantities.
4. For municipalities which collect more than 5 tons WEEE p.a., the municipal collection point is enlarged to become an official SWICO collection point.

ROLE OF LRAs

The manufacturers have set up a Convention for Recycling and Disposal, that obliges participants to impose an Advanced Recycling Fee (ARF) on the sale of new equipment. Manufacturers transfer the fees on a recycling account held by SWICO.

FINANCING

There are 2 different models to calculate the ARF (which includes also the Advanced Disposal Tax for batteries) :

1. IT and office products : fee conditional on the equipment value
 2. consumer electronics : each piece of equipment has a specified fee.
- Consumer goods which price is not higher than c.a. 35,00 € are not subjected to the ARF.

ACHIEVEMENTS

The current figure for collected WEEE in Switzerland is 8 kg/ capita. More than 75% of end-of-life equipment is recycled, approximately 20% are incinerated, and 3% end up in landfills⁴⁶.

⁴⁶<http://www.swico.ch>, <http://www.sens.ch>
⁴⁷Guidelines for the ordinance on the return, taking back and disposal of electrical and electronic appliances, SAEFL, 2000.
⁴⁸The Swiss experience and the EU WEEE Directive , P. Bornand (SWICO), Waste Management World, Nov-Dec 2002.



3.2.6. DENMARK

Generalities

The Danish waste management system is :

- a global waste management model covering the prevention, collection and treatment of all types of waste (industrial, commercial and household)
- under the responsibility of local councils
- making use of energy recovery more than other European countries.

REGULATION

Order from the Ministry of Environment and Energy, n°1067 of December 22, 1998 on Management of Waste from Electrical and Electronic products

SCOPE

The regulation essentially covers white goods, radio and television sets, IT products, office equipment and instruments of monitoring and control.

RESPONSIBILITIES

LRAs

Local councils were given until 1st June 1999 for providing regulations laying down detailed rules on the handling, assignment and collection of WEEE.

RECYCLING AMBITIONS

The regulation should lead to the diversion of 25.000 tonnes of WEEE from incineration and land-filling to recycling and so allow to recover for instance 40% of the landfilled copper.
(Source : Waste 21, Waste Management Plan 1998-2004).

MANAGEMENT

ROLE OF LRAs

Local authorities ensure that waste electrical and electronic equipment is collected and assigned to separate treatment and approved companies. About 30 SME have so developed an expertise and specialised in the processing of WEEE.

PRODUCERS

Upon request, they may be granted permits by local council to take back free of charge their own or similar products.

RETAILERS

Distributors and retailers may offer a take back service in the scope of municipal waste management schemes.

FINANCING

Costs for implementing the WEEE legislation until now have been met by local governments. The regulation in place is estimated to induce a rise in the annual tax paid by households of about 5,4 €.

³⁸ WASTE 21, Waste Management Plan 1998-2004, http://www.mst.dk/udgiv/Publications/1999/87-7909-571-2/html/default_eng.htm

CFC-containing appliances management in Denmark

The collection and management of refrigerating equipments containing CFCs are ensured by an agreement between the Danish Minister of Environment and Energy, and relevant associations on the disposal of CFC-containing equipment.

The aim of the agreement is to collect a minimum of 90% of the total amount of discarded refrigerators for environmentally sound treatment, in compliance with the requirements laid down in a circular on municipal regulations on disposal of CFC-containing refrigeration equipment. Local councils must establish assignment or collection schemes and ensure that CFC-12 is extracted at 95%, and that CFC-11 is extracted at a rate of 80%.

It is estimated that about 250.000 pieces of equipment (12.500 tons) are treated each year, and that 100 tons of CFCs are extracted thereof³⁸.

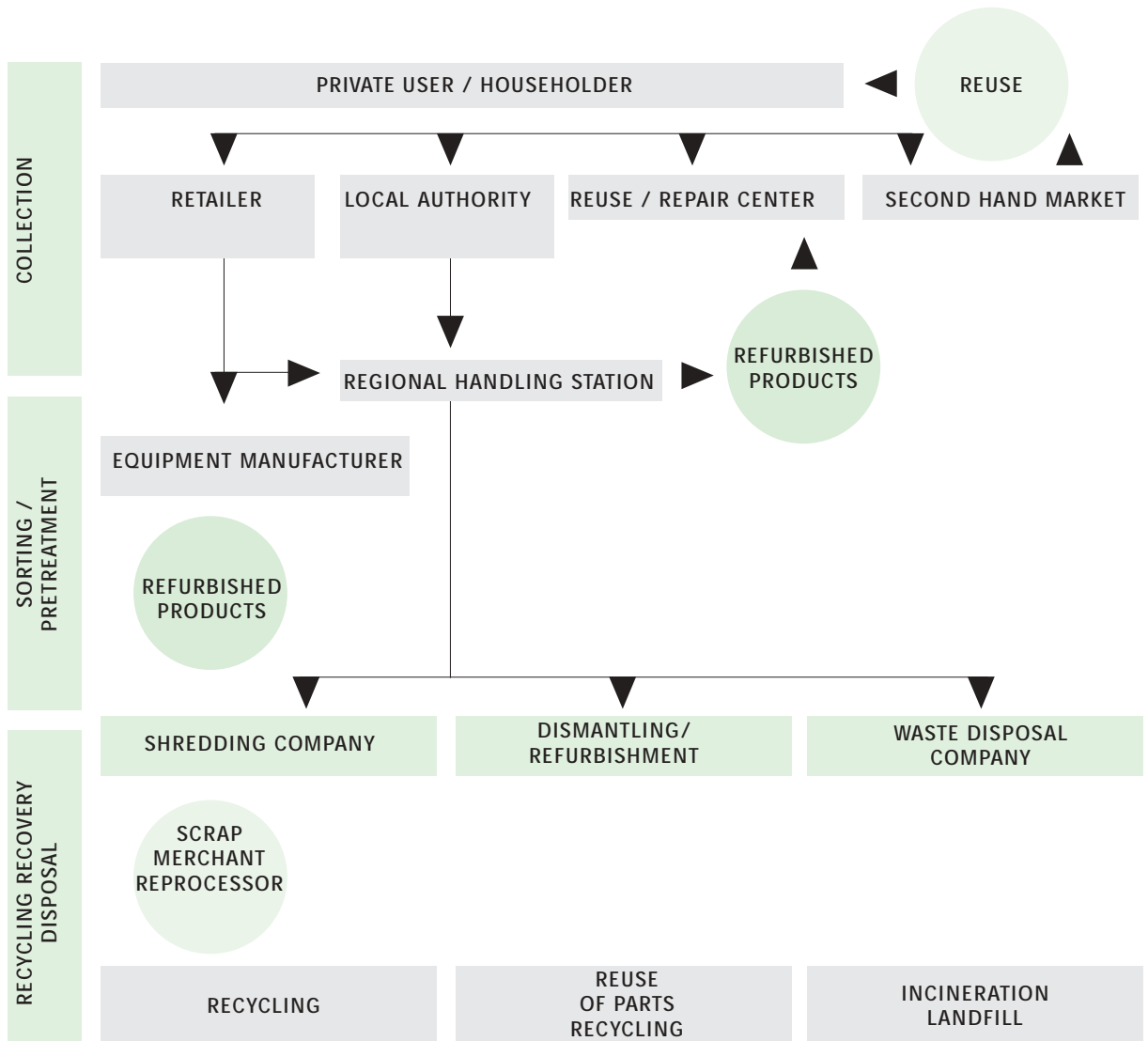




4. THE COLLECTION AND SORTING OF WEEE



4.1. MUNICIPAL WEEE MANAGEMENT STREAMS: GENERAL VIEW



The WEEE directive will affect the current management of WEEE as regards :

- **requirements and standards** for collection and treatment processes (recycling facilities using the Best Available Technologies)
- the **sharing of responsibilities** between the various actors involved.

There will also be an increased need for procedures to quantify the collected WEEE and **record data**.

4.2. GENERAL SCOPE OF ACTION FOR LRAs

Currently, it is recognised that collection directly from retailers may provide better quality products. Manufacturers have an easy supply from their take-back schemes – 80% of the returned units are estimated to be in working order and 10% of the whole appliances and their parts, less than ten years old, are suitable for the remanufacturing process⁴⁹.

But even if worldwide producers decide to set up their own take-back schemes and recycling centres, local authorities, even if not directly charged with specific duties by the European WEEE Directive, will remain the interface between producers and consumers, and current municipal collection facilities a basis of the system, as it makes sense to use the existing collection, sorting and dismantling infrastructures.

The real challenge for LRAs lies in ensuring that WEEE is collected separately, that reusable machines are separated from non reusable ones, and both are sent to the adequate treatment facilities. Consequently, they will have to :

- ▶ make the most of their infrastructure regarding :
 - the setting up of separate containers for WEEE in civic amenity sites
 - the development of other bringing schemes (banks) for smaller items
 - an expanded collection via the voluntary sector, ... in order to prioritise reuse
- ▶ ensure public access (last owners and distributors) for free disposal of WEEE
- ▶ quantify the collected WEEE and record data's.

4.3. ESTIMATING THE POTENTIAL QUANTITIES OF WEEE IN A GIVEN AREA

For the OECD countries, the annual WEEE potential has been roughly estimated at an average of 20 kilograms per capita. To this total amount, private households are expected to contribute 12 kilograms, while 5 kg come from the industrial sectors and 3 kg from cables.

One of the difficulties for the management of WEEE is that there is no connection between the quantities on the market and the waste streams, because :

- their use life is often shorter than their estimated technical life span
- of the phenomenon of storage (residence time), reuse or reselling...

So that when a product is given back depends not only on its lifespan, but also on the household's storage capacity (which are larger in rural areas than in cities), and on human behaviours and psychology.

Two fundamental methods are generally used to estimate the potential amount of waste electrical and electronic equipment (WEEE) in a given area : the "Consumption and Use method", and the "Market Supply method". Both methods rely on assumptions about a typical catalogue of EEE, their average weight, their average life-time, the socio-economic situation in a geographical region and a statistical residence time of electrical and electronic appliances in private households.

More information on these aspects can be found within a study made by Ökopol for the European Commission in 1998⁵³.

From October this year, Japanese citizens will be able to get rid of their laptop or private computer by dumping it at their post office in a labelled parcel, that a logistic enterprise will forward and redistribute to each of the 21 manufacturers which have implemented this take-back scheme together with the Japanese Economy and the Environment Ministries.⁵⁰

Average age of household appliances when discarded by UK households⁵¹

Product category	Age of discarded appliances (years)
Electric cooker	12
Refrigerators and freezers	11
Televisions	10
Hi-fi and stereo	9
Washing machines, dishwashers and tumble dryers	9
Vacuum cleaners and carpet cleaners	8
Video equipment	7
Home and garden tools	7
Microwave ovens	7
Computers and peripherals	6
Radio and personal radio, stereo and CD	6
Telephones, faxes and answering machines	6
Mobile phones and pagers	4
Small work or personal car appliances	4
Toys	4

Note : the data including the products donated or sold and subsequently reused, as well as products discarded as "in need of repair", or "broken beyond repair".

ZVEI, the German electrical and electronic manufacturers' association, estimates that the average age of washing machines that will be returned in Germany during the year 2005 is about 16 years⁵².



In the near future all the appliances will be marked by means of a crossed wheeled bin, to inform the consumers that they should not dump them in the waste bin.

4.4. ORGANISING THE COLLECTION OF WEEE

An efficient collection system is dependent on :

- accessible and efficient collection facilities
- adequate and consistent information to the users.

Transport, handling, but also sorting and storage issues are crucial to preserve reuse opportunities and to avoid damaging or breaking the components that contain hazardous substances. The good practice recommends to have procedures ensuring that everything is operated in an efficient and safe manner. To reduce the risk of harm to people and the environment, the system should ensure minimal movements of products and minimise manual handling. It should also aim to remove hazardous substances and to separate reusable appliances as early as possible in the process.

The collection means will vary, following distances, rural or urban patterns, and the size of collected appliances. Some categories will require specific collection routes like flatbed collection (for fridges and other reusable household appliances). Others will be deposited in bulk containers, banks or put in parcels or envelopes.

4.4.1. MUNICIPAL COLLECTION SCHEMES

Local authorities are responsible for municipal waste management in general, and they already collect WEEE through the domestic collection methods they operate in the form of :

- **Kerbside collection (separate or not, scheduled or on request)**

Sometimes local authorities offer separate collection, sometimes WEEE is collected together with the collection of bulky household waste; some local authorities may collect WEEE on call.

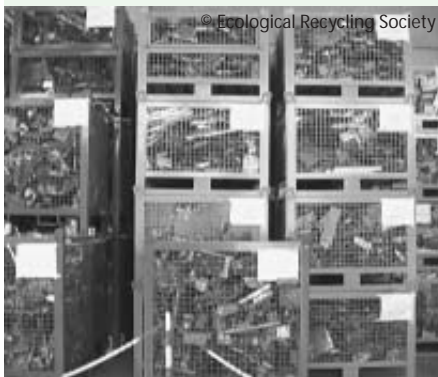
- **Bring systems (recycling parks and collection points)**

The consumer can bring his old appliance to a municipal recycling park or collection point. WEEE can be stored there as far as separate bins and suitable containers are available.

Mobile collection points for WEEE do also exist in the USA for instance, and in Germany : collection trucks remain at the public disposal at scheduled times, in identified areas of the municipality, so that citizens can bring their discarded electrical and electronic appliances.

- **Others**

In all other cases the WEEE is disposed of or incinerated together with other waste streams. This is especially the case for small household appliances, tools, telephones or Hi-fi devices, which end up in household waste bins, as little has yet been done to discourage householders from disposing of WEEE with other municipal waste : for instance, in the UK, only 1% of small household appliances enters the recycling process⁵⁴.



4.4.2. TAKE BACK BY RETAILERS

When buying or delivering a new large household appliance, retailers usually offer to take it back in store or via other arrangements. This "extra service" for the consumer allows them either:

- to send back the appliance to the distributor or manufacturer of the product
- to use the old appliance to recover spare parts
- to sell it as second hand goods
- or to sell it to a scrap merchant for its residual value.

With the new WEEE Directive, this free service may become mandatory.

4.4.3. TAKE BACK BY SOCIAL ECONOMY ENTERPRISES

In various member states, social economy enterprises have been active for years in the collection and management of WEEE. They sometimes represent the main route for the citizens to leave their appliances for proper management, as they can :

- bring their discarded appliances to a re-use centre
- donate them to a charity organisation or community recycling shop with re-use activities
- or make a call to have their appliance(s) collected at home.

4.4.4. OTHER CHANNELS

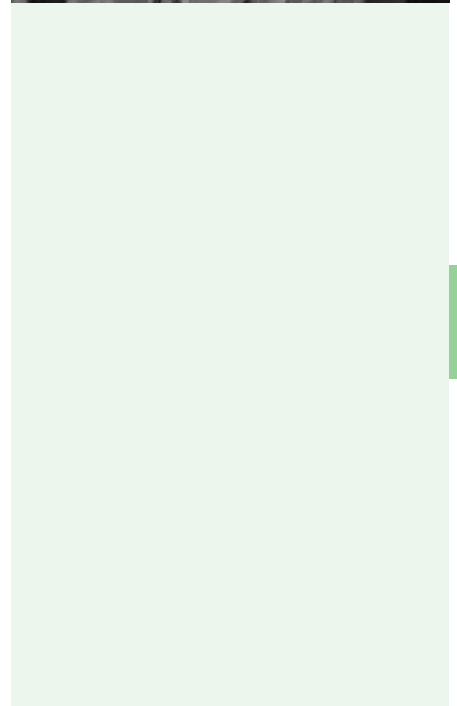
Serviceable old appliances can also be :

- sold privately to second hand shops or dealers,
- sold consumer to consumer (through advertising in newspapers and magazines ...)
- or donated free to family and friends.

These are opportunities to contribute to reuse and life span extension.

Damaged WEEE may be :

- given to a repairer for the spare parts
- given to scrap merchants or other recycling companies.



⁴⁶WEEE Remarket, DARP Environmental Ltd, www.darpenvironmental.com, p. 95.

⁴⁷ENVIRO 2B, 25 June 2003 - <http://www.enviro2b.com/france/web/serv/enviro/ActusDetail?index=0¤t=615&List=verity>

⁴⁸T. Coopers and K. Mayers, "Prospects for household appliances", E-SCOPE, UK, 2000.

⁴⁹"How much WEEE in your cupboard ?", O. Frey (ZVEI), Green Week, Tuesday 3rd June 2003.

⁵⁰Institut für Ökologie und Politik GmbH (Ökopol), „Collection targets for Waste from Electrical and Electronic Equipment (WEEE), Final Report compiled for the DG XI, May 1998.

<http://www.oekopol.de/de/Archiv/Stoffstrom/weee.htm#Methods>

⁵¹Discussion Paper of 28 March 2003 by the UK Government, Scottish executive, Welsh assembly government, and Northern Ireland administration on the implementation of Directives of the European Council and Parliament 2002/96/EC of 27 January 2003 (WEEE) and 2002/95/EC of 27 January 2003 (ROHS), Department of Trade and Industry, Publication Number URN 03/B11, p. 81. www.dti.gov.uk/sustainability/weee/index.htm

For an interesting study on that topic : "The Measurement of WEEE", Resource Recovery Forum, May 2003.



4.5. DATA KEEPING

With the coming into force of the Directive, local authorities will need to compile figures about weight and/or numbers of appliances and parts collected, reused, recycled, recovered and exported.

This information will have to be compiled in reports, in order to set up national databases and to document for instance the evidence of a 4 kg WEEE collection per inhabitant per year. The data capture methods will depend on those of segregated collection. Electronic tagging (e.i. bar-codes) could be developed for that purpose by manufacturers. In the meantime, the weight and kind of appliances will have to be determined by weighing mixed collected WEEE and classifying them into the different directive's categories by sampling, or even better, by gathering more precise information upstream thanks to a segregated collection whenever possible.

As regards data records, it might be advisable to ensure and keep track that all hazardous substances (e.g. CFCs) have been recovered by treatment plants which comply with the technical requirements framed by the WEEE Directive (see chapter 5).

4.6. CHOOSING THE BEST ROUTE FOR THE COLLECTED APPLIANCES

Sometimes the best environmental option for collected WEEE might be dismantling or shredding for recycling. But, when it is better for the environment, reuse must be encouraged, especially when the product has been discarded for the only reason that it no longer matched the user's needs. Keeping appliances fit for reuse requires the correct organisation and type of collection, transport, assessment, sorting and storage operations in order to maintain the "reusability" of such appliances.

4.6.1. HOW TO SEPARATE ITEMS ?

Electrical and electronic appliances are a highly diverse group of products; the WEEE directive has defined 10 categories. But beyond reuse aspects, and for waste management purposes (collection, recycling and data monitoring), sorting the collected items into the following categories may be appropriate⁵⁵.

Categories	Reason for separation
1. Refrigerators & freezers	need for safe transport (without destruction) and subsequent separate treatment.
2. Large white goods [except refrigerators]	may be sent to shredders for ferrous metals recovery.
3. TV sets & monitors	CRT need safe transport (without destruction) and subsequent separate-treatment.
4. Light sources	they need special recycling or recovery processes.
5. Other WEEE	all remaining WEEE (office and IT equipment, brown goods & small appliances) are expected to go into very similar recycling or recovery operations.

4.6.2. ENSURING THE PROPER HANDLING OF APPLIANCES

What is at stake ? To preserve the integrity of the collected appliances by avoiding damage or breakage, to ensure sending them by the best management route to adequate management facilities and to avoid the leakage of hazardous substances.

4.6.2.1. DURING MUNICIPAL KERBSIDE COLLECTION

Considerations for organising WEEE kerbside collection will depend on :

- the costs of collection (area, frequency, number collected)
- the storage capacities
- the possibilities to work with local social enterprises.

Collectors should be able to assess the appliance for reusability and spares requirements at the collection point, and as soon as an appliance is deemed un-reusable, it should be moved to where it can be treated as waste, before any time and money are put into refurbishing and repairing them.

To ensure that handling and loading do not affect reusability, the staff should be trained regarding handling aspects (ex : fridges and freezers should be transported upright) and proper organisation of transport :

- appropriate vehicles with tail lifts for heavy items
- equipment to fasten the appliances to the transport vehicle in order to prevent damage and the release of liquid pollutants
- reusable protective wrapping
- boxes for smaller items.

After an initial selection test, in order to identify whether the appliance can profitably be repaired or refurbished, the appliances should be sorted by type and condition and labelled with their destination, i.e. :

- reuse of whole appliances
- reuse of components
- recycling
- recovery/disposal.

First of all : informing your citizens that second-hand channels are not waste bins

The good condition of the product and its re-saleability are not always easy to appreciate by the public : it is important to make him aware of the difference between WEEE and EEE which could be reused, repaired or resold, and of the different channels which can respectively deal with each of the categories. It is worth raising citizens' awareness on this topic, and maybe implementing criteria for collection or acceptance at municipal collection points.

Since January 2003, a leaflet has been distributed in Brussels' area to promote second-hand, reuse and repair of electrical appliances notably, and to explain to citizens that if a product is too old or broken, it won't be resold through repair workshops or social economy enterprises, but maybe dismantled for the spare parts, or simply shredded to be recycled.

⁵⁵ Institut für Ökologie und Politik GmbH (Ökopool), „Collection targets for Waste from Electrical and Electronic Equipment (WEEE), Final Report compiled for the DG XI, May 1998. <http://www.oekopol.de/de/Archiv/Stoffstrom/weee.htm#Methods>

4.6.2.2. AT MUNICIPAL COLLECTION POINTS

At the collection points like recycling parks small and large equipment can be separated immediately. The segregation between reusable and non-reusable can also be done, in order to send them by the appropriate route to the adequate treatment facilities.

If municipal officers are expected to separate the reusable from non reusable appliances it will be necessary to provide them with transparent information and to train them in giving directives to the citizens or in first making a visual selection on re-usability.

At collection points, the storage of WEEE requires :

- a sufficient storage capacity
- a covered and closed area, with adequate flooring and storage boxes in order to :
 - ▶ preserve reuse potential
 - ▶ ease the dismantling of appliances
 - ▶ prevent the theft of appliances or components with a commercial value
 - ▶ prevent leakages and pollutions
- a limited storage time.

4.6.2.3. AT REGIONAL HANDLING STATIONS

Regional handling stations optimise the scale of collection and transport to treatment facilities. If no selection on reuse is done before, then the regional handling station is the place to do so.

It is possible to pre-treat some of the product groups during their stay in the regional handling station. For instance, CFC-containing appliances can be degassed to ensure environmentally safe transport, or television sets can be dismantled partly to transport the different parts to treatment facilities at different locations.



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4.7. COLLECTION AND TRANSPORT COSTS

According to the WEEE Directive the final holder should be able to get rid of his old appliances free of charge⁵⁶, but separate WEEE collection will necessarily require some investment : containers, box pallets, specific scales, registration tools information campaigns...

How will the financial costs of separate collection be shared ? Producers will have to finance the collection from the so-called "recycling points", the treatment, recycling and environmental disposal of their waste. In the scope of agreements for the definition and use of these collection points, they might provide local authorities, private companies or social economy enterprises with equipment for collection facilities and regional handling stations, as this is already the case in most European producers schemes.

Factors for collection and transport costs include notably :

- the level of service : pick up or delivery
- the kind of products collected (necessary containers, necessary number of transports per tonne, special handling for CFC-containing appliances ...)
- the serviced area and transport distances
- the existing infrastructure.

These costs will probably go down over time once :

- basic infrastructure investments have been made
- logistics have been optimised
- the awareness of citizens has allowed to achieve increased collection rates and create economies of scale.



Management channel	Responsible actors	Collection costs/ tonne
Civic amenity sites	Local Authorities	~ 150 €
Collection on demand		~ 250 €
Scheduled kerb-side collection		~ 215 €
Take-back on delivery	Retailers	~ 235 €
In-store take-back		~ 340 €

Estimated separate collection costs in the UK⁵⁷

⁵⁶Art.5§2,a) WEEE Directive

⁵⁷Discussion Paper of 28 March 2003 by the UK Government, Scottish executive, Welsh assembly government, and Northern Ireland administration on the implementation of Directives of the European Council and Parliament 2002/96/EC of 27 January 2003 (WEEE) and 2002/95/EC of 27 January 2003 (ROHS), Department of Trade and Industry, Publication Number URN 03/811 www.dti.gov.uk/sustainability/weee/index.htm



5. PRE-TREATMENT AND RECYCLING





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5.1 BEFORE DISMANTLING

Before dismantling, shredding, cutting, compressing ... all components and substances which could create environmental or health problems should be removed before the appliance's metal, glass and plastic parts are recycled : capacitors (PCB), cathode ray tubes (CRT), batteries and substances like mercury (e.g. switches in coffee machines) or CFC in refrigerating appliances...

Pre-treatment facilities will need to be clear about their obligations and about which will be the standards and the minimum levels in relation to the removal of liquids etc... For their security and the efficiency of the operations, the WEEE Directive requires that producers inform refurbishment centres, and recycling and treatment facilities about procedures and standards to be followed.

In its annexe III, the Directive defines some technical requirements for treatment and storage which cover: balances/scales to measure the weight of treated waste, impermeable surfaces, waterproof covering, spillage collection facilities, availability of decanters and degreasers, appropriate storage for spare parts, appropriate containment for batteries, condensers and hazardous waste, water treatment equipment...

Any establishment or enterprise carrying out treatment operations should use the best available treatment, recovery and recycling techniques and must necessarily obtain a permit which will define:

- ▶ permitted types and quantities of appliances;
- ▶ general techniques to comply with;
- ▶ safety precautions to be undertaken;

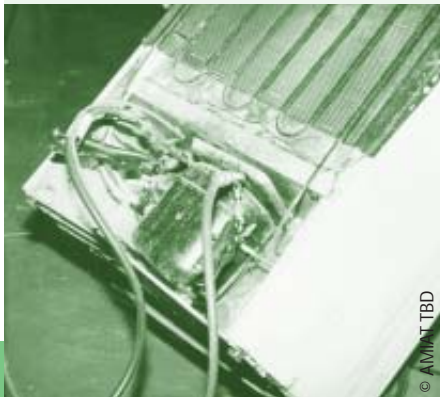
It will have to be inspected at least once per year and reported on.

These activities require the LRA or their sub-contractors to check the compliance of the above requirements.

5.1.1. OZONE-DEPLETING SUBSTANCES (ODSs)

Ozone-depleting chlorofluorocarbons (CFCs) and other atmospherically relevant substances listed in the European regulation (EC) 2037/2000 have been banned from the market, because once released into the atmosphere, they damage the ozone layer. From 1st January 2002 all ODSs used in domestic refrigeration appliances must also be recovered (during servicing and maintenance of equipment, or prior to dismantling or disposal) for destruction by an environmentally acceptable technology, or recycled rather than destroyed.

CFC refrigerant gases can be found in the cooling circuits of refrigerators, freezers, air conditioners, water coolers, heat pumps and dehumidifiers. CFCs are also found in wall panel insulating foam in freezers and refrigerators, packaging, aerosols and degreasing agents.



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Requirements to be met by fridge recycling operations

The major objectives of any scheme designed to collect and treat waste refrigeration equipment must be the loss-free recovery and subsequent destruction of CFCs. Fundamental to its success is the proper collection and storage of the end-of-life appliances before they are subjected to the actual recycling operations.

There are typically two main sources of CFCs in domestic refrigerators and freezers. Approximately 150 g of CFCs (i.e. about 1/3 of the total CFC content) is contained in the cooling circuit, while 300–400 g of CFCs (2/3 of the total) are locked within the polyurethane foam that is used to thermally insulate the appliance. To ensure that all waste appliances are fully recycled, involves treating both the cooling circuit and the insulation foam.

Standards and their enforcement are critical in the ODS recovery operations : these require qualified operators, traceable achievements and efficiencies, and localised solutions whenever possible.

5.1.2. POLYCHLORINATED BIPHENYLS (PCBS) AND HEAVY METALS IN METAL DOMINATED PRODUCTS

The main problem for metal dominated products is to separate precious metals from hazardous substances such as polychlorinated biphenyls (PCBs) and heavy metals. PCBs are carcinogens that do not break down in the environment. Some appliances contain electrical parts such as capacitors that have PCBs : refrigerators, freezers, washing machines, microwave ovens, televisions, heating and cooling equipment and electronic equipment. Shredding these products could produce waste contaminated by PCBs. During disassembly of capacitors there is a danger of receiving an electric shock, and of getting cauterised if the PCBs liquid substances come into contact with skin or organs. The metal separation process also produces fine metal dust containing gold, aluminium, copper and iron, which may harm workers' health.



The RAL Quality Mark is the distinctive label accorded to those operators which comply with the specifications and requirements defined by the RAL Quality Assurance Association for the de-manufacture of Refrigeration Equipment Containing CFCs. These specifications are a comprehensive compilation of requirements that cover all stages of the de-manufacturing process. With complete documentation and logging stipulated for every step, the RAL standard ensures that de-manufacturing is a totally transparent process.

More information:

<http://www.ral-online.org/>

In the Grand-Duchy of Luxembourg, the amount of discarded refrigerating appliances is currently about 15.000 units per year. Thanks to an initiative called the "Superfreonskescht" lead by the Minister of the Environment and the Luxembourger municipalities, the collected appliances are regularly gathered (on demand, when municipalities are about to reach their storage capacity) at a grouping centre, where they are pre-treated by mobile plants for recovering the hazardous substances contained in the cooling circuits, before the insulating foam and other recoverable parts are recycled.





5.1.3. CATHODE RAY TUBES (CRT)

The panel glass of cathode ray tubes contains heavy metals like barium, strontium, zirconium... and the funnel glass has got a heavy lead content. Both must be separated and follow a specific treatment. The fluorescent tube has to be removed under special hygienic circumstances to avoid any contact with skin, while during the removing of barium the inhalation of dust should be avoided. Handling of CRTs can generate a danger of implosion. As a consequence, protection for the face and the neck is needed, hands and arteries have to be covered with special gloves, and stable boots and a thick apron are obligatory for protecting the stomach and hips.

5.1.4. BROMINATED FLAME RETARDANTS

They ensure flammability protection of appliances and are mainly used in printed circuit boards, or components such as connectors, plastic covers and cables (of TV sets and domestic kitchen appliances for instance). If incinerated, they can lead to the emission of toxic furans and dioxins. EEE components with brominated flame retardants must so be prevented from entering incineration processes.

5.2. DISMANTLING METHODS

In order to recover materials, equipment has to be taken apart. This can be done by hand, mechanically or by using a blend of the two approaches. Manual dismantling is normally more costly than mechanical one but often produces higher yields of useful material. Some manual dismantling is essential if components are to be recovered for re-use, as it allows :

- an easier identification of working components for remarketing
- greater separation with little energy consumption
- efficient removal of hazardous waste (but a serious problem is workers' exposure in that respect).

5.2.1. CODES OF PRACTICE FOR DISMANTLING AND RECYCLING

Dismantling of appliances has to be optimal in order to provide components that can be used as spares. Materials of a commercial value (like copper) must be retained for sale while low-value waste material should be collected for processing. Data should also be gathered to inform product designers about making recycling more efficient.

Since the WEEE legislation was introduced, specific processes for dismantling are required, and producers and manufacturers will have to make the necessary information available to organisations involved in dismantling operations. These requirements should be seen as an opportunity for the re-use sector to offer new services and consequently gain more appliances of better quality, and a wealth of spares for repair.

5.2.2. MAIN CRITERIA FOR DISMANTLING:

- ▶ Do you save money by reusing components ?
- ▶ Is it economically feasible to dismantle and recover any value from parts and materials ?
- ▶ Do any pre-treatment operations require the appliance to be dismantled ?
- ▶ Is there a market for the material recovered ?

Dismantling is mainly a manual exercise, and labour costs are a variable cost element, depending on the type of product to treat. But these costs may decrease rapidly together with the experience gained and the investment made in training and equipment.

The costs for dismantling may be roughly estimated on the basis of the dismantling time. For example, the dismantling costs for a PC have been estimated at :

20 –25 minutes labour x average wages + 30% of the average wages to reflect non-labour costs.

Based on the assumption that dismantling a PC of 20 kg costs £5 - £6 (or about 8,00 €) per unit in the UK, the following estimations have been made regarding different categories of appliances which are assumed to be easier to dismantle, and made of less components than PCs⁵⁸.

	Composition	Average weight	Dismantling time	Dismantling costs (£)	Dismantling costs (in €)
ICT products 1	30% PC	20 kg	PC	£5 - £6	~ 8,00 €
ICT products 2	70% other	50 kg	= 1/2PC	£2,5 - £3	~ 4,00 €
Brown goods	66% TV sets	26 kg	= 1/2PC	£2,5 - £3	~ 4,00 €
Large white goods		47 kg	= 1/2PC	£2,5 - £3	~ 4,00 €
Small HH appliances		2 kg	= 1/2PC	£1,25 - £1,5	~ 2,00 €

⁵⁸Discussion Paper of 28 March 2003 by the UK Government, Scottish executive, Welsh assembly government, and Northern Ireland administration on the implementation of Directives of the European Council and Parliament 2002/96/EC of 27 January 2003 (WEEE) and 2002/95/EC of 27 January 2003 (ROHS), Department of Trade and Industry, Publication Number URN 03/811 www.dti.gov.uk/sustainability/weee/index.htm

When products are too obsolete to be repaired, or are worn, they can still be recycled. For instance, all large domestic appliances have historically been deemed recyclable due to their size and weight, and the composition of the pressed steel used for their structures.

5.3. RECYCLING MATERIAL AND COMPONENTS

Equipment category	Ferrous metals	Non-ferrous metals	Glass	Platics	Other
Large household appliances	61%	7%	3%	9%	21%
Small household appliances	19%	1%	0%	48%	32%
IT equipment	43%	0%	4%	30%	20%
Telecomms	13%	7%	0%	74%	6%
TV, Radio etc...	11%	2%	35%	31%	22%
Gas discharge lamps	2%	2%	89%	3%	3%

Source : ICER 2000

5.3.1. RECYCLING TECHNIQUES

There are four broad methods currently employed for recycling:

- ▶ Equipment dismantling : the manual separation of reusable and recyclable components.
- ▶ Mechanical recycling : the removal of hazardous components followed by granulating and shredding in order to remove the recyclable raw materials such as plastic and ferrous metal.
- ▶ Incineration and refining : metal can be recovered after the more combustible materials have been incinerated.
- ▶ Chemical recycling : precious metals such as gold and silver can be removed from printed circuit boards and components via chemical processes⁵⁹.

However, according to wide industry practices, the dismantling process is still mostly done by hand. The challenges in the future focus on less manual and more automated processes and on finding more markets for recycled raw materials.

New technologies available for recycling vary according to the type and main components of appliances.

5.3.1.1. FOR PLASTICS

Plastics are used in WEEE mainly for the casing/housing of appliances, and some plastic dominated products may find less recycling outlets than metal ones– the predominant disposal route for plastics is incineration with energy recovery or even landfill. In fact, the recycling of plastics is not more difficult than other materials : the challenges are to clearly identify the polymers and to separate them from the different materials attached, e.g. filters, stabilisers, flame retarding additives and pigments used to change the properties of the basic polymeric material. To complicate matters, current plastic housings often have labels, felts, shock pads etc. attached to them.

Most of the recyclers still rely on manual identification and sorting techniques. Nevertheless, in order to improve plastics' recycling efficiency, recycling facilities are beginning to use new automated **sorting systems** that identify common polymers by using x-rays and visible light sensors or infrared rays. Other mechanical systems available include air classification, flotation, electrostatic or spectroscopic separation.



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Potential **chemical processes** include methanolysis (a depolymerisation process), which reduces old plastics to their original ingredients by applying heat and pressure in the presence of methanol. This combination not only causes the polymer chains to break down, leaving pure monomers which are purified and re-polymerized into new resin: it also allows destruction of contaminants. This chemical process can now be used to make food containers from recycled plastics, thus closing the loop for many plastic containers.

5.3.1.2. FOR METALS

Metals dominated products may be ferrous (iron, steel) or non ferrous (aluminium, copper, precious metal). They are mainly white goods such as washing machines, dishwashers, and small household appliances, but also PC components or mobile phones.

Metals can be recycled an almost unlimited number of times. Separation of ferromagnetic materials with magnetic methods is fairly simple. Recent investigations have demonstrated the feasibility of the use of true colour machine vision combined with high performance computing, enabling cost effective and accurate sorting of recycled and shredded non-ferromagnetic metals (aluminium, copper, brass, bronze, coated brass, lead, zinc, stainless steel). Metals can be recovered by shredding, incineration or cooling (applications with printed circuit boards⁶⁰). Precious metals such as gold and silver can be removed from printed circuit boards and components via chemical processes.

5.3.1.3. FOR GLASS

Identification and separation of **glass dominated products** (such as TV-sets and monitors) is currently one of the problematic areas. The cathode ray tube that accounts for 50-55% of a TV set must be divided into screen (or panel) glass and conical (funnel) glass. The first consists of barium and strontium, while the latter contains mainly lead. Separation of panel glass from funnel glass is the most critical issue in CRT glass separation. There are several mechanical (such as plasma, water jet or laser cutting) or thermal methods (with electrical resistance) that have been tested to separate and recycle them. Different mechanical or chemical methods are also used for cleaning CRT panel glasses from covering films.

There are now more than 100 different CRT panel compositions (sometimes with lead, sometimes without lead) plus several different transmission technologies for each composition. In addition, TVs, monochrome computer monitors, and the vast array of colour monitors have all very different constructions. The result is that development of a standardised disassembly technique is difficult due to the lack of uniformity in this technology.



Recovery of printed circuit boards

A method of recovery by cooling has been developed by Daimler-Benz-Research: steel as well as polymers get brittle when cooled down to -70°C or less, while the toughness of copper and aluminium is increased. Consequently, the pre-cut (to a size of around $20 \times 20 \text{ mm}$) printed circuit boards are cooled with liquid nitrogen, then grinded into smallest parts in a hammer mill, where the polymers fall from metal parts. In addition to cooling, nitrogen prevents polymers to oxidise and thus hinders the development of dioxin and furan. The separation of the different resource fractions is done with conventional methods like sieving, magnets, eddy-current separators and so on⁶⁰.

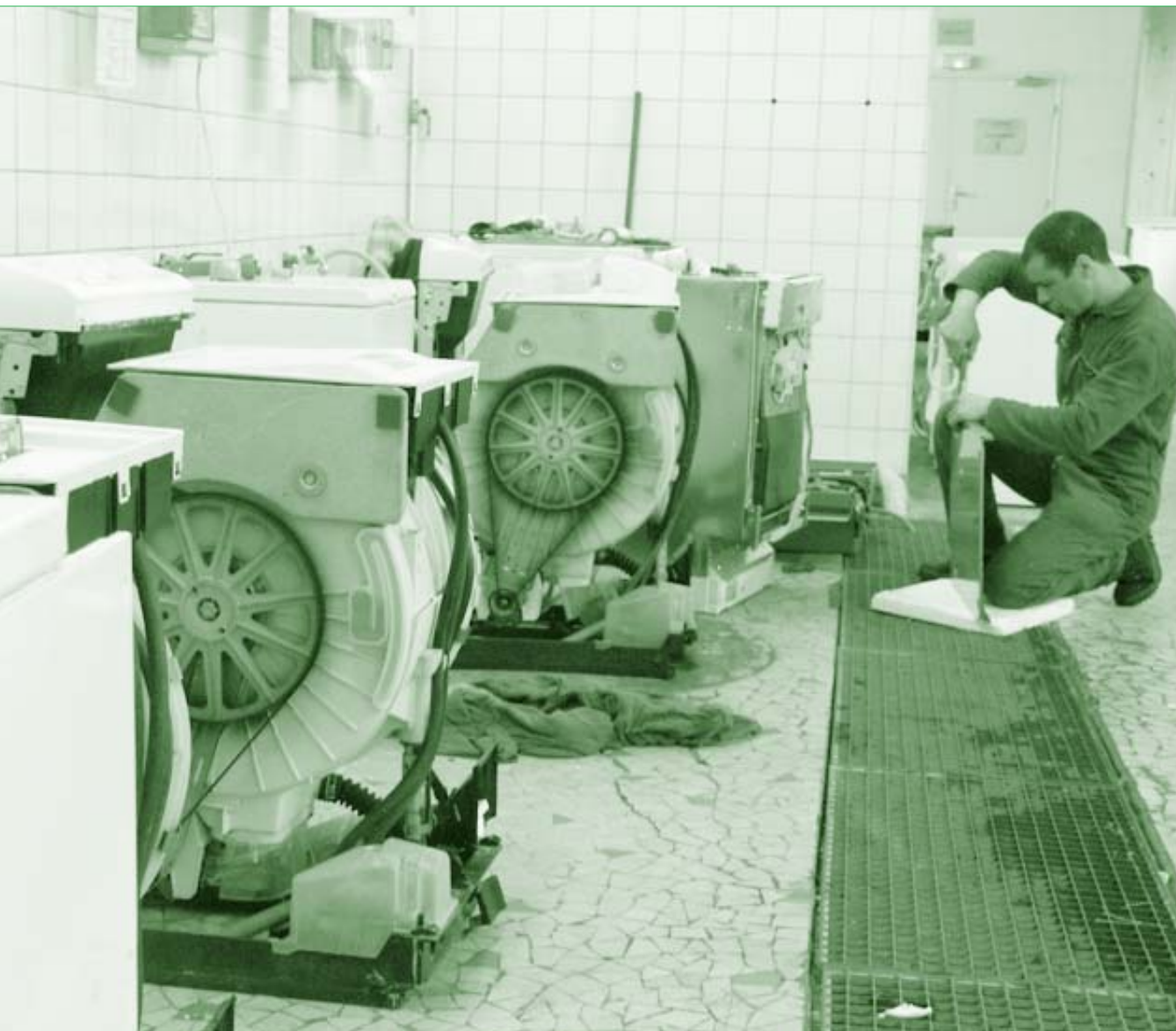
⁵⁹Environmental Strategy Briefing Note, August 2000
⁶⁰ECOLIFE – Closing the loop of elect(ron)ic products and domestic appliances. From product planning to end-of-life technologies.
 Thematic network n° BRT-CT 98 5076
<http://www.ihrt.tuwien.ac.at/sat/base/ecolife/>



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6. THE REPAIR AND REUSE OF OLD APPLIANCES



THE ENVIRONMENTAL BENEFITS OF WEEE REPAIR AND REUSE

In its report on Virtual dematerialisation "Ebusiness and Factor X", the Wuppertal Institute estimates that the production of end appliances accounts for a high proportion of the entire product's resource consumption. A case study has shown that for a notebook PC, the production phase consumes almost the same quantity of resources as the use phase (40 to 50 percent depending on users' behaviours). This is a result of its material content (which requires intensive processing upstream for components such as PWBs, LCDs, chips and precious metals). Considering the great efforts in producing one single end appliance, the Wuppertal Institute concludes that reuse and recycling as well as the extension of the use phase of EEE are important improvement options from a life-cycle perspective⁶².

6.1. WHY REPAIR AND REUSE WEEE ?

Reconditioning, repair and reuse are attractive means to tackle the WEEE problem by extending the lifespan of old appliances. European authorities have attempted to encourage the development of those activities since it is explicitly stated in the Directive that "Member States shall give priority to the reuse of whole appliances"(art. 7 §1).

Reconditioning, repair and reuse will extend the lifespan of used products and components so that they can be put back into the market. Unlike recycling which requires the breaking down of technical components, that have often been carefully and expensively machined into lower value raw materials, reconditioning, repair and reuse keep units or components in their entire state (therefore retaining higher value with a lower expenditure of efforts⁶¹).

These activities are already well developed in Europe and beyond, and are known to be profitable. For example, there are more than 70.000 firms operating in the US alone⁶³. In the UK, there are over 300 community organisations supplying second hand goods to people in need, and according to them, electrical appliances are on the top of the list of customers desires⁶⁴.

The repair and reuse of products not only allows to save recycling and treatment costs, but also give economic benefits from the resale of the products at a lower price than new ones. They constitute a new economic sector (with little overlap with existing activities) where a new kind of industry (small businesses and community groups) can find great opportunities in the remarketing of white goods for example. They are especially suitable for social enterprises engaged in reuse activities, offering work, training and skills to long-term unemployed or disabled people.

Indeed, the social benefits associated to reuse and repair of old appliances are particularly important on two grounds:

- ▶ these activities offer interesting work in sorting and recycling as well as the training of low-skilled workers or those with few employment prospects
- ▶ reused goods being significantly cheaper than new ones allows households with lower incomes to access goods they would otherwise not be able to afford - thereby reducing social exclusion.



6.2. PROSPECTS FOR REPAIR AND REUSE

Despite the fact that reuse is explicitly protected in the Directive, there are no clear drivers to encourage the development of repair and reuse activities, and art.5 §4 stipulates that the envisaged reuse activities must not lead "to a circumvention of the provisions related to the treatment or recovery of WEEE".

Besides, up to 31st December 2008, and unlike reused components, materials and substances, whole appliances which are reused won't be taken into account for the calculation of the recovery and recycling targets of art. 7 §1. This provision does not really constitute a motivation for producers to favour the reuse of their products, and LRAs will have their role to play in paying attention to the protection of existing reuse systems, in preserving the potential of appliances capable of being reused as a whole, and in directing them to the appropriate paths.

Among the main barriers to repair or reuse are :

- ▶ the rapid pace of technologies and the changing design of appliances
- ▶ the scarcity of knowledge about the goods and their components
- ▶ the composition of recent appliances : mainly plastic products are usually more difficult to repair than metal ones
- ▶ the costs of repair, which often exceed the costs of manufacturing a new product
- ▶ the decreasing quality and lifespan of new products put on the market
- ▶ the need for definition and quality standards of the reuse/repair processes
- ▶ the lack of commercial tools for secondary markets.

These barriers limit the scope of repair or reuse activities to appliances which fulfil criteria's both in terms of :

- 1) reusability / saleability, depending on :
 - ▶ the age of the machine : this will determine notably its energy/water consumption and its intrinsic hazardousness
 - ▶ the type and model of the machine : determine whether the product has not been made obsolete by alternative technology
 - ▶ the demand for such appliances as regards capacity, function, utilities : the appliances for which there is the most important demand from the social economy are fridges, ovens, washing machines, and ICT products
 - ▶ the goods' overall conditions
- 2) attractiveness of repair, which is linked to:
 - ▶ the presence of valuable spares
 - ▶ the type of main fault occurrence
 - ▶ the feasibility of repair (notably – availability of spare parts...)
 - ▶ the costs of repair versus sale
 - ▶ the price of a new machine.



⁶¹White goods, Remarketing and the WEEE Directive, Amy Griffiths in *Waste Management World*, pp. 36-40, Jan-Feb 2003.

⁶²Digital Europe: virtual dematerialisation and factor X, Wuppertal Institute, March 2003; <http://www.digital-eu.org/publications/Default.asp?pubid=32>

⁶³White goods, Remarketing and the WEEE Directive, Amy Griffiths, Op. Cit. n°61

⁶⁴Fit for re-use, a guide to the repair, refurbishment and reuse of domestic electrical appliances, Craig Anderson, Furniture Recycling Network, UK, 2001.



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Social economy enterprises are businesses of very diverse forms with primarily social objectives, instead of profit making ones.

(Social Enterprise, a strategy for success..., Department of Trade and Industry, UK, July 2002)

6.3. SOCIAL ECONOMY ENTERPRISES : KEY PARTNERS OF LOCAL AUTHORITIES

One approach to encourage reuse is to persuade social economy enterprises to become more involved in areas like collection and dismantling, and by creating a place for them in waste management contracts.

6.3.1. A DEVELOPING ECONOMIC SECTOR

In the past 50 years, recycling and refurbishing have emerged as an important sector for the development and growth of social enterprises. Organised collection, sorting and resale of used clothes, household furniture or other materials (like paper) were initially undertaken by charitable organisations such as the Salvation Army.

Along with the economic crisis of the 1990s, these experiences were supplemented with entrepreneurial groups combining social and economic objectives. Many of these enterprises emerged from labour market integration projects, traditionally focusing on the social aspects of their enterprises rather than on economic performances.

These entities have developed new skills and more sophisticated practices involving the use of modern technologies for the reclamation of end of life goods, exploring new opportunities in recycling and recuperation markets, or providing LRAs with the delivery of waste management services like the selective collection at source of waste goods and materials. Furthermore, social enterprises often combine these entrepreneurial activities in the recycling sector with awareness raising campaigns to promote more sustainable consumption behaviours. Such campaigns are often conducted with the financial support and co-ordination of local authorities interested in reducing the impacts of waste and consumption patterns on the environment.

6.3.2. ENSURING THE QUALITY OF REUSE ACTIVITIES

The success of reuse initiatives will directly depend on the trust of customers within the quality and security of second-hand appliances, which require to organise reuse activities with professionalism.

For instance, the identification of appliances which could be profitably remarketed calls for initial visual, electrical and safety tests. These will allow to assess the completeness and the condition of the appliances, as well as to ascertain that it is not electrically hazardous under normal operating conditions.

After repair/refurbishment, operation tests should also assess the fitness of the product through high voltage tests, for example, and a cosmetic cleaning should give it an attractive appearance.

The experience of social economy enterprises in managing reuse activities can bring a useful and profitable expertise.



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CASE STUDY 1

Ensuring quality and safety of reused appliances in Flanders

In Belgium, the Flemish Region (6 million inhabitants) is entirely covered by a network of re-use centres, which in 2002 employed over 1.700 persons and collected nearly 25.000 tonnes of waste of which more than 70% could be re-sold.

KVK is the branch organisation, which supports these centres in professionalising their re-use activities through the common development of strategies and marketing activities. KVK also represents its members towards all relevant authorities from the local to the European level.

Preparations for Flemish WEEE legislation started in 1995. The lobbying of KVK resulted in the explicit integration of re-use within the legislation (VLAREA, 12/1997), which states that all collected appliances (regardless they are collected by local authorities or retailers) must be separated into reusable and non-reusable streams.

Since July 2001 the producers are obliged to organise and to finance the collection, recycling and treatment of WEEE and have set up a collective management structure. Consumers now pay a visible fee when they buy a new product. This fee is used to finance the collection, centralisation and treatment of old appliances.

Producers feared that potential lack of quality in the reuse and refurbishment of discarded appliances could cause safety problems. The Flemish re-use sector decided to respond to the producers' concerns : from 1998 onwards the KVK started to build a network of specialised refurbishment centres for household appliances at a regional scale (ca 300.000 - 500.000 inhabitants), instead of the local level of re-use shops : appliances collected by the local re-use centres are tested and refurbished in specialised refurbishment centres, and finally resold in the local shops.

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KVK has developed a standard business-plan and created a common label (Revisie®) for the marketing of re-used appliances. It also organises training for instructors, and informs re-use centres on safety, quality and juridical responsibility.

To obtain the authorisation to use the trademark "Revisie®", re-use centres need to fulfil a list of criteria:

- ▶ to test and refurbish appliances according to standardised procedures
- ▶ to ensure a proper control of the quality by qualified responsible persons
- ▶ to offer a 6-month guarantee
- ▶ to have an insurance policy that covers all applicable liabilities and responsibilities
- ▶ to use the agreed programme for registration and monitoring
- ▶ to report data to the KVK to allow comparison between the refurbishment centres
- ▶ ...

So far, half the Flemish region is covered by seven refurbishment centres using the Revisie-trademark.

For more information on the management of reuse activities, you can consult :
"Fit for re-use, a guide to the repair, refurbishment and reuse of domestic electrical appliances", Craig Anderson, Furniture Recycling Network, UK, 2001

6.3.3. ENCOMPASSING SOCIAL OBJECTIVES

Social enterprises have an added value in providing goods and services for people with low incomes who are dependent of social welfare mechanisms, and in fighting unemployment by setting up new activities and by training or employing specific groups of people.



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6.3.3.1. EMPLOYEE TRAINING

Mostly skills are acquired on-the-job in addition to specific training courses. Vocational training and qualifications (such as working with shredders, computing, learning to drive special vehicles...) are usually provided to workers as part of the whole integration process, which also involves social training (life and work skills training, social behaviour, conflict solving, etc.).

At ENVIE, in France, 50 - 60% of all workers leave the enterprise as skilled workers and are able to get permanent contracts in other companies. A partnership ENVIE-Thomson-Darty-AFPA (a French vocational training association) has created a vocational training pool.

CREATE in the UK provides training with nationally recognised qualification standards (NVQs). Trainees are not limited to training in repairing appliances, but also gain qualifications in Engineering Assembly, etc.

At Recycle-IT!, another UK based social enterprise, training and qualifications are offered by partners, the Training Agencies and Barnfield College, and is supplemented in-house when necessary.

RREUSE (the organisation which represents and supports national networks and federations of social economy enterprises carrying out re-use and recycling activities in Europe) is also developing currently a specific training course for the recycling operators at the European level.

6.3.3.2. SUPPORT TO IMPOVERISHED PEOPLE

By reducing differences in service provision and job opportunities, social economy enterprises contribute to build cohesion and reduce poverty within a geographical area.

Social enterprises address the demand of unmet needs through the supply of second-hand equipment.

Moreover, people they employ are often disadvantaged by the labour market, so that social economy enterprises not only contribute to reducing exclusion, but also create an added value of „employability“, as people grow in professional skills thanks to their training.





6.3.3.3. CREATING LOCAL JOBS

Reuse and recycling activities provide work to around 40.000 people in social economy organisations throughout the EU. The most important sectors are WEEE, bulky furniture and textiles, followed by paper and glass. The number of jobs and amount of waste treated are estimated as follows :

	Number of jobs	Quantities of waste treated (tons)
WEEE	10.000	200.000
Bulky waste	4.500	350.000
Textile	2.000	110.000

For an extrapolation at the European level, it is probably necessary to double these numbers.

CASE STUDY 2

A partnership with social economy for refurbishing electrical household appliances in Nantes (France)

In 1992, the neighbouring municipalities of Nantes and St-Herblain were confronted with excessive unemployment rates in several suburbs. An employment team was set up as an independent association to seek opportunities in creating additional employment with added value, i.e. without harming the private sector. The team had heard of the success story of ENVIE (Entreprise Nouvelle Vers l'Insertion Economique – New enterprise towards economic integration).

The activity of ENVIE

The ENVIE network in France was founded in 1984 by a few people coming from the Emmaüs association. Its main activity is to recondition equipment while allowing young people in difficulty to obtain work. The network is now made of 38 member companies located on 28 sites across France and employing 650 people (200 permanent staff and 450 salaried being trained). They collect and treat 300.000 electrical appliances annually, of which 25% can be resold at one third of the price of new equipment, with a one-year guarantee.

The Nantes project

ENVIE 44 in Nantes has been created thanks to :

- 1) **start up capital** covering at least 6 months rent and salaries, obtained from the state, the region, the municipality, a large endowment charity and a few gifts
- 2) **support from distributing companies** of large electrical appliances (Darty, Leclerc and Conforama) which agreed to give access to the equipment they were taking back (transport by professionals bringing new equipment would ensure the provision of quality products)
- 3) **an advertising campaign for second hand equipment** focusing on both the social and the environmental dimensions to contribute to the local economy (which worked well with youngsters customers coming from the suburbs, and with better-off people equipping their summer house).

Results achieved

The organisation collects today 16.000 electrical appliances per year and has a stable employment of around 40 people, including 10 permanent technicians and trainers.

At the end of their training, half the trainees obtain an employment either in the electrical sector, or e.g. as a lorry driver, the important being to have a first successful professional experience.

The environmental function of ENVIE 44 (collection, sorting, refurbishment and treatment of WEEE) is now recognised besides its employment function, as it is now paid by appliance treated like traditional collectors. The success of the collaboration with ENVIE has even led to a review of the waste policies and other projects have now been developed regarding second hand clothing, used paper, old books and personal computers.

A new pilot project anticipating the implementation of the WEEE Directive

Under the forthcoming transposition of the European WEEE Directive into French legislation, the French manufacturers and distributors of electrical equipment will become responsible for the take-back, recycling and treatment of used equipment in compliance with environmental best practices. In order to appreciate the reality of technical, logistical and financial constraints, generated by the implementation of the WEEE Directive, manufacturers have undertaken a pilot project with ENVIE 44 on a representative sample of the French population and territory (1% of the French population – 555.518 habitants – within an area of 24 municipalities with varied profiles where all distributors' brands are represented).

The pilot, which started in July 2002, covers both re-use and dismantling / recycling. It allows ENVIE to become a full economic operator combining re-use and recycling activities. It also allows the manufacturers to design an organisational scheme suitable at the scale of France and to determine with some precision the costs of the collection and treatment systems to be implemented (and consequently the fee to be put on new appliances).



© LIPOR

Fabricada na natureza

Um computador de 20 kg é composto por:

- 1 kg de vidro
- 4,4 kg de plástico
- 1 kg de ferro
- 2,8 kg de alumínio
- 1,4 kg de cobre
- 1,2 kg de zinco
- 100 g de chumbo
- 100 g de cádmio

Fabricadas e

Seu computador
foi feito com

7. BEYOND SORTING AND RECYCLING WASTE : AN EVOLVING ROLE FOR LRAs

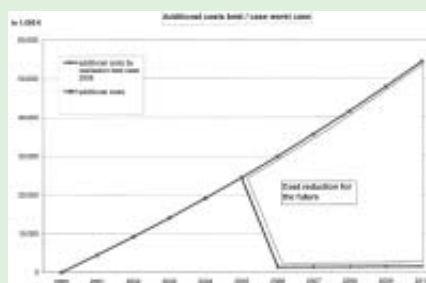
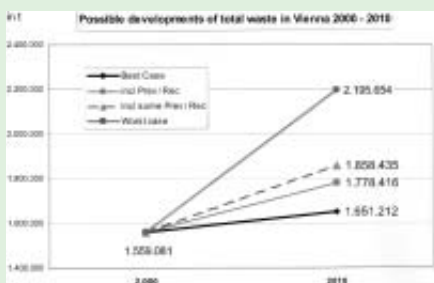


7.1. TACKLING WASTE GROWTH : A CHALLENGE FOR LRAs

Waste is generated at the local level but results from a more global issue : our current lifestyles and consumption patterns. This means that tackling the waste problem must not be restricted to end-of-pipe solutions, but must also encompass strategies to tackle production and consumption. Local authorities have major incentives to act resolutely in these fields : after all they are the final recipients of our waste, and it is in their interest to avoid waste growth.

Prevention is worth it

The 1.600.000 inhabitants of Vienna produced 1.560.000 tons of municipal waste in 2000 (including 800.000 tons of household waste). The municipality has calculated that, with the current growth rate, the total amount of municipal waste will reach 2.200.000 tons by 2010, requiring the building of additional disposal and incineration facilities for the 600.000 extra tons.



Source : Prof. Gerhard Vogel, Department of Technology and Community Science, Vienna University of Economics and Business

Based on this assessment, the municipality calculated that developing a strategy aiming at avoiding and reducing waste in the future could save up to 55.000.000 € (for waste management facilities' capacity expansion) in 10 years. The feasibility of waste reduction, through promotion campaigns for more sustainable consumption patterns, was tested in pilot projects. These showed that correctly informed consumers could reduce their waste production by 15% quite easily, by changing their consuming and shopping behaviours. This made clear that efforts towards prevention would be profitable : therefore the Government of Vienna decided to allocate a budget of 3 million € per year during the next ten years for waste prevention activities. This support is covered by the waste fee.

The improvement of our global environment requires action at the local level and, beyond encouraging recycling, local and regional authorities have their role to play in :

1. promoting eco-design
2. promoting repair and second-hand goods
3. raising awareness on the proper use of products
4. changing consumption behaviours
5. promoting the replacement of products by services
6. tacking the best from Information and Communication Technologies (ITC)
7. raising awareness and changing habits.

⁶⁶BREZET J.C., VAN HEMEL C., *Eco-design: a promising approach to sustainable production and consumption*, UNEP, Paris, 1997.

⁶⁷Environmentally improved product design case studies of the European electrical and electronics industry. Eco-design subgroup. ECOLIFE Thematic Network, July 2002.

Downloadable at: <http://www.ihrt.tuwien.ac.at/sat/base/Ecolife/ECOIndex.html>

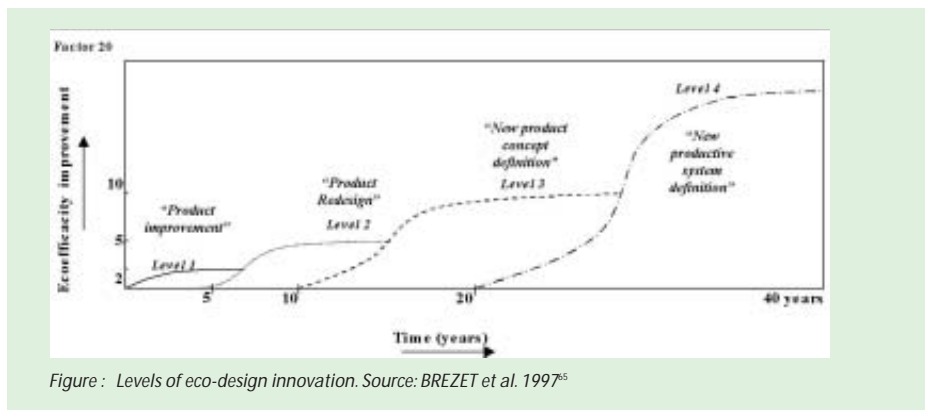
⁶⁸Integrated Product Policy

⁶⁹Integrated product Policy as a Tool in Environmental Protection – the Bavarian Point of View, Dr. H-C. Steinmetzer, in proceedings of the Citizens Parliament on Sustainable Consumption, Brussels 14 March 2003, organised by ACRR, IBGE-BIM, CRIOC-OIVO and the European Commission

7.2. PROMOTING ECO-DESIGN

'Eco-design' or 'design for the environment' is the systematic incorporation of life cycle considerations into the design of products or services. It has emerged from the observation that a proactive approach of systems thinking in the form of eco-design could lead to direct cost reductions as well as to environmental improvements, but also to increasing sales by bringing products to the market which have both a good environmental performance ("social benefit") and a good performance for the individual customer ("customer benefit").

There is an increasing trend today towards considering the entire lifecycle effects of product: the effects of suppliers upstream, and of product use and disposal downstream. These effects must increasingly be considered as the emphasis in environmental management is currently shifting from being defensive to being proactive i.e. competing in the market on environmental performance. The increasing adoption of voluntary environmental management systems (ISO 14001 and EMAS) and product standards (e.g. eco-labelling) is part of this process. It is expected that this development will continue, from product improvement to productive system innovation as depicted in the following figure:



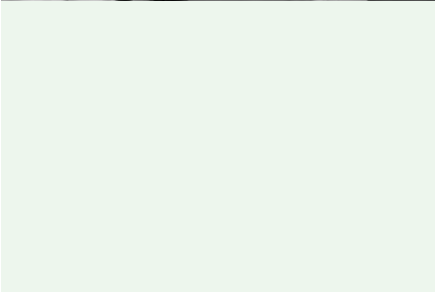
Four levels of eco-design can be defined as follows:

- Level 1: **product improvement**, re-styling which can consist of decreasing the use of materials or replacing one type of fastener by another, and may already lead to a 25-50% reduction in environmental pressure per consumption unit.
- Level 2: **product redesign**: a new product is redesigned on the basis of an existing product.
- Level 3: **new product concept definition**, with different functionalities.
- Level 4: **new production system definition**: this occurs when innovation in the productive system is necessary⁵⁶.

Some regional authorities such as the city of Torino (I) or the Bavarian State (D) have started cooperation projects with local universities and industry to promote eco-design in local industrial processes.

In Torino, the municipality and the Politecnico (High School of Science and Technology) have finalised an agreement to organise a special degree in eco-design. The programme, organised in 4 periods of 6 months, is open to graduate students and already experienced engineers, and provides education on a variety of issues centred on eco-design such as composition of products, lighting techniques and lighting appliances, innovation, management and communication.

In Bavaria, the Ministry of State Development and Environmental Protection made IPP⁶⁷ one of the central field of its environmental policy and, with this particular objective, created a specific IPP unit. The State authority held a congress in April 2000 which resulted in the selection of several R&D projects combining business, science and the state authorities. One of these has allowed to reduce by a factor two (in comparison to the ecologically best performing customary product) the energy consumption and the overall number of different materials of a vacuum cleaner, as well as to reduce its time of disassembly by a factor 14 (from 182 to 13 sec)⁶⁸. Many other projects are still underway. Some of them are targeting consumers and aim for instance to identify which elements of IPP may be used in marketing strategies to create demand for "green" products, or to find out how a product panel should be composed and work in order to improve the eco-design of products.



"Aus. Wirklich aus ?" – A "stand-by" Campaign in Schleswig-Holstein (D)

Stand-by consumption in Germany in 1995⁶⁹ was equivalent to 14 billion kWh/year or Berlin's electricity needs for one year. This resulted in the emission of some 14 million tons CO₂/year, which contribute to climate change. End of 2000 the federal state of Schleswig-Holstein (D) started a campaign on the unnecessary electric power consumption through idle losses, with electronic appliances (especially the communication- and conversation- electronics) remaining on the "stand by" position⁷⁰.

⁶⁹German Federal Environment Minister, http://www.umwelt-deutschland.de/index_englisch.html

⁷⁰For more information :
Energienstiftung Schleswig-Holstein, Stiftung öffentlichen Rechts, Dänische Straße 3 – 9, D-24103 Kiel -
Tel.: ++49-(0)431/9805-600 - Fax: ++49-(0)431/9805-699 -
E-Mail: info@essh.de - <http://www.energienstiftung.de/>

⁷¹Study on different types of Environmental Labelling (ISO Type II and III Labels): Proposal for an Environmental Labelling Strategy, by Charles Allison & Anthea Carter (Environmental Resources Management) for the DG Environment, European Commission, September 2000 <http://europa.eu.int/comm/environment/ecolabel/pdf/studies/erm.pdf>

⁷²For more information : <http://europa.eu.int/comm/environment/ecolabel/> or <http://www.eco-label.com>

7.3. PROMOTING REPAIR AND SECOND-HAND GOODS

Cities like Vienna have already taken initiatives in order to promote the repair and reuse of Electrical and Electronic Equipment, by editing guides of repair enterprises to the attention of citizens.

In 1994, the Munich municipality published a brochure which compiles a list of addresses of repair shops in Munich. This was followed-up by the "Repairwork-day" organised for the first time in 1997. On this day, citizens could bring their broken utensils for repair by experts free of charge. The surprising result was that more than two-third of the household utensils could be restored by minor repair work.

In March 1999, the Municipal Department 22 (Environmental Protection) of Vienna, in collaboration with the Municipal Department 48 (Waste Management), launched the first exchange platform for second-hand goods on the Internet : <http://service.wien.gv.at/wab/>
The repair guide, the guide to renting facilities and the waste disposal manual are also available online.

Promoting of second-hand goods, repair etc. may stress aspects like :

- low prices
- warranty
- green choice supporting local enterprises...

7.4. RAISING AWARENESS ON THE PROPER USE OF PRODUCTS

There are ways to use products in a more or less environmental friendly manner. Examples include:

- ▶ the use the "eco-programmes" for washing machines and dishwashers
- ▶ not leaving appliances on the stand-by position,...

Local authorities can raise public awareness on these topics, and the results of such awareness campaign can sometimes be amazing at the scale of a local authority.

7.5. CHANGING CONSUMPTION BEHAVIOURS

Consumers represent the demand side and should be informed about their environmental impacts in buying, using and discarding EEE and about the possibilities available to them for reducing these impacts : they can choose to buy long-life and eco-efficient products, stop using useless ones and so influence the offer side.

Promoting eco-labelled products

Companies are increasingly approaching customers with environmental messages to win their attention and choice. One of such environmental communication tools are eco-labels that allow manufacturers to distinguish their products according to established criteria. There are three types of labels: type I, type II, and type III that have been established by the International Standardisation Committee (ISO).

- Type I labels are environmental claims that are based on criteria established by a third party and are multi-issue, being based on the product's life cycle impacts.
- Type II claims are based on self-declarations of manufacturers and retailers.
- Type III claims consist of quantified product information based on the lifecycle impact. These impacts are presented in a form that facilitates a comparison between products, e.g. a set of parameters.

Type I labels are rather well-established with almost each European country promoting its own label, the most known ones being Blue Angel in Germany, and the Nordic Swan Label in Scandinavian countries. The European Union has established its own eco-label : the EU Flower.

Though lacking in objectivity, type II labels are sometimes preferred by manufacturers due to notably : the cost of some type I labels (feasible for large multinationals but not affordable for SMEs), the length of the application procedure (that due to fast technology cycles of electronic products makes application meaningless), the fact that national labels are not coordinated with the labels in other countries, and that eco-labels have little visibility and understanding for consumers. All the above mentioned may contribute to considering type I eco-labels as trade barriers especially in developing countries⁷¹.



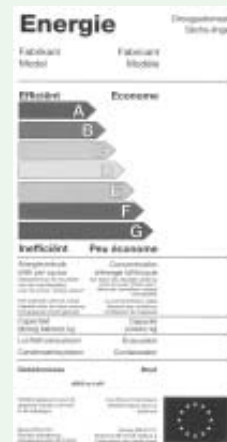
The European Eco-label – the Flower⁷²

This label is of the ISO I type, and awarded to products which comply with very stringent environmental and performing criteria following a "cradle to grave approach" taking into account the impacts of production, use and disposal of the product :

- a guaranteed performance
- their energy (electricity) and resources use (detergents, water)
- the ease of dismantling/recycling
- their content in hazardous substances
- the availability of spare parts
- the availability of instructions for users for environmental use
- their noise.

The European Energy Label has been introduced by a European directive, on the labelling of domestic appliances (Directive 92/75/EC). It must be visible on all appliances for sale in shops, and allows consumers to compare easily (thanks to a graduate scale from A to G) the energy performance of various ranges of products among which : refrigerating appliances, freezers, washing machines, dryers, dishwashers, ovens, refrigerators, bulbs, air conditioners...

The label gives also other specific information, such as energy consumption, noise...





Energy Star⁷³ is a voluntary labelling program introduced by the US Environmental Protection Agency (EPA) in 1992 to identify and promote energy-efficient products, in order to reduce greenhouse gas emissions. Computers and monitors were the first labelled products. The ENERGY STAR label is now on major appliances, office equipment, lighting, cooling equipment, home electronics, and more. For instance, producers participating within this program agree to produce equipment which consume less when not in the use phase, etc...

PROMOTING ENERGY ECO-LABELS

In January 2002, the **Local Energy Management Agency of Clermont-Ferrand** (F) (ADUHME, created in 1996 thanks to the European SAVE II Programme), has launched a six-month communication campaign whose aim was to promote the use of the Energy label. The initiative was mainly based on the assessment that in energy invoices of dwellings built since the early eighties, domestic appliances count for as much as heating, and that substantial savings could be made if white goods were all energy efficient. For instance, **the use of efficient refrigerating appliances could allow to reduce by 3,2 times on average their energy consumption** so that savings could amount to 725 kWh per household per year⁷⁴. The idea was to promote energy labels among :

- retailers, and inform them so that they use them as selling points
- consumers, whose awareness must be raised so that they prefer energy efficient equipment.

Beyond that, a network of 36 retailers-partners has been gathered within a "Charter of the dealer" through which they notably committed themselves to relay the information to their customers. Some 40 sellers were given an half-day training providing them with tools to "sell" energy efficiency⁷⁵.

In November 2001, the **Energy Foundation Schleswig-Holstein** (D) started a campaign on energy-efficient illumination, wherein lies a key energy (and money) savings potential after the "stand-by" issue. The main goal of this information campaign was to convince users that a range of prejudices are today no longer applicable against energy-savings-lamps, since it has undergone new developments like more diverse forms and colours, and better technology (higher switch-reliability). The main advertising events ran from November 2001 until February 2002, but other activities, like information spreading through the trade or in the framework of the energy-advice of the consumer-headquarters, are still running⁷⁶.

The **Walloon Region in Belgium** went further and decided to provide subsidies for the purchase of eco-efficient electrical domestic appliances : from 2004 onwards, the purchase by private households of fridges, washing machines or dishwashers with the A+, A++ or AAA labels will receive a premium of 75,00 €. The premium may amount to 200,00 € for a gas tumble dryer. Lighting is also addressed and a 5,00 € subsidy will be awarded for the purchase of 2 class A light bulbs⁷⁷.

⁷³For more information : <http://www.energystar.gov>

⁷⁴"L'étiquette énergie, pensez-y ! Campagne d'information sur l'électroménager blanc performant », rapport final, p.5 -

<http://www.aduhme.org/images/pdf/RAPfinal.doc>

⁷⁵For more information : ADUHME (Association pour un Développement Urbain Harmonieux par la Maîtrise de l'Énergie), 14, rue du Buffon, F - 63100 Clermont-Ferrand, <http://www.aduhme.org>

⁷⁶For more information : **Energiestiftung Schleswig-Holstein**, Stiftung öffentlichen Rechts, Dänische Straße 3 - 9, D-24103 Kiel - Tel.: ++49-(0)431/9805-600 - Fax: ++49-(0)431/9805-699 - E-Mail: info@essh.de - <http://www.energiestiftung.de/>

⁷⁷Le Soir Eco, 19,20,21 July 2003.

7.6. PROMOTING THE REPLACEMENT OF PRODUCTS BY SERVICES

Dematerialisation (a shift from product ownership to service emphasis) seems a promising way to encourage a more efficient use of materials and a lowered production of waste⁷⁸. Providing services through renting, sharing, pooling or leasing... are new approaches to save materials and resources: in such systems, value derives from the service provided by the producer, while the product becomes a means of delivering this service and remains its property.

According to a report on Product Service Systems (PSS), dematerialisation changes a user's need fulfilment in such a way that the necessary material and energy flows decrease significantly⁷⁹. Besides, Product Service Systems increase the involvement of the producers with the product during its use (maintenance, upgrade) and after use phases (take back, repair, recycling).

Product Service Systems are nothing new in the electronic equipment industry; companies are offering service packages that include hard- and software maintenance. Recent developments within the IT industry have resulted in an explosion of new service techniques and service segments. Product service systems can offer big stable market for specialised service providers; some producers of electronic appliances, such as XEROX, have already opted resolutely for the leasing approach.

XEROX : INTEGRATED SUPPLY CHAIN AND DIGITAL DOCUMENTS – OR ABOUT RENTING A COPY SERVICE INSTEAD OF BUYING COPY MACHINES

As a result of a strict environmental policy, the end-of-life potential of products, components and supplies has been maximised by building the concepts of easy disassembly, durability, reuse and recycling into equipment design. XEROX document systems are designed in such a way that a large proportion can be reused or recycled in a new product from the same family. XEROX offers the same guarantee for products regardless of the reprocessed content.

The reuse and recycling rate is enhanced by situations where XEROX remains in contact with the customer throughout the product life cycle. Examples of such customer relationships include the servicing and maintenance of equipment, and arrangements whereby the customer purchases a document service rather than the equipment.

This policy yields important results : between 1997 and 2001,

- parts re-use and recycling has diverted an average of 65.000T/year from landfills,
- returned equipment can be rebuilt re-using 70-90% by weight of components,
- designs based on previous models may have 60% of parts in common with previous equipment⁸⁰.

⁷⁸Product Service Systems, Ecological and Economic Basics, March 1999

⁷⁹Product Service Systems, Ecological and Economic Basics, March 1999

⁸⁰For further information and more case studies please visit ECOLIFE webpage:
<http://www.ihrt.tuwien.ac.at/sat/base/Ecolife/ECOIndex.html>.



DIGITAL TECHNOLOGIES CAN REDUCE ENVIRONMENTAL IMPACTS

A report by Digital Europe found that digital technologies can dramatically reduce pressure on the environment. E-commerce can – under specific circumstances – provide significant resource efficiency potentials, especially if products are replaced by services. Public administrations can lead in offering e-services (push strategy) as part of their e-government strategies. Besides, they can request services rather than products from their suppliers whenever possible (pull-strategy).

⁸¹Digital Europe: virtual dematerialisation and factor X, Wuppertal Institute, March 2003; <http://www.digital-eu.org/publications/Default.asp?pubid=32>

⁸²Idem

⁸³Information and Communication Technology

⁸⁴Digital Europe: virtual dematerialisation and factor X, see here above.

7.7. TAKING THE BEST OUT OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)

If WEEE is the fastest growing waste stream and contains large quantity of dangerous substances, the development of e-technologies can also create opportunities in the field of dematerialisation and savings of material resources through telecommuting, tele-shopping, teleconferences, e-mails, e-books and services offered on the Internet.

The same report found in particular that:

- ▶ Music downloaded legally from the internet can have less than half the environmental impact of buying a pre-recorded CD. Researchers compared three methods of purchasing 56 minutes of pre-recorded music and found that⁸¹:

	Material used (kg)	Equivalent in producing aluminum drinks cans
Purchasing a CD online	1,31	5
Buying a CD in the high street	1,56	6
Downloading music online	0,67	< 3

- ▶ Online banking can have almost one third of the environmental impact of branch banking⁸²

	Material used (kg)	Equivalent in producing aluminum drinks cans
Paying a bill at a counter	2,56	10
Paying bills online	1	4

Teleworking appears to be another interesting way towards dematerialisation. Modern and forth-coming ICT⁸³ can positively save on transportation, either through the substitution of physical transport or by more sophisticated organisation of transport use. The Ministry of Environment in Finland for instance has estimated that 450.000 workers (about 20% of the population) could potentially become telecommuters and thus perform all or a part of their job outside the workplace. If all of them would work one day a week at home, distances travelled by car would be reduced by about 216 million kilometres, thus reducing by 1% CO₂ and air pollutant emissions from privately owned motor vehicles in Finland.

7.8. RAISING AWARENESS AND CHANGING HABITS

ICT technologies have a significant "dematerialisation" potential and can contribute to decouple economic growth from resource consumption. However, the positive impact will largely depend on changing consumers' habits and tackling the so-called rebound effects which are likely to have a counterbalancing influence. Indeed, tele-working or tele-shopping make it possible to adapt travelling times to people needs but what takes the place of a car journey to work or to the supermarket ? The time gained could be used for recreational activities such as cycling or playing football but it might also be used by some people for travelling to the countryside by car !

- ▶ E-mails are a good example of the potential to reduce envelopes and paper consumption as long as they are not all printed as soon as we receive them.
- ▶ Music downloads from the internet have substantial positive effects as long as consumers do not re-materialise digital information by burning music files on CDs. Digital Europe has shown that this habit might even over-compensate the savings from a purely digital distribution⁸⁴.

Sustainable production and consumption must go hand in hand! But, with virtual products, the responsibility shifts significantly to the consumer. This reinforces substantially the importance of awareness raising, consumer education and the promotion of cultural changes. All domains in which local authorities can have a significant role to play !



ICT – a path to paperless office

The Brussels Region has launched pilot projects in public and private enterprises to assess the potential of paper and energy savings allowed by the proper use of advanced IT equipment. The project also aimed to identify factors which influence consumption and to determine ways to impact positively on those factors.

Ten pilot entities have been selected, and **3 potential scenarios for improvement** identified :

- ▶ awareness and education of employees
- ▶ introduction of new technologies and eco-efficient tools
- ▶ reflection on the structural organisation and the management of information flows for the whole organisation.

The main conclusions of the project are the following :

- The **reduction potential of paper consumption** can range **from 10% to 30%** only by making the most of existing tools (employees often have a bad knowledge of the available material). For the Brussels Region's offices, this means a reduction potential for paper consumption between 1.900 and 5.700 tons per year.
- If an integrated approach was implemented, **with the aforementioned improvement opportunities**, this rate of **30% could be exceeded**.

GLOSSARY

TERM	MEANING
Electrical and Electronic Equipment (EEE)	Equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields falling under the categories set out in Annex IA and designed for use with a voltage rating not exceeding 1000 Volt for alternating current and 1500 Volt for direct current. <i>(art. 3, a) WEEE Directive)</i>
Energy recovery	Use of combustible waste as a means of generating energy through direct incineration with or without other waste, but with recovery of the heat. <i>(art. 3, e) WEEE Directive)</i>
Historical waste	WEEE from products put onto the market before the 13th August 2005.
Orphans	WEEE whose producer is not capable of being identified or does not exist anymore when waste management costs occur.
Prevention	Measures aimed at reducing the quantity and the harmfulness to the environment of WEEE and materials and substances contained therein. <i>(art. 3, c) WEEE Directive)</i>
Producer	Anyone who : <ul style="list-style-type: none"> - manufactures and sells EEE under his own brand - resells EEE produced by other suppliers - or imports or exports EEE on a professional basis into a Member State. <i>(following art. 3, l) WEEE Directive)</i>
Producer responsibility	Application of the polluter-pays principle, aiming at integrating the environmental externalities within the price of products : the WEEE Directive entails an individual producer responsibility, requiring that producers bear the costs for the collection (from collection points), treatment, recycling and environmentally sound disposal of the products of their own brand. A collective producer responsibility would allow to share the treatment and recycling costs following the market shares of producers.
Reconditioning	Process of returning a used product to a satisfactory working condition.

TERM	MEANING
Recovery	Any of the applicable operations provided for in Annex IIB to Council Directive of 15 July 1975 on Waste (75/442/EEC) ¹ . (art. 3, f) WEEE Directive)
Recycling	Reprocessing in a production process of the waste materials for the original purpose or for other purposes, but excluding energy recovery. (art. 3, e) WEEE Directive)
Repair	Fixing of specified faults in a product.
Re-use	Any operation by which WEEE or components thereof are used for the same purpose for which they were conceived, including the continued use of the equipment or components thereof which are returned to collection points, distributors, recyclers or manufacturers. (art. 3, d) WEEE Directive)
Treatment	Any activity after the WEEE has been handed over to a facility for depollution, disassembly, shredding, recovery or preparation for disposal and any other operation carried out for the recovery and/or the disposal of the WEEE. (art. 3, h) WEEE Directive)
Waste	Any substance or object in the categories set out in Annex I of Council Directive of 15 July 1975 on waste (75/442/EEC), which the holder discards or intends or is required to discard.
Waste Electrical and Electronic Equipment (WEEE)	Electrical or electronic equipment which is waste within the meaning of Article 1(a) of Directive 75/442/EEC, including all components, subassemblies and consumables which are part of the product at the time of discarding. (art. 3, b) WEEE Directive) Screens, keyboards, capacitors, tubes, printed circuits boards are components . Subassemblies are for example shelves of a refrigerator, without which the equipment of origin could not function as foreseen by the manufacturer. The consumables are pieces of the equipment that must be replaced in the short-term, like ink cartridges or batteries ² .

¹OJ L 37, 13.02.2003, p. 24

²OJ L 194, 25.07.1975, p. 39.

³Explanatory Memorandum WEEE and ROHS Directives, COM (2000) 347 Final, Brussels, 13 June 2000, p.32.



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RESOURCITIES is the gateway to the outputs from the project "Sustainable Consumption in Cities – European campaign on products without waste and recycled products":

- **an information report on :**
 - ▶ waste and resources in Europe and beyond
 - ▶ recycling, reuse and their benefits
 - ▶ dematerialisation and the role of Local and Regional Authorities
- **a catalogue of good practices**, illustrating how European municipalities can promote more sustainable lifestyles and consumption patterns, waste prevention and recycling
- **a downloadable brochure** in 5 languages (EN, FR, ES, NL, PT) presenting the relations between our current ways of life and the consumption of natural resources. It complements the exhibition "The Earth, a user's guide : consuming products without waste and recycled products".
- **a regular updating of the present guide**, to follow the new developments and initiatives induced by the implementation of the WEEE Directive into national laws.

For further details or for sharing information with us : acrr@acrr.org

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www.acrr.org/resourcities

RESOURCITIES

HOW TO MANAGE RESOURCES AND WASTE IN CITIES ?



ACRR (ASSOCIATION OF CITIES AND REGIONS FOR RECYCLING)

ACRR is an international association with a pedagogic and scientific aim. With more than 70 Local and Regional Authorities in Europe, it promotes the exchange of information and experiences on the sustainable management of municipal waste, notably through prevention at source, reuse and recycling.

ACRR is open to political decision-makers and technical managers, who want to develop their expertise and play a proactive role in the development of policies and techniques of waste management.

ACRR organises conferences and seminars, allows its members to stay in close contact with events and discussions held at the European level, and provides them with access to an international network of actors involved in urban waste management. It also publishes reports and studies, as well as regular newsletters, and displays lots of relevant information on municipal waste management on its website <http://www.acrr.org>

Brussels Office

Gulledelle 100, B - 1200 Brussels
tel: +32.2.775.77.01 - fax: +32.2.775.76.35
acrr@acrr.org

General Secretariat

1st Floor - The British School
Otley Street - Skipton - North Yorkshire BD23 1EP, UK
Tel: +44 1756 709 600 - Fax: +44 1756 709 801
acrr@acrr.org



CARE ELECTRONICS

CARE Electronics means Comprehensive Approach for the Recycling and eco-efficiency of Electronics. This is a voluntary, international and environmental R&D network within the EUREKA framework, that ensures close cooperation with the electronics industry through their associations such as EACEM, EUROBIT, ECTEL and EECA.

The major objective of this network is to stimulate environmental projects throughout the electronics industry, including financial, technological and research aspects, with a view to emphasise the development of sustainable products, the sharing of environmental responsibility and the protection of limited natural resources.

CARE Electronics

bernd.kopacek@ihrt.tuwien.ac.at
<http://www.ihrt.tuwien.ac.at/sat/base/cv2000/index.html>



RREUSE (RE-USE AND RECYCLING EUROPEAN UNION SOCIAL ENTERPRISES)

RREUSE represents and supports national networks and federations of social economy enterprises from 11 European countries, which carry out re-use and recycling activities. The aims of RREUSE are to:

- encourage and strengthen collaboration between the member organisations in order to promote good practices, research and development of activities and partnerships
- enable member organisations to exchange information concerning national and local policies, legal and fiscal frameworks in relation to reuse, waste management, import and export, social provisions
- represent and promote the sector and its activities at all relevant European and international levels.

Re-Use and Recycling European Union Social Enterprises

info@rreuse.org
<http://www.rreuse.org>

