International POPs Elimination Project

Fostering Active and Efficient Civil Society Participation in Preparation for Implementation of the Stockholm Convention

Zero waste as a Best Environmental Practice to address the POPs issues created by waste incineration and/or landfilling of waste

- Case Study from Sofia, Bulgaria

Iskra Stoykova

Romani Baht Foundation
8 Nov Zhivot Str., Sofia, 1373 Bulgaria
tel/fax: 00 359 2 920 42 72
e-mail: baht2000@rtsonline.net

Bulgaria
April 2006

About the International POPs Elimination Project

On May 1, 2004, the International POPs Elimination Network (IPEN http://www.ipen.org) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;

- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;

- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

For more information, please see http://www.ipen.org

IPEN gratefully acknowledges the financial support of the Global Environment Facility, Swiss Agency for Development and Cooperation, Swiss Agency for the Environment Forests and Landscape, the Canada POPs Fund, the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM), Mitchell Kapor Foundation, Sigrid Rausing Trust, New York Community Trust and others.

This report is available in the following languages: English language

International POPs Elimination Project – IPEP

Zero waste as Best Environmental Practice to address POPs issues created by waste incineration and/or landfilling of waste

- Case Study from Sofia, Bulgaria

Table of Contents

1. Introduction

Although the EU Commission recognised in July 2005 that "... landfill and incineration, [are] the least favourable end-of pipe solutions", such projects are widely promoted in Central and Eastern European countries and supported by the European Investment Bank, the World Bank, the EU funds and other International Financial Institutions. This would perpetuate the unsustainable approach to the waste problem for many years to come. Recycling, reuse, and composting of waste are not only more environmentally sound than incineration and landfilling, but also create significantly more jobs for the same amount of money. Moreover, they prevent an outright waste of precious natural resources. Every ton of wasted material which ends up in a landfill or an incinerator must be extracted or produced again, leading to further pollution, energy use and expensive imports.

Bulgaria, a prospect EU member in 2007, is facing a great challenge to bring its waste management system in line with EU Directives. Being one of the ex-Communist countries, Bulgaria has suffered severe environmental degradation during the former regimes. There were no regulations on the use of energy and natural resources. Cheap and dirty sources of energy were used and natural resources were overexploited, causing extreme pollution. With transition, though, political awareness of environmental problems has increased and measures have been taken to fight environmental problems. Legislation has been gradually introduced, inspired by European legislation, with the idea of meeting the European requirements in the event of joining the Union. However, new regulations are currently not implemented in practice because of high costs and problems continue to aggravate.

At the present moment, the most pressing and critical situation with finding waste management solutions confronts the Sofia municipality. The capital city of Bulgaria became notorious internationally with two big waste crises in the past year – 2005, when the people living in proximity to the city's only landfill "Suhodol" blocked the roads of the municipal trucks that transport the waste because of unfulfilled obligations to close down the landfill as planned. The result was that the city was on the verge of epidemics after being buried for one week under waste. In March 2006, the Sofia municipality is coming already very close to exhausting the capacity of the three sites for temporary storage of the city's waste and under pressure both from citizens and endangered EU membership is desperately looking for a permanent solution to the problem. The most publicized option by city officials is building an incinerator.

The aim of this research is to analyze the municipal waste management programme of Sofia and make recommendations for an integrated approach for treatment of household waste as an alternative to building an incinerator by highlighting the role of the Roma scavengers and carters for recycling and the existing opportunity for empowerment of a marginalized community through their engagement in the implementation of an environmentally sustainable municipal waste management system.

The study finds links between consequences of our waste management and environmental pollution. The Stockholm Convention, accepted on May 22, 2001, regards waste management as a big source of emissions of persistent organic pollutants. According to the European inventory of dioxin releases of 1995, waste incineration was actually the biggest source of PCDD/Fs in Europe[i]. After adoption of strict limits for incinerators, their emissions were reduced significantly; however, a part of them was transferred to solid wastes from these plants. Landfill fires, and, especially, illegal domestic waste burning, remain significant sources of PCDD/Fs emissions to air. Zero Waste is a way to prevent this, because one of important tools of this vision is broad education of the public and co-

operation with the inhabitants. It is also good example of Best Environmental Practice to address the unintentional POPs issue according to Article 5 of the Stockholm Convention.

The involvement of inhabitants in the waste management system results, in its consequences, in reduction of over-consumption, in minimisation of wastes, in prevention of their formation and in their recycling. It means that if we calculate reduction of PCDD/Fs emissions thanks to a better method of waste management in the study, we do it just for the purpose of illustration, because the total impacts of this strategy are considerably broader.

2. Zero waste case study – Sofia, Bulgaria

a. Sofia Municipality Waste Management Programme

According to the Municipal Waste Management Programme of Sofia, adopted with decision 586 of Sofia City Council on 13 September 2005 with an implementation period of September 2005 – December 2009, the only method for waste treatment on the territory of Sofia is landfilling.

No processing of the household waste is taking place and there are no loading stations or waste separation sites constructed. The morphological composition of household waste as of 2000 (weight %) is shown in Table 1. Generated household waste in Sofia municipality is presented in Table 2.

Table 1: Morphological composition of household waste as of 2000 (weight %)
Source: Sofia Municipality Waste Management Programme 2005 – 2009

1.	Paper and cardboard	7,9
2.	Polymers	6,8
3.	Glass	12,0
4.	Metals	1,5
5.	Textiles	1,5
6.	Timber	1,0
7.	Leather, rubber	1,0
8.	Food and kitchen waste	35,0
9.	Slag, sand, earth	4,6
10.	Others of predominantly organic origin	28,7

Table 2: Generated household waste in Sofia municipality
Source: Sofia Municipality Waste Management Programme 2005 – 2009

Year	**2001**	**2002**	**2003**
Generated household waste in tons	336 000	352 377	364 444

Note: The quantity of the household waste is according to data of the operator of the Suhodol landfill

Until September 2005, the waste of Sofia went to the landfill "Suhodol" which was the first and only depot on the territory of Bulgaria operating according to the EU Directive 99/31. It provided service to four towns and 34 villages with a total population of 1.2 million

people. Its capacity was exhausted in June 2005 but depositing continued despite citizens' protests and blockades until September 2005.

The Municipal Programme suggests several alternatives for finding an urgent long-term solution for waste treatment. Meanwhile, the municipality introduced installations for pressing, baling and packing of household waste that allows temporary storage of the waste. The Programme planned the construction of four installations with the capacity of 300 tons per day each that have to meet the daily generation of 1000 tons of household waste of Sofia. The process includes the following stages: sorting, grinding, baling, packaging, storing, transporting, and finally, temporary storage. The temporary storage is envisaged for a period of three years on area of 430 decares (43 hectare) while a waste processing plant is built.

On January 27, 2005 the Sofia City Council adopted a Concept for management of household waste. The major suggested options for treatment are: *High temperature incineration of the waste without prior sorting* and *Development of an integrated system for treatment of hard household waste in accordance with European practices*. The variety of other technologies to be reviewed include: system of plasma arc disposal without prior sorting; landfilling with prior sorting of recyclable components; processing and treatment of waste according to the OXALOR method (please see http://www.oxalor.com/oxalor_n/procede.php?lang=en); conversion of the waste into diesel fuel with the use of diesel catalysts; and solidifying of the waste. In 2006, an investor has to be selected to implement a proposed technological solution for the household waste treatment. In this connection, on March 9, 2006 Sofia municipality announced a call for investment proposals for the construction and management of plants and facilities for household waste treatment (excluding waste collection and transportation).

b. The waste crisis in Sofia and prospective solutions

The present situation is not in correspondence with what was anticipated in the Programme. The municipality could only negotiate the construction of three installations instead of four – "Kremikovtzi", "Gara Iskar" and "Trebich", none of which offers any possibility for temporary storage that should meet the three years period suggested in the Programme. Currently, the bales are stored in "Kremikovtzi" and "Gara Iskar" but they are reaching the full capacity of the installations and according to Deputy Mayor of Ecology of Sofia Milor Mihaylov all sites will be full by June 2006. At the end of February 2006, there were more than 150,000 bales and they were leaking. The citizens living close to the mine of Chukurovo that was suggested by the Government and the Ministry for Environment and Waters (MEW) for temporary storage of the waste of Sofia have filed a complaint with the Sofia Prosecutor's Office and also blocked the roads in front of the trucks with bales sent by the Mayor in February which forced the authorities to abolish the order. The only alternative that is discussed now is the railroad station "Gara Yana", which is municipal property and located 18km away from the city. Therefore, in the remaining three months until reaching the full capacity of the installation sites the municipality will develop detailed cadastral plans of the terrain and hopes to obtain permission from the MEW. The cost of each bale is 2.6 leva (€1.33), the cost of the loading is between 0.98 and 2.6 leva (€0.50 – €1.33) and the total cost for baling is 24 million leva per year (~€12 million).

In February 2006 technical experts from JASPERS (Joint Assistance in Supporting Projects in European Regions) – an initiative of the European Investment Bank, European Bank for Reconstruction and Development, and the European Community – responded to the

invitation of the Mayor of Sofia for a discussion for technical support for the development of a project for a waste processing plant that can be used for applying for EU funds. The experts' findings were that the waste problem of Sofia has a national dimension and if not adequately addressed it can endanger the EU accession process. On February 17, 2006 the Mayor of Sofia met with the director of the incinerator of Milan, Italy – Antonio Carminati who presented the city's system of waste treatment that also involves recycling. The construction of the proposed incinerator will take four years and the treatment will cost 30.40 EUR/ton. In interviews before the media the Mayor also has mentioned other offers for a waste processing plant – for example, building a plant similar to the waste-processing plant in Brussels that would cost 105 million EUR and take 28 months. A US investor has proposed building a plant in eight months.

c. The national recycling programme

According to commitments made by the State, by 2011 Bulgaria has to introduce mass recycling of waste which then needs to be further processed in waste plants. Since 2005 the Sofia municipality has made contracts with the four out of the five private organizations for recovery of waste operating in Bulgaria – Ecobupack, Ecopack Bulgaria, Bulecopack, Re Pack, Reco Pack. If a private firm that produces packages or packages its goods does not pay a license fee to one of the five private organizations, it should pay a product fee for waste treatment to the State Enterprise for Management of the Activities for Protection of the Environment (EMAPE) at the MEW. The funds received should be re-invested in new containers for recycling until the whole territory of the country is covered. In fact, these fees are paid by the consumers because they form part of the price of the products.

However, the income from product fees paid by the importers and producers of packaged products has been far less than expected and the achievements of the five private organizations for waste recovery are insufficient, according to Minister of EW Dzevdet Chakurov. The expectations of the MEW for 2005 were that the income from the product fees would be 217 820 000 leva (~€111 million) of which 32 673 000 leva (~€16 million) should have been deposited in the EMAPE company. However, the revenues there were only 11 161 985 leva (~€5.7 million). The Minister primarily blames the private waste recovery companies saying that they work only formally with very few containers and use accounting tricks to report recycled packages. Another accusation of the Ministry is that the five organizations purchase secondary materials from scavengers and collection points and then report it as collected and recycled waste. Thus more than 151 million leva (~€77 million) of eco-fees for 2005 were lost and have been kept by the firms as profit, claimed the Minister. The aim of the Ministry is to make the private firms pay more for recycling and not fulfill their commitments with minimal expenses.

On the other side, the private companies for waste recovery complain that the scavengers steal from their containers, which makes it very hard to fulfill their obligations. The director of Ecobulpack – Dimitar Zorov claimed that his company has exceeded the planned quantities and for 2005 instead 25,000 tons they have recovered 29,000 tons of waste. In Sofia municipality the company operates in one administrative district – Serdika, and for three months has collected 11.3 tons paper (7 tons), glass (1 ton) and plastics (4 tons). In addition, Ecobulpack has constructed an installation for separation of waste in the landfill of the town of Sliven. The project costs 400,000 leva (~€204,000) and employs Roma people equipped with special uniforms. A similar facility could be built for Sofia as well, which would reduce the volume of the baled waste by 30 percent. In 2006, recycling in

separate containers was introduced in 18 municipal districts in Sofia. Four companies have signed contracts with the municipality. Bulecopack works in the districts of Lyulin, Mladost, Iskar and Novi Iskar; Recopack will operate containers in Ovcha Kupel, Poduyane, Ilinden, Studentski, and Krasna polyana; Ecobulpack works in Serdika, Nadejda, Vuzrajdane, Izgrev, Slatina; Eco-pack works in Oborishte, Krasno selo, Sredets and Triaditza. The main problem, however, is that the actual area covered is very small as well as the number of containers.

By March 31, 2006 the MEW will officially report on the achievements made with respect to recycling of packaged goods and most probably the future development will be that the private waste recovery companies will increase their waste fees. The example that the MEW gives to support its claim against the five private companies is that of a big firm paying its fees to EMAPE (http://www.pcinpact.com/articles/d/55.htm) – its yearly fees are almost a half of what was collected by two of the private waste recovery companies. According to data of the MEW in 2005 one of the private companies has collected license fees of 1 292 190 leva (~€661,000), another - 1 242 613 leva (~€635,000). The Ministry refused to name the companies but they have a membership of more than 1,600 firms, among which Coca Cola and Danon. The firms which paid product fees to EMAPE for 2005 number more than 250, among which are Astera Cosmetics, Kenar, Procter and Gamble Bulgaria, Praktiker, etc. Recycling programmes in Sofia have not existed long enough to collect any accurate data on the number of citizens taking the initiative to recycle.

d. The role of Roma scavengers and Roma carters for recycling in Sofia

MEW (2003a) estimates that roughly 10,000 people are scavenging rubbish bins and landfills to collect and sell recyclable materials on the territory of Bulgaria. It is not clear where this figure comes from as there are no studies. In Bulgaria, as in many countries where scavenging exists, it is associated with dirt, disease and squalor. This livelihood leads to low life expectancy and high infant mortality. Even if scavengers are not the poorest they are ascribed the lowest status in the society. (Medina, 2000)

In big cities like Sofia, there are so many scavengers that they sometimes have to fight for saleable waste. The recyclable materials are left by some people next to the rubbish containers but most of them are thrown away mixed, which substantially decreases their quality and collection rate. MEW (2003a) notes that the scavengers create problems for the collection companies and damage the containers. The high number of scavengers makes it possible for the collection shops to maintain a substantial operating margin: the differences between the reprocessors' purchase prices and collection shops purchase prices are 80BGN/ton for paper and 55BGN/ton for metals (BT-Engineering, 2003b). Following are two examples of the price differences – Table 3.

Table 3: Two examples of the price differences
Source: March 2006 interviews with collection shops' owners and scavengers and carters and price list of Kemsteel Ltd. - Sofia

Type of material	Reprocessors price per kg	Collection shop's price per kg	Difference
Brass yellow	5.18 leva	2.80 leva	2.38 leva
Aluminum soft	3.06 leva	1.90 leva	1.16 leva

Exchange rate: 1 USD = 1.6 leva; 1 EUR = 1.95 leva

Change: 1 leva = 100 stotinki (st.)

In Sofia there are three Roma neighborhoods – *Fakulteta* with total population of 35,000; *Hristo Botev* with total population of 13,000 and *Filipovtzi* with total population of 4,000 people (Picture 1). (Statistics are unofficial, according to information of locally based Roma NGOs, while the official numbers are half as large.)

Picture 1: The three Roma neighborhoods, Sofia, Bulgaria
I – Philipovtzi neighborhood; II – Fakulteta neighborhood; III – Hristo Botev neighborhood

The total number of Roma scavengers working in Sofia is about **75** of whom 30 from *Fakulteta*, 20 from *Hristo Botev* and 25 from *Filipovtzi*. The total number of Roma carters working in Sofia is about **205** of whom 100 from *Fakulteta*, 70 from *Hristo Botev* and 35 from *Filipovtzi*.

The carters usually have two horses each but some of them have 4-5 horses, two of which they rent out to other Roma for about 10 leva per day. The price of one horse is between 2,000 and 5,000 leva. Some of the carters have apprentices who are young boys between the age of 10 – 15 year-old who do not receive any wage or money for the materials they have collected during the day but only food and cigarettes. Normally one cart will collect about 100 kg of metal or $2m^3$ of wood and will make on average 1 trip per day each day.

The major types of materials collected by the scavengers and the carters are paper, glass, metals, plastics and wood including the sub-categories as described in the table below (Table 4).

Both groups cover all districts of Sofia, including the city center as well as some of the nearby villages, including Lozen, Mramor, Gorna Banya, Suhodol. The main sources of materials are the trash bins; the basements of the people living in blocks of apartments and

houses who let the Roma clear them of unnecessary items; the shops; the construction sites, the factories. Recently, the access of carts to the city center has been restricted but the regulations are not followed. Sometimes the carters are arrested by the police because of alleged stealth of the materials transported. Therefore they have started asking for letters from the owners of the shops or the basements acknowledging that they have conceded to give out the materials.

The carters collect mainly iron and non-ferrous metals as well as wooden materials during the winter period (November – March). The scavengers collect paper, glass and non-ferrous metals. Both groups sell the materials collected (apart from the wooden materials) to local purchasers' collection points or to other Roma living in the neighborhoods, who later sell it to the collection points. The wooden materials are sold during the winter period internally in the Roma neighborhoods and are used for heating.

The Roma carters and Roma scavengers do not use any special equipment or protection of any kind in their work. Due to this they are exposed to different kind of hazardous waste, which is disposed together with the household waste. These include batteries, medicines past the expiry date, used paint packages, used machine oils, etc. In addition, in the Roma neighborhoods the Roma scavengers and carters quite often will burn car tyres and other mixed materials to extract the different kinds of metal, which contaminates the air they inhale. The question of treatment and recycling of hazardous waste is not solved on the national level. In the near future this is expected to find a solution with the support of the ISPA funding through the establishment of a National Center for Treatment of Hazardous Waste.

For the purposes of this research, interviews with 30 Roma carters and 30 Roma scavengers were made from all three Roma neighborhoods. Besides, 7 collection points for paper, 5 collection points for paper and glass, 4 collection points for glass, 5 collection points for paper, glass, plastics, iron and non-ferrous metals, 10 collection points for iron and non-ferrous metals were visited. The collection points visited are located in 4 administrative districts in Sofia in close proximity or inside the Roma neighborhoods, where the largest quantity of materials is sold.

Table 4: The major types of materials collected by the scavengers and the carters including quantity per month and prices

***** Exchange rate: 1 USD = 1.6 leva; 1 EUR = 1.95 leva
Change: 1 leva = 100 stotinki (st.)

Type of materials	**Price per unit/kg/m3**	**Quantity per month**	**Total value per month (leva)***
Corrugated cardboard	0.08 – 0.10 st.	24 tons	2400
newspapers	0.06 – 0.08st.	12 tons	960
Mixed paper	0.07 st.	6 tons	420
Jar caps	0.50 st. – 0.60 st.	8.8 tons	4,840
Lead	0.60 st.	4.1 tons	2,460
Zink	0.60 st.	8.2 tons	4,920
Pig iron	0.28 – 0.30 st.	175 tons	49,000
Aluminum plate	2.20 leva	4.1 tons	9,020
Aluminum soft	1.90 leva	2 tons	3,800
Aluminum hard	1.70 leva	6,15 tons	10,455
Brass yellow	2.80 leva	2 tons	5,600
Brass white	3.20 leva	6,15 tons	19,680
Copper sheets	6.70 – 7.00 leva	6,15 tons	42,200
Lead acid battery	0.20 st.	41 tons	12,300
Iron hard	0.30 st.	110 tons	33,000
Iron soft	0.18 – 0.20st.	100 tons	19,000
Mineral water bottles	0.30 st.	4.5 tons	1350
Plastic canister	0.20 st.	4.5 tons	900
Nylon bags	0.10 st.	11.25 tons	1125
Plastic bottle crates	0.25 st.	11 tons	2750
Beer bottles	0.05 st.	28,000 units	1400
Wine big bottles	0.06 st.	42,000 units	2520
Wine small bottles	0.04 st.	8,400 units	336
Brandy big bottles	0.05 st.	11,200 units	560
Brandy small bottles	0.03 st.	19,600 units	588
Vodka big bottles	0.06 st.	14,000 units	840
Vodka small bottles	0.04 st.	11,200 units	448
Coca cola small bottles	0.08 st.	14,000 units	1120
Coca cola big bottles	0.10 st.	14,000 units	1400
Broken glass	0.02 st.	33.6 tons	672
Jars with normal caps	0.04 st.	22,400 units	896
Jars with screw caps	0.05 st.	19,600 units	980
Wooden material: woodwork, cupboards, crates, etc.	10 leva/m3	8200 m3	82,000

e. The flow of the materials: the collection shops and the reprocessors

There is no reliable data on the number of collection shops in Sofia municipality as well as in the country as a whole. The number according to various sources fluctuates between 500 and 1,800 for the territory of Bulgaria. In principle, the collection shops should obtain their license from the Regional Inspectorate of Environment and Waters but no such database is kept presently.

There are eight producers of *paper* with recycling facilities. The two biggest reprocessors Trakia Papir Plc and Belovo Plc recycle 90% of the waste material. There is a substantial difference in the price of used paper and cellulose, which makes recycling paper very profitable. The secondary raw materials are 50% of all raw materials used in the paper production. The companies do not have technologies for recycling paper covered with polymers, foil, grease, *etc.* (such as Tetrapak). Of the 276,913 tons of paper waste generated in 2001, 125,163 tons was packaging waste and around 65,000 tons was recycled.

In Bulgaria the recycling metallurgical industry is gaining momentum after main factories were privatized and are currently being modernized and increasing their production capacity. The major reprocessors of scrap from ferrous metals are Stomana Industry Plc – Pernik, Kremikovtzi Plc – Sofia, LeKoKo Plc – Radomir and the iron casting factory in Ihtiman. The scrap metal from non-ferrous metals are purchased and reprocessed by Yumikor Copper Plc. – Pirdop, Sofia Copper Plc., Alchomet Plc. – Shoumen, Cabelsnab – Sofia.

According to the review of the Bulgarian Association for Recycling (BAR), which is a non governmental organization with members that comprise 80 percent of the market of scrap ferrous metals and 90 percent of the market of non- ferrous metals, the revenue of the recycling industry of scrap metal formed 2.7 percent of the GBP of the country in 2003. The major companies on the market operate all of the following: little collection shops; regional basis for collection; central basis for sorting and treatment; reprocessing plants or export.

The main flows for export of scrap from ferrous metals are directed towards Turkey, Greece and Macedonia. The export of scrap from copper and copper alloys is directed towards Italy, South Korea, China, Belgium and Germany. The scrap from aluminum and aluminum alloys goes to the countries of the Far East, Italy, Germany and Austria. The scrap from steel is 100 percent exported because there is no reprocessing capacity in the country. This data shows that the proportion between reprocessed in the country and exported scrap from ferrous metal is 68 percent to 32 percent. In the case of non-ferrous metals this proportion is 34 percent to 66 percent. The transportation costs in the case of exports sometimes reach 10 percent of the price of the scrap and the prices are formed based on the quotes from the London Stock Exchange.

Around 11,000 tons of metals were recycled in 2001 and the metal packaging waste was 21,473 tons out of 65,123 tons of total metal waste. According to the forecasts of industry experts in the period 2005 – 2010, the reprocessing of scrap from ferrous metals and copper and copper alloys will double and will reach quantities between 25,000 – 30,000 tons per

year for the scrap from non-ferrous metals and 1, 500, 000 – 2, 000, 000 tons for scrap from ferrous metals. The trend is that about 65 percent of the total scrap from copper and copper alloys will be reprocessed in the country. In support to this is the fact that the big metallurgical plant – Sofia Copper Ltd invested in the purchase of installation of copper cathodes which will double the reprocessing capacity of the plant so that it will reach about 220t per year. About 15 percent will be the increase in the consumption of the local reprocessors of scrap from ferrous metals.

There are six companies producing *glass*. Four of them have technologies for glass recycling, three have an interest in recycling, and only one - Stind Plc - is actually recycling glass - mainly waste from the fillers. In 2001, 12,000 tons of glass waste was recycled, the glass packaging waste was 88,000 tons and the total glass waste 141,000 tons (MEW, 2003a). The first installation for glass recycling with metals separation, milling and cleaning equipment was constructed in Kichevo, Varna municipality in 2001. (BEEA, 2003) Even if glass can be recycled many times, the low purchase prices and the high requirements for purity and separation of the different colours of glass make its recycling unprofitable.

All current reprocessing capacities can meet the recycling targets except for *plastics*, of which only 11% can be recycled (MEW, 2003a). The high-technologies needed for the separation of different plastics; the contaminated nature of the plastics received from containers; the limited number of recycling facilities; and the low prices of the imported polyethylene plastics for recycling and primary raw materials all lead to high recycling costs for municipal waste plastics. There is still no facility for automatic separation of the different plastics types in operation. All this results in recycling of mainly waste from industrial processes: Polypropylene (PP) and polystyrene (PS) plastics: 2,000-3,000 tons/year. The plastic collected by the shops is around 400-500 tons/year (Argus and MD Urboproject, 2001). The total plastics municipal waste is estimated to be 263,000 tons/year, of which 106,000 tons/year are packaging waste (MEW, 2003a). Until recently there was no recycling of polyethylene terephthalate (PET) plastics in Bulgaria, so the collected PET plastics were exported. An installation for recycling of PET has been constructed in Shumen by Metarex Ltd in 2002 (MEW, 2003c).

There is no collection or recycling of other packaging materials such as textiles, composites, and wood (Argus and MD Urboproject, 2001).

Zero Waste practices and prevention of unintentional POPs releases

In this study we presented a zero waste case study to prevent the flow of wastes to landfills and municipal solid waste incinerators. Zero waste also prevents unintentional POPs releases from their significant sources, which are waste incinerators and/or fires at landfills. Table 5 shows for example dioxin (PCDD/Fs) releases per 1 ton of disposed municipal solid waste according to the UNEP Dioxin Toolkit 2005 edition. [ii] Other figures can be calculated when other default emission factors are used. Some of them per 1 ton of municipal solid waste for Central and East European countries are presented in Table 6.

Table 5. PCDD/Fs releases by burning 1 ton of municipal solid waste under different conditions / source categories according to UNEP Dioxin Toolkit, 2005 edition.

Source Categories	Potential Release Route (µg TEQ/t)			
	Air	Water	Residues	Total
Low technol. combustion, no APC system	3,500	-	75	3,575
Controlled comb., minimal APC	350	-	515	865
Controlled comb., good APC	30	-	207	237
High tech. combustion, sophisticated APCS	0.5	-	16.5	17
Landfill fires	1,000	-		1,000
Uncontrolled domestic waste burning	300	-	600	900

Table 6. PCDD/Fs releases by burning 1 ton of municipal solid waste under different conditions / source categories according to data from CEE region and EU.

Source Categories	Potential Release Route (µg TEQ/t)			
	Air	Water	Residues	Total
Modern MWI, Czech Republic[iii]	0.93			
MWI Termizo Liberec, dioxin filter, Czech Republic[iv]		-		50
MWI Termizo Liberec, dioxin filter, Czech Republic[v]	0.9	-	29 - 90.2	29.9 - 91.1
MWI in Bratislava, data for 2003, (meets the EU limit for air emissions 0.1 ngTEQ/m^3), Slovakia[vi]	0.4			
MWI in Košice, data for 2003, (does not meet an EU standard 0.1 ngTEQ/m^3), Slovakia[vii]	60			
Older MWI, Europe[viii]	25-1,000			
Up-to-date equipped MWI, Europe[ix]	0.5			
Modern MWI in England and Wales, data for 2002[x, xi]			10.1 - 183.7	
Landfill fires				No data

Note: MWI = Municipal Waste Incinerator

For calculation of emission default factors for landfill fires there are less data available with wide range of results. In a landfill fire simulation, Hirai et al. (2005)[xii] burned refuse derived fuel (RDF) in a steel bowl filled with soil. The RDF was comprised of paper and textiles, 51.8 percent; plastics and leather, 32 percent; wood and grass, 5.3 percent; garbage, 9.5 percent; non-combustibles, 0.4 percent; and others, 1 percent. They reported emission factors for releases to air of 23-46 ng TEQ/kg and for releases to residues, 120-170 ng TEQ/kg, with 70-90 percent of the dioxins partitioned to the residues. Hirai et al. report shows that landfill fires can emit less dioxins than UNEP Dioxin Toolkit estimates. Therefore it is always better to make calculations within some range.

Table 7 shows potentially saved dioxin releases by the presented zero waste practice from several CEE countries. The pilot calculation is based on the amount of recycled waste per one year in the described activity of the Roma population in Bulgaria, which was 42 t/year. This amount of waste that was counted into the calculation does not include wastes that can not be burned (glass), that ended up at landfills (hazardous waste) and/or were burned (wood, part of hazardous waste).

Table 7. On UNEP Dioxin Toolkit based calculation of prevented dioxin releases because of waste taken away from waste flows to waste incineration and/or landfilling.

Dioxin source category / subcategory	Case study Sofia
	g TEQ
Low technol. combustion, no APC system	0.150
Controlled comb., minimal APC	0.036
Controlled comb., good APC	0.010
High tech. combustion, sophisticated APCS	0.001
Landfill fires	0.042
Uncontrolled domestic waste burning	0.038

The total savings of dioxin releases can vary from 1 mg up to 150 mg per year by only this relatively small demonstration project using pieces of a zero waste strategy in Sofia. By using other than UNEP Toolkit emission factors we can get different figures. These differences can be estimated from comparison of emission factors demonstrated in Table 6 with those set up in the UNEP Dioxin Toolkit. There are differences in estimations of releases through waste incineration residues for example, but this is not a major matter of this study.

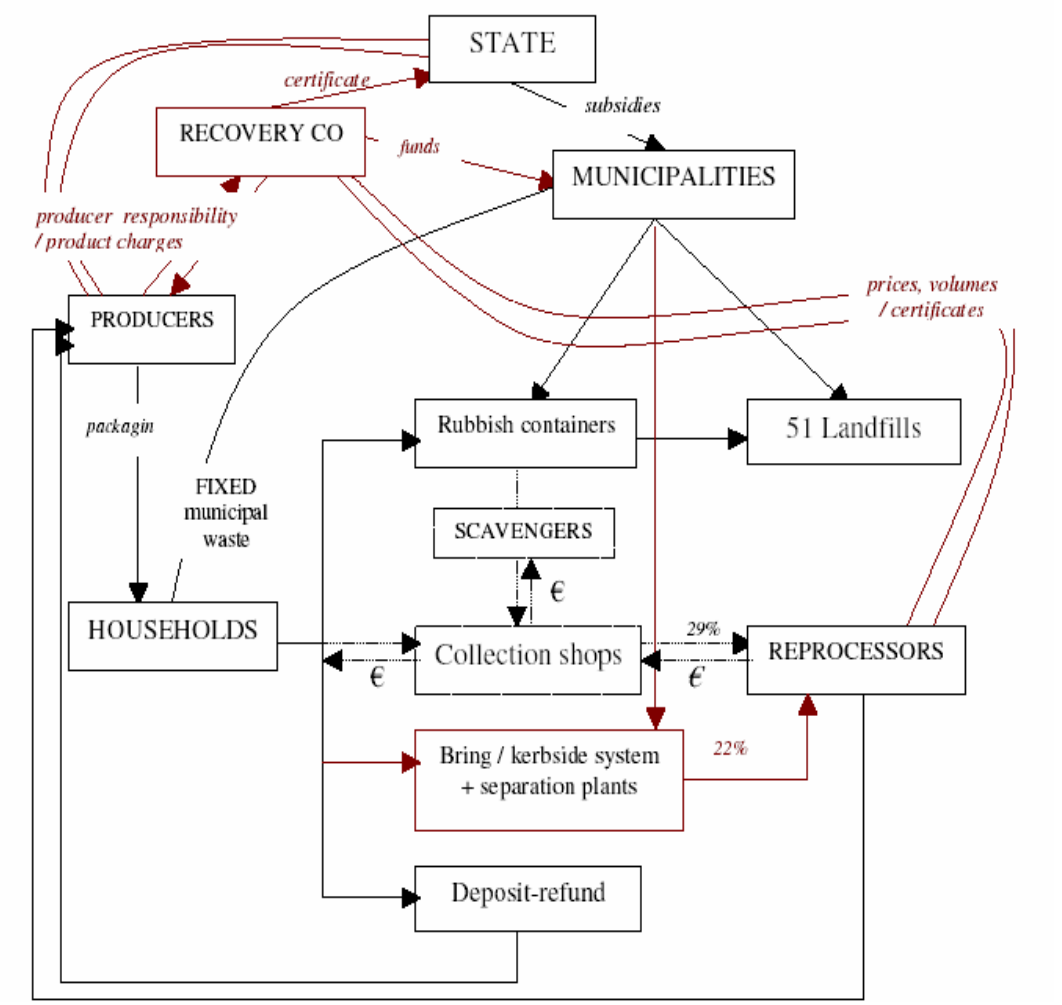
In reality, savings are much greater when we include energy and raw materials input into products that were saved. Energy generation and different products production also generates some amounts of unintentionally produced POPs. These savings are not easy to calculate.

Conclusions

The figure below (Picture 2) represents the current system of waste management in Bulgaria as well as the proposed changes /in red/ to be implemented in the next years. To the "landfills" box in the future can also be added "incinerators" as there is a real prospect of using EU funds in the following years for building an incinerator in the Sofia municipality.

- The Government has had to comply with the strict legislative requirements on treatment and disposal of waste imposed by the EU accession negotiations.
- The Sofia municipality has faced rising costs of waste collection, landfills approaching and reaching full capacity, and lack of sufficient resources for any substantial investments in improving the management of waste.
- The previously state-owned monopoly for the collection and sorting of secondary raw materials was privatized and replaced by collection shops purchasing used paper, glass and metals.
- The increased number of poor people brought about a new phenomenon in Bulgaria: the scavenging of rubbish.
- The international donors arrived with generous grants and expertise to solve the municipal waste problem.
- There is a lack of an integrated approach to waste management and the undermining of the efficient market-based system for collection of recyclable
- Priorities and financial resources are set according to the EU requirements and not according to the acuteness of local waste problems leading often to end-of-pipe solutions. Heavy investments and focus on end-of-pipe measures (landfills and prospective incinerators) leaves no funds and attention to simpler and less expensive solutions at the source of the waste generation.

- International grants bring additional funding for feasibility studies and construction of treatment and disposal facilities but often the proposed solutions are based on foreign experience, which have little relevance in the local conditions. A stark example is the proposed Green Dot system, which cannot be operational in a country where scavengers fight for the recyclable waste from the rubbish bins. It can only aggravate their situation and undermine a competitive market for used paper and metal scrap.
- Currently there are 14 investment projects for building incinerators in the Sofia municipality.



Picture 2: Government Strategy for meeting the recycling and recovery targets

(Red lines denote proposed changes to the current system; dashed lines are entities, which will gradually disappear.)

Source: **Velkova, Maria R. (2003) Is the proposed Bulgarian Government Strategy on municipal waste separation cost-efficient? M.SC. Thesis, Environmental change and management, University of Oxford**

In this report we presented a zero waste case study which shows how a citizen-based initiative can significantly contribute to improvement of waste management. We hope that this case study can be used as a pilot project replicated elsewhere in the world. It is based on a simple idea: collecting the wastes separately.

The total savings of dioxin releases can vary from 1 mg up to 150 mg per year by only this relatively small scale but very effective activity that uses pieces of zero waste strategy in Sofia. This is a lot when we look at figures of total dioxin releases estimates and compare them with the scale of the projects. The results stress the need for broader introduction of zero waste strategies as a Best Environmental Practice and as one of important tools to minimize and finally eliminate unintentional POPs releases.

Recommendations

The main recommendation on the basis of this research concerns recognition and improvement of the conditions of work of Roma people engaged in recycling activities.

The current governmental policy of ignoring the scavengers' problem only aggravates it and leads to unfeasible policy proposals for waste separation. Street-recycling can be a recognized occupation having the same rights as the self-employed workers (as it is in Brazil) (Zobel, 2003).

The MEW is already accumulating funds from product charges. The MEW can use these funds to make the households aware of the packaging waste problem and the benefits the scavengers bring to the environment. If the households only leave the recyclable waste next to the rubbish containers instead of throwing it mixed in them, both the quality and quantity of the collected waste will increase and some dignity will be given to scavengers. This could be a transitional 'social' curbside system.

Another option which was noted as an initiative of the recovery company Ecobulpack in Sliven, is to establish installations for separation of waste at the landfills, where Roma people will be employed. This will prevent the conflict of interests between the two groups – the recovery companies and the Roma scavengers and carters as long as the workers employed are paid adequately for their labour.

The Government and NGOs can also help the scavengers set up co-operatives and regional marketing associations through loans and grants. Scavengers' co-operatives can circumvent the low prices of the collection shops and improve the status of the scavengers. This practice has proven very beneficial for the standard of living of the scavengers in Indonesia, Colombia and Brazil where scavengers earn up to twice the minimum wage (Medina, 2000). The co-operatives accumulate funds and can invest in transportation and separation equipment. They can gather funds for education, health and life and accident insurance.

Over the last few years, co-operatives have been created in many Latin American and Asian countries: Venezuela, Peru, Ecuador, Guatemala, Costa Rica, the Philippines, and India. Scavengers' co-operatives can promote grassroots development in an economically viable, socially desirable and environmentally sound manner.

Other recommendations include:

- The polluter-pays principle should not only be present in the law: it should be enforced by awarding the municipalities not only with responsibilities but also with adequate budget for meeting them.

- Full costing of the waste management services should be accompanied by the monetization of the environmental externalities. This can be achieved by setting higher standards or imposing taxes on landfilling and processing of primary raw materials.
- Targets can be reached at least cost by the obligated producers of packaging and landfill operators if trade in recycling, recovery and biodegradable waste reduction certificates is allowed. Reprocessors, composting plants, landfills with methane extraction will be able to issue these certificates and be compensated for the environmental benefit they deliver. This will set the prices correctly and stimulate plastics, glass and organic recycling and increase metals and paper recycling.
- Simple solutions can be very powerful such as a plastic bag environmental charge, which would be able to eliminate a large proportion of this unnecessary input to landfills.

References

Argus, MD Urboproject (2001) Database on Packaging and Packaging Waste in Bulgaria: First Interim Report. Commissioned by the German Federal Environmental Agency, Reference No. Z 1.6 – 90 213 – 40/1, FKZ 380 01 021 (unpublished)

BT-Engineering (2003b) Technical and financial models for separate collection of waste for recycling in six regions: Montana, Pernik, Ruse, Sevlievo, Sozopol and Silistra. MEW (unpublished, in Bulgarian)

Medina, M. (2000) Scavenger Cooperatives in Asia and Latin America. Resources, Conservation and Recycling Vol. 31, p. 51-69

MEW (2003a) Programme for Implementation of Directive 94/62/EC on Packaging and Packaging Waste. MEW (unpublished)

Velkova, Maria R. (2003) Is the proposed Bulgarian Government Strategy on municipal waste separation cost-efficient? M.SC. Thesis, Environmental change and management, University of Oxford

Zobel G. (2003) Trash can economy. The Big Issue. March 31- April 6

Web-sites:

http://bankwatch.ecn.cz/project.shtml?w=330665 – Web-site of Bankwatch network

http://www.sofia.bg/pressecentre/press.asp?open=4 -- Web-site of Sofia Municipality's virtual press center comprising articles from Bulgarian print media

http://www.bar-bg.org/ -- Web-site of the Bulgarian Association for Recycling

CONTACT:

Romani Baht Foundation
8 Nov Zhivot Str., Sofia, 1373 Bulgaria
tel/fax: 00 359 2 920 42 72
e-mail: baht2000@rtsonline.net

[i] Quass, U., Fermann, M., Broeker, G. 2000: The European Dioxin Inventory - Stage II. Final Report Volume 3. Assessment of dioxin emissions until 2005.This report was prepared by the North Rhine Westphalia State Environment Agency on behalf of the European Commission, Directorate General for Environment (DG ENV).

[ii] UNEP 2005: Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases. 2nd edition, February 2005.

[iii] Holoubek, I. et al. 2003/2005: Úvodní národní inventura persistentních organických polutantů v České republice. Project GF/CEH/01/003: ENABLING ACTIVITIES TO FACILITATE EARLY ACTION ON THE IMPLEMENTATION OF THE STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS (POPs) IN THE CZECH REPUBLIC. TOCOEN, s.r.o., Brno representing Consortium RECETOX - TOCOEN & Associates, TOCOEN REPORT No. 249, Brno, August 2003. Version 2003. http://www.recetox.muni.cz/sources/unido_narodni_inventura_03/POPsINV_cast_IV_Kapitola_7_Potraviny.pdf

[iv] Havel, M., Petrlík, J. 2004: Toxic waste from waste incineration - dangerous neighbour. Arnika - Toxics and Wastes Programme. Prague, August 2004.

[v] Petrlík, J., Ryder, R. A. 2005: After Incineration: The Toxic Ash Problem. "Keep the Promise, Eliminate POPs!" Campaign and Dioxin, PCBs and Waste WG of IPEN Report. Prague - Manchaster, April 2005. Also available at: http://ipen.ecn.cz/index.php?l=en&k=download&r=default&id=113.

[vi] Matějovičová, J., 2006: Základ pro Akčný plán, identifikáciu, charakterizáciu a riešenie uvoľňovania POPs do ŽP, Bratislava, január 2006

[vii] Matějovičová, J., 2006: Základ pro Akčný plán, identifikáciu, charakterizáciu a riešenie uvoľňovania POPs do ŽP, Bratislava, január 2006

[viii] UNECE/EMEP: Task Force on Emissions Inventories and Projections, Guidelines for Estimation of and Reporting on Emissions under the Convention on Long-Range Transboundary Air Pollution, EB.AIR/GE.1/2002/7, UN ECE Ženeva 2002

[ix] UNECE/EMEP: Task Force on Emissions Inventories and Projections, Guidelines for Estimation of and Reporting on Emissions under the Convention on Long-Range Transboundary Air Pollution, EB.AIR/GE.1/2002/7, UN ECE Ženeva 2002

[x] EA 2002: Solid Residues from Municipal Waste Incinerators in England and Wales. A report on an investigation by the Environment Agency, May 2002

[xi] Petrlík, J., Ryder, R. A. 2005: After Incineration: The Toxic Ash Problem. "Keep the Promise, Eliminate POPs!" Campaign and Dioxin, PCBs and Waste WG of IPEN Report. Prague - Manchaster, April 2005. Also available at: http://ipen.ecn.cz/index.php?l=en&k=download&r=default&id=113.

[xii] Hirai, Y., Kida, A., Sakai, S., 2005. Emission factors of PCDD/DF and PBDE by landfill fire simulation. Presented at the 25th International Symposium on Halogenated Environmental Organic Pollutants and Persistent Organic Pollutants (POPs), Toronto, Canada, 21-26 August 2005. CD ID 1037.