

COOPERATION-COORDINATION-COMMUNICATION: OPPORTUNITIES FOR MORE SUSTAINABLE WEEE MANAGEMENT IN CENTRAL AND EASTERN EUROPE

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BIOGRAPHY



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ABSTRACT

Waste electronic and electrical equipments represent one of the fastest growing waste streams in Europe. The general infrastructural development, the expansion of the electronics and informatics, the integration processes and the political, economic and structural changes of the former socialist countries also contributed to the constantly growing amount of WEEE¹. Latest Environmental Assessment of the EU showed an unfavourable picture on waste generation: taking the stored historical waste also into account, the Union should manage more than 8 million tons of waste electronic and electrical equipments, today. Central and Eastern Europe is affected by this waste stream in many ways facing *huge waste bases* due to the pace of ICT²- and infrastructural development and managing *extremely high amount of long-term storage waste* as a consequence of special attitude of endusers gained in in the soviet era. In order to implement sustainable WEEE management both on country and region-level, first, they should work-out efficient management and coordination methods, eliminate insufficient conditions of disposal sites, rationalize resources and data-management, communicate stakeholders and last but not least, improve transnational cooperation. The most burning question is how CEE region³ is able to rationalize its resources and capacities in order to introduce efficient and sustainable WEEE-management models. There has already been successful local initiatives: Czech, Slovak and Hungarian projects are known. These national programs were rolled-out proactively and predating the introduction of referring European legal obligations⁴, while other new member states limited their actions only to meeting the legal requirements.

Local success stories and practices of cooperation programs serve ground for the assumption that the region is able to improve the efficiency of WEEE management through motivation of liable parties, decentralization and transnational cooperation. The paper outlines the key factors and possible steps of the implementation by investigation of best practices and set-up of a transnational WEEE management model.

KEYWORDS

Central and Eastern Europe, WEEE, ICT waste management, LCA thinking, coordinating organisations, sustainability, optimization, transnational cooperation

¹ WEEE: Waste electronic and electrical equipment

² ICT: Information and Communication Technologies

³ In the paper CEE region covers 10 countries (as it is registered by the EEA): Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Lettvia, Poland, Romania, Slovakia, Slovenia

⁴ directive 2002/96/ec of the european parliament and of the council of 27 january 2003 on waste electrical and electronic equipment [official journal L 37 of 13.2.2003], as amended by directive 2003/108/ec [official journal L 345 of 31.12.2003] and directive 2002/95/ec of the european parliament and of the council of 27 january 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment [official journal L 37 of 13.2.2003]¹

1 THE PROBLEM OF WASTE ELECTRONIC AND ELECTRICAL EQUIPMENTS AND THE ECONOMIC PERFORMANCE OF CENTRAL AND EASTERN EUROPEAN REGION

Waste electronic and electrical equipments represent one of the fastest growing waste streams in Europe. The integration processes, political, economic and structural changes of the former socialist countries, and revolutionary inventions of the informatics also contributed to the constantly growing amount of WEEE⁵.

Central and Eastern Europe also faces huge waste bases due to the pace of ICT⁶- and infrastructural development, the expansion of the electronics and the end-users special attitude. Moreover, *local market conditions* and *consumers' behaviour* expose the region to additional challenges: problems of *historical waste, management methods and capacities, insufficient conditions of disposal sites and lack of regional solutions* should be managed.

Latest Environmental Assessment⁷ of the EU gave an unfavourable picture on waste generation: The Community(+EFTA) produces circa 1700 million tons⁸ of waste per annum, out of which one Central and Eastern European citizen generates 3,8 tons. It is a shocking fact that at least 3% of this amount is hazardous⁹. (It means a slight category rate increase compared to the third report.) The Used electronic and electrical equipments, being hazardous wastes, means direct risk to the environment. Statistics show an increase of 16-17% since 1998. The ratio of WEEE varies regionally from 4 to 10% of the total amount of hazardous waste and we can calculate with an annual growth of 3-5%. Taking the stored so-called 'historical waste'¹⁰, also into consideration, the Union should manage more than 8 million tons of waste electronic and electrical equipments, today.

Central and Eastern European ICT development still follows the EU-15 countries and is in the closing-up phase, so this region is especially threatened by the environmental risks of fast changing installed bases. Co-incidence of current and *long-term storage waste, lack of modernization, regionally varying quality of services* are the reasons why the WEEE management capacity of CEE countries lags far behind the EU-15 average. The most burning question is how CEE region¹¹ is able to optimize its resources and potentials in order to introduce efficient and sustainable WEEE-management models.

There has already been successful local initiatives: Czech, Slovak and Hungarian projects are known. These national programs were rolled-out independently of the European directives and legal obligation, while other new member states limit

² WEEE: Waste electronic and electrical equipment

⁶ ICT: Information and Communication Technologies

⁷ Europe's Environment: The Fourth Assessment, EEA, October, 2007.

⁸ EECCA Countries generate 3450 tons of waste per annum, which mean 14 kg/citizen.

⁹ The Pan-European region produces more than 250.000.000 tons of hazardous waste annually!

¹⁰ historical waste: Waste equipments as long-term storage pollutants accumulated in the Soviet era.

¹¹ In the paper CEE region covers 10 countries (as it is registered by the EEA): Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Lettvia, Poland, Romania, Slovakia, Slovenia

their actions only to meeting the legal requirements.

Local success stories serve ground for the assumption that *through coordination, communication and cooperation, we can rationalize* the waste management resources, human capital, knowledge base and responsibilities in the region, while transnational *optimization* of the services and solutions, improvement of environmental conditions, minimization of regional disparity and upturn in human development.

1.1 SITUATION ANALYSIS – SUCCESSES IN THE REGION

WEEE situation is a popular subject both for researchers and the media, despite the unsatisfactory quality of databases, incoherences of statistics and difficult accessibility of disclosed data. Official country statistics are published by the national statistical offices, agencies and environmental ministries. EUROSTAT and EEA¹² are responsible for supervision of the country reports and prepare the annual reports by categories and by region. Though the member states provide reports each year, transparent timeline data is available only between 1996-2004 and mostly estimations (on the basis of the service providers' and coordinative organizations reports and market shares) are published for the WEEE category.

Initially, we should get an overview on the economic performance – as a significant factor of waste generation - of the three countries managing successful programs. Data for both the economic growth and human development are accessible for 2007, but environmental assessment reports only the year of 2004. In order to get coherent and comparable dataline, we take 2003 as the base year when evaluating the national performances. *Table 1* shows the comparison.

Table 1.

Human development and GDP indices in Czech Republic, Hungary and Slovenia

Country	Population (million)	GDP index	GDP/capita (PPP, USD)	HDI (2004) ¹¹
Czech Republic	10.27	0.865	19,408	0.885(30th on the World rank list)
Hungary	10.21	0.845	16,814	0.869 (35th)
Slovenia	1.99	0.888	20,939	0.91(27th)
CEE	105	0.75	8,802	0.802(average)

(2004)

GDP indices show an interesting picture of the developing economies and draw our attention to recent trends. The Czech growth rate was 5.5% in 2005, which slightly increased to 6% in 2007. 2007 reports communicated an expansion of 1.2 % for Hungary, and 6.8(!)% for Slovenia. Except for the 2007 performance of Hungary, these countries achieved their annual economic goals and targets, and performed definitely above the average of the European Union¹³ during the last years. Due to the

¹² EEA: European Environmental Agency

¹³ 2.2% according to EUROSTAT

economic progress of period 2002-2006, the Human Development indices of the countries in question were also higher that time than the CEE-average.

In this progressive period, successful Information Society programs and ICT-investments were implemented in the countries in question, and EEE¹⁴-spendings increased in each state (due to the uprise in economic performance, the significant increase in households' income and the successful national implementation of IS strategies) – according to the latest IDC¹⁵ reports. This information is a key lead not just because it helps studying the current consumption model, but for the EEE-repurchasing forecasts, which say that in the named countries, repurchasing frequency of those products is getting higher at least during the next 3 years.

As the independent organisation of IDC reported, a representative household in the region, uses one equipment for 3-5 years (the estimation depends on the type of the device).

Table 2. Hazardous waste generation in CEE countries and in the EU¹⁶

Country	Hazardous waste/capita (kg)	Hazardous/total waste ¹ , %	WEEE/ capita (kg)	WEEE/ Hazardous waste per capita, %
Czech Republic	276	6	18-19	6.8
Hungary	93	5	17-18	18.2
Slovenia	34	2	4	11.7
CEE	155	5	10	3.2
EU25	129	2	18-20	14.7

At the moment, Hungary should manage 170.000 tons¹⁷ of WEEE. The others also have large stockpiles at service providers or at pick-up points and as seen in *Table 2*, each country's WEEE-generation makes up bigger proportion of hazardous waste than the region's or the EU's, on an average.

After detecting the quantities and understanding the seriousness of the WEEE problem, several initiatives and successful programs were launched in these states: As the very first ones in the region, *Czech* waste managers and agencies cooperated with the aim to establish collection systems. The 4 biggest service providers joined the initiative. They have a permanent dialouge with the authorities and the manufacturers in order to meet the legal requirements and market challenges. In addition, the authorities provide stable, reliable and efficient institutional background and

¹⁴ EEE-spendings: amount of money spent on electronic and electrical equipments

¹⁵ Source: Worldwide PC 2007-2011 Forecast - David Daoud, Doug Bell, Loren Loverde, International Data Corporation, March 2007. IDC: Independent Data Corporation

¹⁶ Author's estimation on the basis statistics reported in Hazardous and Industrial Waste Management in Accession Countries, EC- Eurostat- EEA, 2003. ISBN 92-894-6220-5 and The potential of Solid Recovery Fuels and Waste Management in Central-Eastern European Countries – Hanna Burczy, Tomasz Golec, Urszula Dabrowska, Institute of Power Engineering Warsaw, 2006.

¹⁷ Based on a personal interview made with Zoltán Tóth, the managing director of the Hungarian market leader coordinating organisation Electro-coord(www.electro-coord.hu), 09/08/2005.

favourable strategical frameworks. Their results are service quality improvement, capacity-optimization and program-based inventions.

In Slovenia, a coordinative organisation takes over the liabilities of the manufacturers and distributors. It is a necessity, since the local market is not efficient enough yet, moreover the number of licenced service providers is quite low. Their biggest result - unique in the CEE region – is the up-to-date waste reporting system and database¹⁸.

The *Hungarian* manufacturers and importers established and joined coordinative organisations – as soon as the regulations were communicated – and set a network to minimize their additional administrative and operative tasks. Their motives were basically economical, and they created efficient competitive situation on market.

The coordinating organisations take over the liabilities and reporting duties of the manufacturers such as the Czech service providers and agencies do. Their systems are based on inventive reporting tools and cooperation with the licenced service providers. It is not a side-fact, that the authorities provide strategical framework for their cooperation, inventions and the manufacturers' programs.

2 CZECH SUCCESSES IN IMPLEMENTATION OF THE WEEE DIRECTIVE – COOPERATION IN INNOVATION

Legal background of the Czech waste mangement was developed between 1997 and 2002. In the second part of the period, the legal harmonization was also implemented. Due to the quick adoption of the EU directives, the first „EU-conform” waste reports were made in 2003. By the way, the Czech Statistical Office had been collecting and consolidating data for the national waste production from 1992.

Since the background network of authorities is working well and it operates transparently, the Czech manufacturers and liable parties were able to quickly react and meet both the legal and market requirements. Cooperation program-based initiatives were launched first here.

Authorities of waste management and administration:

- Ministry of Environment (MoE)
- ministerial authorities for 14 regions of the country (as of the institutional re-form in 2001)
- 76 District Offices
- Czech Environmental Institution (CEU)
- Center for Waste Management (as of 2001)
- Statistical Office of Czech Republic

Good example for efficient operation of an Authority is that the Ministry of Environment began a project for the motivation of manufacturers' programs and initiatives, as of 1999. At the moment 5 collection systems are working, and the MoE has continuous dialogue with the industry through the Czech and Moravian Electrical and Electronic Idustry Association and the AREO (Association of WEEE Managers).

¹⁸ Source: <http://waste.eionet.eu.int/wastebase>

It empowers the Authority for control and planning also. Seeing the Information Society development, the Government motivated the establishment of a coordinative organisation especially for the ICT waste category (REMA).

Early set up of collection systems are results of the permanent dialogue between the industry and the authorities and cooperation between business actors and endusers.

Table 3. Collection systems in Czech Republic

Service provider/ coordinative organization	Relevant products
RETELA (in cooperation with AREO)	ITC, household equipments, medical instruments, monitoring devices
ASIKO	ITC, small household equipments, medical instruments, monitoring devices, games, other EEE
CECED	Household equipments
Ecolamp	Lightening
REMA	Household equipments, games, other electrical equipments
Elektrowin	All categories

Source: WEEE Forum, <http://www.weee-forum.org>

Strengths and weaknesses of the Czech WEEE management:

Strengths:

- strong and efficient institutional background
- decentralization in programming
- early reaction and programs of manufacturers
- high rate and good partnership of joined liable parties
- stable competition of service providers and coordinating organisations
- all waste categories are covered
- coordination of the authorities and the industry
- permanent reduction of the number of disposal site
- low prices of disposal

Weaknesses:

- difficulties due to the high proportion of hazardous waste and WEEE
- lack of coherent and up-to-date waste databases and reports
- not definite separation of service providers, coordinators and consulting agencies
- low rate of recycling
- high rate of incineration
- the majority of waste incinerators did not meet the legal requirements¹⁹

¹⁹ Source: Vladimír Dobes, Vladislav Bizek: Identifying Complementary Measures to Ensure the Maximum Realisation of Benefits from the Liberalisation of Trade in EGS, Case Study: Czech Republic, In: OECD Trade and Environment Working Paper, No. 2004-1.

The opportunities of the Czech WEEE management are mostly in *the efficient institutional background*, the *efficient cooperation programs motivated by the authorities* and in the *market conditions*. The fast industrial and infrastructural development of the country means continuous environmental risk (hazardous waste quantity is almost twice as much as the average of the region and its proportion of the total waste quantity is 3 times higher than the average of the EU25). On the other side, the national historical waste base is quite low.

International cooperation means expanding business possibilities for Czech WEEE managers and consulting organisations: since the actors have both the expertise and the best practices in cooperation model of WEEE management, it is suggested implementing territorial cooperation projects in the field. Low disposal and management prices give further advantageous attributes to the country's WEEE-profile (depending the waste category, disposal prices are from 0.3 to 3.9 Euro/kg), if transnational cooperation is concerned²⁰.

3 COMMUNICATION AS A KEY FACTOR OF SUCCESS? – SLOVENIAN RESPONSES TO THE CHALLENGES OF WEEE

Slovenia was the first in the region, who had the necessary regulations both for the general and the hazardous waste. The country also managed a well-timed harmonization process. The Ministry (MEASP) began the work in 1993 with the transposition of Basel Convention and finished in November, 2004. Set up of efficient institutions and quick legal harmonization created the right operational conditions both for the industry and the administrative bodies.

The national institutions of waste management:

- Ministry of Environment, Energy and Spatial Planning (MEASP)
- Environmental Agency of the Republic of Slovenia (EARS)
- Statistical Office of the Republic of Slovenia (SORS)

Consciously planned share of responsibilities reflects the efficient operation of the Slovenian institutions. Slovenian successes in communication and reporting are due to the results of EARS and SORS.

EARS manages primer data coming from liable parties. SORS coordinates reporting and database-management, tries to explore the sources of incoherences and insufficiencies of the reports, as well as makes studies on the industry. Outcome of the reforms optimizing its role is transparent: Slovenia has made the most accurate waste-reports in Central and Eastern Europe from 2001.

In spite of the advanced database management sometimes there are conflicts between the EARS databases and statistics published by the SORS. Generally, it can be stated, that SORS communicate more moderate statistics to EUROSTAT. Due to the double check of data, trend-demonstrations are reliable.

Slovenia had also worked-out a complex National Action Plan (NEAP) to manage the environmental problem.

²⁰ Source: www.retela.cz, pricelist (http://www.retela.cz/index_en.php?s=15)

Development of environmental and waste management strategy was coordinated in line with the fundamental objectives of the NEAP²¹.

Implementation of WEEE management program was started based on a multi-level communication campaign even before the EU-accession.

Strategical objectives of waste management:

- focusing on the economic aspects
- minimization of pollution and amount of waste
- speeding up investments in hazardous waste management

Priority goals of waste management in the current Action Plan:

- promotion of technology
- apply modern methods in recovery and in disposal
- improve public participation in waste management by involvement of local communities

Special instruments applied in waste management:

- introduction of Eco Tax on landfill (2001)
- introduction of Eco Fee (as new economic instrument) for 10 EEE categories (2003)
- two tenders for waste management services (one for household and one for non-household appliances)

By the way, Slovenia had the most favourable environmental assessment as a new memberstate: statistics show that its environmental performance is already meets the EU-average. The country is in a very good position as far as the annual WEEE generation is concerned: 4kg/capita is below the average.

Actions of the Slovenian authorities and communication and application of economic instruments motivated both the manufacturers and other liable parties to improve the collected amount of WEEE.

Due to the modern aspects and approaches to the WEEE-problem, the citizens became more active and responsible for the environment. In comparison with Czech Republic, the biggest difference is, that Slovenian solutions depend highly on the *administrative bodies* and *the authorities* while the Czech model is more decentralized focusing more on *cooperation* and individual *initiatives* of liable entities and service providers. The different national approach and the intention of centralization have led to a monopolic system, in which there is only one key player as a coordinating organisation (ZEOS).

This fact generates a lot of questions regarding the effectiveness and further challenges of the system, since there is no multi-level competition in the market. On the other hand, the most burning issue is the certification of waste managers and disposal sites. The monopolistic position of the coordinative organisation does not serve the improvement of waste-manager licences. Opportunities of the industry are

²¹ „The fundamental objectives of NEAP are to guarantee a better living environment in Slovenia and to establish the environment as a limiting, but stimulation factor of development.” In Introduction of NEAP, MEASP, Slovenia, 2005.

driven by the parties' intention to cooperate and establish other coordinative organisations. Obviously, this action can produce more efficient competitive situation and the possibility for better quality of services, increase in take-back and recycling capacity, and price-advantages.

Strengths and weaknesses of Slovenian solutions:

Strengths:

- scheduled communication and effective use of economic instruments
- efficient operation of and communication by authorities
- communication focus on the desired increase of recycling rate,
- accurate, coherent and up-to-date reporting
- well-developed databases

Weaknesses:

- short of licenced disposal sites and waste managers (about 20%),
- unefficient management methods
- monopolistic competition among service providers
- small number of joint manufacturers
- low capacities for recycling (max. 10-20.000 tons/year),

4 HUNGARIAN SYSTEM OF WEEE MANAGEMENT AS AN EFFICIENT MODEL FOR COORDINATION

It can be stated, that the legal harmonization and progress for convergence in waste management started quite late in Hungary. Due to the Commission's rebuke, the Hungarian Government and Ministry of Environment urged the transposition process so that the first phase of the adaptation was finished by January, 2002. The final phase ended in October 2004.

Hungarian WEEE-management practice represents an ambivalent situation in the region. Extraordinary conditions are due to the customer's special behaviour and the competition on the market of coordinative organisations and service providers. but for the developed logistics solutions applied. It has been studied that households and small businesses has compiled up a great amount of WEEE during the recent 15 years. This special behaviour is a natural reaction to the shortage lived during the socialism: by planning and storing obsolete but operating devices on a long run, end-users would like to minimize their risks. The result is shocking: 300,000 tons of historical waste. During the last 4-5 years, bigger waste managers and pick-up points has reported that historical waste makes up 10-15%²² of WEEE. According to the latest estimation of coordinator Electro-Coord Kht. 480,000 tons (300,000 historical+180,000 tons current waste base) of WEEE should be managed, while it is only 8000 tons in Slovenia. It means 17-18 kg/citizen.²³ Furthermore, the proportion of hazardous wastes is quite high, while the rate of recycling is definitely low.

²² Based on a personal interview made with Balazs Bercesi, project coordinator of TERRA-V Ltd., 14/09/2005.

²³ Source: estimation of Zoltán Tóth, in press conference presentation, <http://www.electro-coord.hu/it.php>

There are further challenges for the backward institutions, administrative bodies and regional authorities since the institutional background and the database-management is very weak in Hungary. At the moment, WEEE reports and statistics are not publicly available at the authorities or in the HIR database (Waste Information System).

All these facts contributed to the Commission's rebuke. As a reaction to the assessment, the Ministry rolled-out an Action Program for Waste Management in frame of the second National Environmental Program (2003-2008). The strategical base of the Action Program (AP) is the National Plan for Waste Management²⁴(NP), which contains operative elements as well.

Operative goals of WEEE management in the NP and AP:

- improvement of prevention and recovery rate by legal and economic instruments (e.g.: product fee for EEE)
- special control and administration of WEEE stream, program to be set up
- set up of national collection system
- integration of plans for waste management
- financial support for R&D in technology modernization
- financial support for modernization of recycling and selection facilities
- financial support for education in WEEE management
- support for recultivation of disposal sites

As a result of efficient intervention and communication of the authorities, the industry began to organize collection systems in 2001, and they established 4 coordinative organisations during two years (*Table 4*). The competitive situation and the quick answer of the industry motivated the coordinators to drum up as many liable companies as possible in the shortest term.

The efficiency of their work is proved by the statistics:

- by 2005, more than 220 liable entities had joined one of the systems
- the industry could meet the EU targets for take-back, recycling and recovery,
- cost of WEEE management is the lowest in the CEE region (0,2-12 Euro/device²⁵, while e.g. in Slovenia it is 10-12 Euro.²⁷).

²⁴ Source: National Plan for Waste Management 2003-2008., MoEW/KvVM, Hungary, 2003.

²⁵ Source: press release of general manager Emil Sehic, ZEOS, in: WEEE News, BuyUSA U.S. Commercial Service, 19/08/05.

Table 4. The Hungarian collection systems

Coordinating organizations	Products included
Electro-coord Kht. (70% market share)	All the categories
Ökomat Kht.	Household equipments
Elektro-Waste Kht.	ITC, medical devices, games, monitoring devices, other EEEs.
Re-Elektro Kht.	All the categories

Source: WEEE Forum, <http://www.weee-forum.org>

Strengths and weaknesses of the Hungarian system of WEEE management:

Strengths:

- Use of economic instruments (eco-taxes)
- Special legal instruments harmonized with the strategy
- Good level of service in case of coordinative organisations
- Successful initiatives and programs of manufacturers
- Detailed action plan for waste management

Weaknesses:

- High volume and growth rate of WEEE
- High amount of historical waste
- Underdeveloped recycling and disposal sites (only 50 sites -out of 1200- meet the EU requirements)
- Low recovery rate
- Low level of cooperation among liable parties
- Deficiency of institutional background, especially in case of regional bodies
- Low level of information flow and databases available

5 OPPORTUNITY FOR A REGIONAL COOPERATION IN WEEE MANAGEMENT – *THEORY OR PRACTICE?*

As seen, 3 national solutions were studied in order to collect the key characteristics of WEEE management practice in the CEE region. By use of different elements of local methods, we can construct the optimized regional model. The hypothesis of the paper says that *efficiency gains in the design*, therefore those successful local systems can be combined and designed into one optimized model.

We should take the following factors into consideration when defining the environmentally and economically optimized and sustainable model²⁶.

- Environmental impact
- Time efficiency
- Cost efficiency

Primarily, we have to construct the model and the logistics work-flow to be able to track the impacts.

Model components and system boundaries:

- standardized and harmonized legal requirements and frameworks (in all the countries)
- collection systems should be set up (in each country)
- minimization of risks and responsibilities of liable entities through coordinating organisations (Hungarian pattern)
- effective communication programs, reporting system and up-to-date local, regional and national databases (Slovenian method)
- technical expertise and professional services
- special skills in cooperation and clustering (Czech practices)
- transboundary shipment of WEEE is a possible solution for disposal (Hungarian case studies)²⁷
- C2C²⁸ technologies are available at manufacturers
- economic and legal instruments to motivate competition
- economic and legal instruments to improve quality of services and proportion of licensed suppliers

Key characteristics:

- specialization
- takeover of responsibilities
- models of wasteflow in the standard logistic chain:
 1. end-users » 2nd tier distributors » 1st tier distributors / importers / manufacturers » waste managers
 2. end-users » 2nd tier distributors » waste managers
 3. end-users » waste managers

²⁶ Source: Coatanéa, Kuuva, Makkonnen, Saarelainen, Castellón-Solano: Analysis of the concept of sustainability: definition of conditions for using exergy as a uniform environmental metric, in: Proceedings of 13th CIRP International Conference on Life Cycle Engineering, Volume 1., p. 81-86., 2006.

²⁷ Source: Adrienn Malik: Environmental thinking in Information Technology: Hewlett-Packard, In: Ablakon bedobott pénz – case studies for environmental management, KÖVET-Inem Hungária, 2004. ISBN-963 217 3899

²⁸ Cradle-to-Cradle technologies cover design for closed-loop recycling by which original manufacturers can re-produce products without significant quality deterioration. Source: MacDonough-Braungart: Cradle to cradle – Remaking the Way We Make Things, Kindle Edition, 2002.

- cost-effectivity (total cost of system-set up, administration, collection, management, transport and disposal)
- maximization of benefits
- minimization of environmental impact
- minimization of time of return

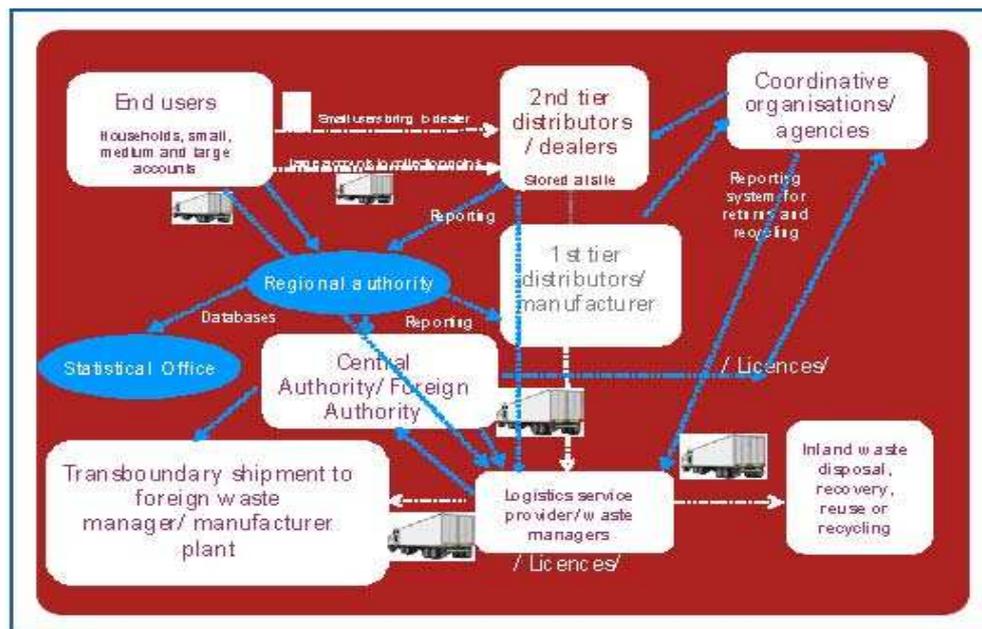


Figure 1.

Advised model for logistics work-flow of WEEE management in CEE region²⁹

The logistics chain above is not totally unknown in our region. Few manufacturers have similar programs for ICT waste take-back. But they mostly work only with inland agencies, service providers and - obviously - authorities. Local waste utilization is also preferred.

Neither the local authorities nor the agencies/consultative organisations have drawn their attention to the advantages of transnational solutions. Of course, certain manufacturers (or importers/liable entities) minimizing their costs and environmental investments, have implemented transnational waste management programs – as individual initiatives. Just to mention a few: Felxtronics, Hewlett-Packard, Braun, Sony. Foundation of ERP³⁰ resulted in solutions of that wider view: involved multinationals began to share responsibility, knowledge, resources and services also in waste management, but we can not state, that it shows a trend.

Compared to inland solutions, how can a transnational cooperation model in waste

²⁹ The author's edition.

³⁰ ERP: European Recycling Platform

management really contribute to economic and business progress and to a more sustainable environment? Let's see a case study for costs and benefits.

5.1. Transnational WEEE management model in practice: result of a case study at Hewlett-Packard Hungary

Hewlett-Packard as a leading manufacturer and service provider³¹ in the international ICT market, realized the transnational way of WEEE management while improving both business and environmental performance.

Environmental action	Since	Environmental impact (compared to 'business as usual' solutions)	\$ Investment € Operational costs £ Benefits ! Time of return
Manufacturer's and coordinators decentralized program to take-back and recycle HP ink cartridges and toners (47 pick-up points country-wide, foreign (Czech) agency for management and coordination, both inland and foreign service providers for waste management, transport and recycling, transboundary shipment of waste)	01/02	<ul style="list-style-type: none"> - Less transportation (-1000kms/50 endusers /month), - Less emission, - Less use of fuel (less 300 litres/50 endusers/month), - No inland waste disposal and incineration - Less waste disposed (95% of components and 65% of total weight can be recycled at the manufacturer's German plant) - 65% less material needed for new cartridges 	\$ 3.2M Ft/12,800€ € 2.6M Ft/10,400€ £ 4.4M Ft/17,600€ (annual data) ! 1 year 9 months Additional impacts: -70% saving of time/year -cost saving by reuse of most components at original manufacturer
Manufacturer's and distributors joint decentralized program to take-back and manage ICT wastes generated at large accounts (pick-up at site, (foreign(Czech) agency for management and coordination, both inland and foreign service providers for waste management, transport and recycling, transboundary shipment of waste)	06/03	<ul style="list-style-type: none"> - Less transportation (-3000 kms/1200 accounts/month) - Less emission - Less use of fuel (less 10800litres/1200 accounts/ year) - No inland waste disposal and incineration - Less waste disposed (95% of components and 65% of total weight can be recycled at the manufacturer's German plant) - 65% less material needed for new cartridges 	\$ 0.355 M Ft/1,420€ € 0.288M Ft/1,152€ £ 0.485M Ft/1,940€ (monthly data) ! 1 year 9 months Additional impacts: -cost saving by reuse of most components at original manufacturer

Table 5. Environmental and economical impacts of applying transnational waste collection system for Hewlett-Packard cartridges³²

The environmental, time and economic benefits of the certain project above demonstrates the optimization opportunities of international cooperation programs in the field of WEEE/ICT waste management. Planning a sustainable transnational system for the management of used equipments is a complex task. The planning cycle below shows that complexity of factors to be considered when managing a program for ICT wastes.

³¹ Hewlett-Packard was reported market share leader in 6 subsectors of international ICT market in 2007.

Source: www.hp.com, Press Release, PALO ALTO, Calif., Oct. 10, 2007

³² The author's edition.

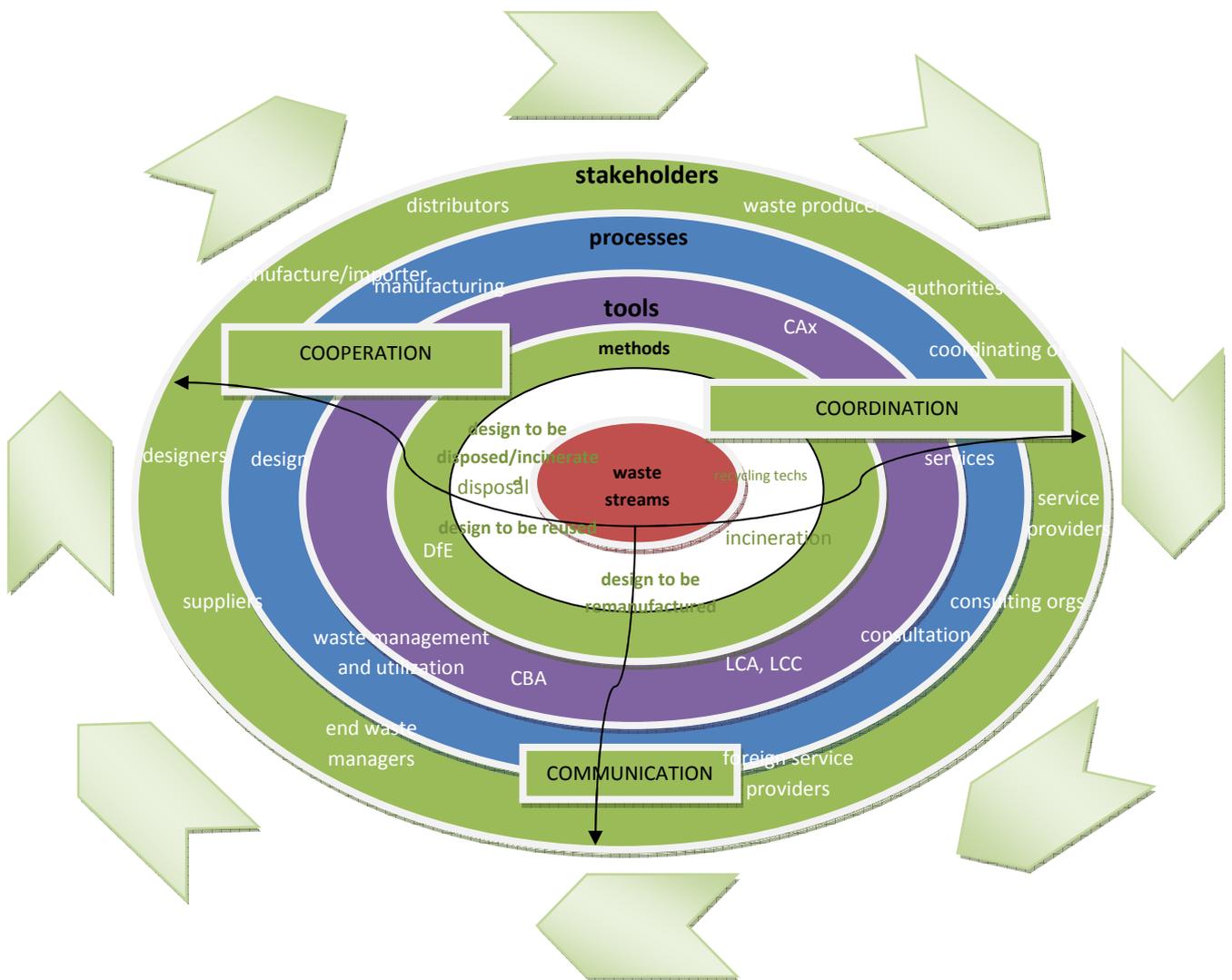


Figure 2. The optimization cycle for the management of waste equipments.

Source: The author's edition.

As generally in case of innovation in waste management, there still are obstacles and difficulties impeding the realisation. The most important ones are outlined below:

- legal constraints on transboundary shipments and service providing
- difficulty of international solution for financial deposits (as security guarantee for the case of negative environmental impact during service providing)
- asymmetric communication between manufacturers (due to the competitive situation)
- slow communication between national authorities and bodies
- lack of an up-to-date international database for ICT waste
- liable entities concentrate mostly on meeting the targets (deadlines, return rate, recycling rate) and obligations instead of optimization

Today, it is clear for the European Community that sustainable WEEE-management approach requires both environmentally and economically designed collection networks. Pace of introduction of sustainable solutions highly depends on effectiveness of regulations and interventions.

Both Community-level and national governments have responsibility in motivating business actors to cooperate, to specialize and to generate economic and environmental gains on a shorter run than 'business as usual' solutions.

Manufacturers and liable entities are inevitably willing to cooperate if there is a business/economic driver or an obligation to fulfil (as seen, there are good practices of cooperation- and specialization-based optimization in waste management).

Therefore, governmental bodies, business actors, R&D organisations, local societies and all the stakeholders must change their views and they have to participate in the optimization processes: they should *communicate, cooperate and coordinate* in order to implement sustainable WEEE-recycling programs.

WEEE is not only an end-of-life category, but an input also: waste equipments are (renewable) re-sources. „Waste equals food.“³³

³³ Source: William McDonough: Waste Equals Food – Our Future and the Making of Things, In: Awakening – The Upside of Y2k, The Printed Word, Spokane, 1998.

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