Concerns regarding the proposed waste-to-energy incinerator in Zagreb, Croatia

Green Action considers plans for a 385 000 tonnes per year waste-to-energy plant in Zagreb to be premature and dangerous, on environmental, economic and legal grounds. Our comments are set out below, including concerns about the lack of sufficient provisions for the disposal of hazardous ash and residues from the plant; air pollution increases; failure of the project to adequately follow the waste hierarchy; the unlikelihood of sufficient monitoring and enforcement, the inefficiency of burning resources, and the excessive cost of incineration.

We are concerned that this project is being viewed as a panacea for the city's waste problem rather than as a last resort. Even the Environmental Impact Assessment (EIA), which has recently been rejected by the Ministry of the Environment, names a number of important tasks which need to be undertaken before construction of the incinerator begins, most of which are tasks which need several years to be successfully implemented, for example ensuring that Croatia has facilities to safely process and dispose of hazardous waste, and ensuring that re-use, recycling and composting in Zagreb is adequately increased. We insist that the long-overdue work on improvement of waste management in Zagreb must not be carried out hastily and that the City Council must not be tempted by ready-made end-of pipe solutions, but must adhere to the waste hierarchy and utilise the most effective solutions rather than the easiest.

1) Producing hazardous waste from municipal waste

According to the EIA, burning an estimated 385 000 tonnes of waste and sludge per year would produce between 95 603 and 105 471 tonnes of ash, depending on which incinerator variant is used. This represents between 24.8% and 27.4% of the original weight of the waste/sludge. It is likely that even greater quantities of ash would be left as these calculations are based on the incinerator operating in optimum conditions, which is rarely the case in reality, and would be especially likely in this case because of the lack of satisfactory efforts to divert organic waste from the municipal solid waste.

Bottom ash is designated as being put on the municipal landfill, as is the fly ash, though the fly ash, being hazardous, would be solidified in cement. However, this is not a satisfactory solution as cement dissolves after some years and the heavy metals and dioxins encased within would once again be available in the environment in a highly absorbable form. A rehabilitation project funded by the EBRD is being carried out to remove the hazardous elements of the landfill and to end the careless mixing of non-hazardous and hazardous waste, yet it is now proposed to recommence this practice. In addition, it is not yet clear that the rehabilitation has resulted in a completely leak-proof landfill, as allegations of corner-cutting and leakage have been made by various parties[1]. Since Croatia does not have any designated hazardous waste sites, it would either need to build some, or export the hazardous waste, and the costs and acceptability of this would need to be assessed. In addition, if the bottom ash is landfilled, it needs to be clear where this would take place after 2011 when Zagreb's municipal landfill site is due to close.

Only the filter residues are designated as being treated as hazardous waste. These will make up between 8 361 and 16 487 tonnes per year, depending on the variant used. The

[1] For example in December 2003 it was reported that one of the protective layers in the Jakuševac landfill had broken, raising questions about the quality of the work done. Members of the Jakuševac Association for Environmental Protection (UZOJ) also allege that the technical aspect of the project was not carried out properly. The concrete layers put into the landfill were supposed to be several metres thick, but according to UZOJ they are only 1.5 metres thick and still leak. (P. Gallop: 'Case study on Zagreb Solid Waste Management Programme: Completion of Two Landfills" in Balkan Case Studies: Bridging the Gap Between EBRD Rhetorics and Reality, CEE Bankwatch, May 2005, p.31)

variation in these figures is in itself troubling. If there is less toxic filter residue, as in variant B, it suggests that the remainder of the toxins which would have been caught in the filters are present somewhere else, presumably in the fly and bottom ash. These figures are also too inexact to make proper plans for dealing with the waste.

Hazardous waste is a huge and largely unaddressed problem in Croatia, and the current policy involves exporting it. However, this is relatively expensive, at 0.35-.05 euro/kg, and as a result some businesses seek alternative solutions. This has led to the current situation in which half of the country's hazardous waste is unaccounted for, and has most likely ended up on municipal landfills, of which only a few are properly constructed. Some may have been simply dumped whilst some may have been incorporated into construction projects.

It is highly irresponsible to construct new sources of hazardous waste while this state of affairs continues. It is not only socially unacceptable to create hazardous waste which we then export to others, but it is also extremely expensive. Taking the lowest projected quantity of filter residues (8361 tonnes) and the lowest named fee for export (0.3 €/kg), it will still cost €2 926 350 per year. Taking the highest projected quantity of filter residues (16 487 tonnes) and the highest fee (0.5 €/kg) it will cost €8 243 500 per year. The EIA was correct in stating that Croatia must construct facilities for dealing with hazardous wastes, but this should not mean that Croatia then produces more of them. The construction of hazardous waste facilities is also not a task to be taken lightly, particularly when half of the country's hazardous waste is unaccounted for, which makes it difficult to correctly assess needs, and this is not something that can be done as a quick measure before building an incinerator. Since improper supervision of incinerator ashes could lead to human exposure to dioxins and heavy metals in highly available forms, this issue requires much more careful planning and supervision than has been the case so far.

2) Increasing air pollution in Zagreb

Zagreb already suffers from air pollution problems in some areas, which would be made worse by an incinerator, no matter how modern. The EIA stated that:

"...the construction of PTOO will lead to an increase of total emissions of SOx compounds by 0.8%, NOx compounds by 4.2% and suspended particles by 2.3% compared to 1998. With regard to the fact that the City of Zagreb air quality is categorised in category II (...), and that a legal obligation already exists for the city to take measures for environmental protection that would not lead to the further excessive burdening of the atmosphere with harmful compounds, the addition of increased emissions of the order of magnitude of around 4% to the level of total emissions may present a problem."

This problem cannot be solved satisfactorily in a short time period and will require several years to be properly addressed. The quality of air in the city needs to be improved, not worsened. Although the EIA stated that the incinerator emissions would be well below the legal limits, this depends on maintaining optimum burning conditions and is not likely to be the case in reality. For example, in 1999 and 2000, every municipal waste incinerator in the UK for which meaningful data existed breached emissions limits several times.[2]

3) Pre-empting the waste hierarchy

Plans for a municipal waste and sewage sludge incinerator have been pursued as an attractive quick-fix solution to the problem of waste in Zagreb, without proper consideration of the waste hierarchy or of the actual situation concerning waste in Croatia and in Zagreb.

[2] Greenpeace: Criminal Damage: A review of the performance of municipal waste incinerators in the UK, 2001, p.7 http://www.greenpeace.org.uk/MultimediaFiles/Live/FullReport/3766.PDF

The EIA recognised that the figures on which the incinerator plans are based are not necessarily very precise, and recommended that before the beginning of the construction of PTOO it would be necessary to create a waste inventory for 2001-2004 and projections for the coming 10-year period, and on the basis of that balance sheet establish the validity of the projected capacity PTOO for thermal treatment of 300 000 t/year municipal waste. This is certainly needed and should have been carried out as the **first** step in developing a waste reduction and management strategy, not as an afterthought. In the draft Waste Management Strategy of the Republic of Croatia, (Section 4.2.1), the Zagreb incinerator is already planned, whilst other waste-to-energy plants will not be located until expert analysis on the quantity, category and methods of waste management have been done. There is no justification for the Zagreb incinerator to be hurried along without such an analysis already having been completed. This is not only a matter of procedure but has concrete implications: the contents of the waste dictate the possibilities for dealing with it and the efficiency of the incinerator. If the calculations are not correct the lower calorific value may not be guaranteed with potentially serious consequences for the efficiency of the combustion process and therefore the emissions levels and amount of hazardous ash created.

The EIA, in the absence of accurate figures, was dealing with an estimated 300 000 of municipal waste to be incinerated, in addition to sewage sludge from the wastewater treatment plant, but the amount and quality of waste is too central to the study to be left as an estimate. It is necessary to know which kinds of waste are present, and in which quantities, in order to develop a coherent policy based on reducing the amount of waste, and then re-using, recycling and composting, before finally considering energy recovery and landfill. The EIA recommended that the City of Zagreb should recycle more “since for economic and ecological reasons incineration streams of municipal waste with a calorific value of less than 6 000 kJ/kg is not anticipated at PTOO” (for example organic 'green' waste, and mixed waste with construction rubble). We agree with the recommendation to elevate the level of recycling, but are not convinced that this makes the incinerator compatible with recycling, since there are many kinds of waste, for example PET and paper, that can be recycled but can also be burnt in an incinerator with less effort on the part of the authorities. In Croatia where recycling is not widespread, there is a high likelihood that the ‘easiest option’ will be taken and that the waste hierarchy will not be adhered to.

The EIA states that **before the beginning of construction** of PTOO the City of Zagreb must ensure that recycling and composting deals with a minimum of 20 - 25% of the total waste, with a tendency towards a further rapid rise in the recycled quantity, and that the system must be running effectively before commencing the commercial operation of PTOO. In particular, it recommends that the City should increase the number of recycling bins and centres, implement a fee system rewarding recycling and penalises disposal, educate citizens, and consistently apply the Regulation on the Treatment of Packaging Waste (which has recently been superseded) and other regulations. This is in sharp contrast with the current situation in Zagreb, in which there are insufficient incentives or education for citizens to reduce waste, for example citizens are charged by the size of their house, not the weight of waste that they produce. Recycling of municipal waste has stagnated in Zagreb: the number of paper containers (6 500) and glass containers (4 500) has stagnated, and there are only 1600 containers for PET and metal packaging.

Although the EIA was right in its recommendations, it did not go far enough, particularly in its analysis of the alternative scenarios for waste management with and without an incinerator. In spite of its lip service to waste reduction through fee incentives and education of citizens, it does not develop this idea into an analysis of a future scenario in

which waste does not continue to rise at the projected rate, or a scenario in which a door-to-door recycling collection and an effective composting scheme in operation ensure higher than projected diversion rates, which leads it to recommend rather weak recycling targets, and therefore its estimates of the quantity of waste to be incinerated cannot be regarded as accurate. Although 20-25% recycling and composting represents an improvement on the current situation, and would be a good starting point for further increases, it may be possible to realise those increases quicker than projected, with a door-to-door collection of recyclable and biodegradable materials, together with publicity, and fees and other incentives to increase citizen participation. According to Peter Jones of waste management company Biffa, 'Most in the industry agree that at least 60% is a realistic target for diversion from landfill into biodegradation and recycling.'[3] An increasing number of places are achieving even higher diversion rates, for example:

- **Canberra, Australia** (pop. around 320 000) has set itself a target of zero waste by 2010, and went from 22% to 69% recovery of waste between 1993/4 – and 2002/3)[4] , with no incineration.
- **San José, California,** (pop. 954 000) recycles more than 64% of its solid waste[5]
- **Edmonton in Canada** (pop. 697 657) has attained a 60% diversion of residential waste from landfill without any incineration,[6] and is aiming to increase this.
- **Seattle, US,** has adopted a 60% target for diversion from landfill by 2008 and in 2002 recycled 40%. Between 1995 and 2002 there was no increase in total volume of waste despite an increase in population and employment.[7]
- The province of **Nova Scotia** in **Canada** (pop. 936 921) managed to raise its waste recovery (without incineration) rates to 46% by 2002.[8]
- **Austria** recycles and composts 56% of its municipal waste[9], and it is widely recognised that there is scope for more waste diversion.

Although the composition of waste varies in different locations, and the diversion measurements are not carried out in a standardised way, the above examples give an indication of the high diversion rates which are not only being practiced, but which have been achieved in only a few years rather than decades. It is important that recycling and composting is given a chance to flourish well before any new disposal projects are implemented, otherwise it will be tempting for the city authorities to stop increasing recycling services once the incinerator is in operation.

The EIA did not mention the possibility that incineration may have an adverse effect on the planned waste reduction and recycling. This is particularly relevant given the lack of certainty that the projected incinerator is based on an appropriate capacity. The possibility of the incinerator providing a disincentive to waste reduction, recycling and composting

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[3] Biffa: PFI Update 2001

[4] Canberra Australian Capital Territory Government: No waste by 2010, Turning Waste Into Resources, 2003 progress report http://www.nowaste.act.gov.au/styles/progressreport2003.pdf

[5] http://www.recycleplus.org/achievements.htm

[6] Edmonton City Government Official Website: http://www.edmonton.ca/portal/server.pt > Environment > Waste management, viewed on 17th August 2005

[7] Seattle City Council: Solid Waste Plan 2004 amendment http://www.seattle.gov/util/About_SPU/Garbage_System/Plans/Solid_Waste_Plan/index.asp, viewed on 17th August 2005

[8] Nova Scotia Department of Environment and Labour: Status Report 2004 in Solid Waste-Resource Management in Nova Scotia http://www.gov.ns.ca/enla/waste/docs/WasteResourceStatus2004.pdf, viewed on 17th August 2005

[9] Final report on the framework national strategy for waste management, with emphasis on municipal waste, Carl Bro Consortium as part of the EU Cards Programme, 2003, cited in Draft Strategy of the Waste Management Strategy of the Republic of Croatia, Zagreb, March 2005

was raised at a public meeting on 21.04.2005.[10] Dr. Zlatko Milanović, technical director of waste management company ZGOS, replied that it is better to have an incinerator that is too big rather than too small. We do not agree with this assessment, as we believe that waste minimisation should be the central aim of any waste strategy, rather than incinerating precious resources which could be re-used, recycled or composted. The EIA pointed out that it is better to compost than burn organic material, but in other cases, such as PET bottles, there could be competition between reduction, recycling and incineration.

In its analysis of alternative methods, the EIA compared landfill, mechanical-biological treatment (MBT) and incineration in an inadequate and simplistic way, and hardly explores the possible interaction between different methods of waste treatment. Neither did it explore the alternatives for the treatment of sewage sludge. Although it is not surprising that the EIA was aimed at justifying the construction of an incinerator, its consideration of the alternatives should have been of a higher quality. Landfill was dismissed, for good reasons, as ecologically unacceptable, and it was correctly argued that the EU Landfill Directive requires a reduction in the amount of waste being taken to landfill. However, the important point is that the EU Landfill Directive (1999/31/EC) requires **a decrease in the amount but also in the toxicity** of the waste being landfilled (Preamble, Para. 8). Incineration decreases the amount of waste going to the landfill but in doing so concentrates the toxicity, and should therefore be regarded as a highly suspect means for fulfilling ecological ends. It is also misleading to consider the three choices alone, as if choosing one removes the need for the other options, since incineration also requires a landfill. The EIA criticized MBT since it only reduces the amount of waste and does not eliminate it altogether, but this can also be said of incineration, and MBT results in a stabilised material which is less harmful in a landfill than incinerator ash.

4) Lack of regulatory oversight in Croatia

Given Zagreb's experience with the PUTO toxic waste incinerator and waste management in general, there is no reason to be confident that supervision and monitoring will be sufficient to ensure that any new incinerator operates within legal limits. The PUTO hazardous waste incinerator started operating in 1998. Local people began to complain of health problems which they attributed to the incinerator, including hormonal disorders, indigestion and breathing difficulties, and they claim that life expectancy in the area decreased, while cases of cancer increased.[11] In addition they claim that fruit trees stopped bearing fruit and that birds vacated the area.[12] There were several incidents at the plant, when chemical reactions caused fires to break out. In October 2001, thick purple smoke billowed from the plant for days, which irritated the eyes and caused breathing difficulties. Local people pressed charges against the owners of PUTO.[13]

It was widely alleged that the incinerator was used to burn illegally-imported hazardous waste in order to increase its income.[14] This appears to have been ignored by the authorities, but the Environmental Inspectorate did take a number of legal proceedings

[10] Local agenda Jakuševec, Mičevec, Kosnica, and Novi Šćitarjevski meeting on waste management, 21.04.2005, Kosnica Youth Centre

[11] Tesić, Mladenka, Interview with Members of UZOJ - Jakuševac Association for Environmental Protection, Zagreb, 2004

[12] Tesić, Mladenka, Interview with Members of UZOJ - Jakuševac Association for Environmental Protection, Zagreb, 2004

[13] Tesić, Mladenka, Interview with Members of UZOJ - Jakuševac Association for Environmental Protection, Zagreb, 2004. The main investor in PUTO was the City of Zagreb, together with the companies Hafner (Bolzano) and IRS (Meinheim) (UNECE, Environmental Performance Review: Croatia, UN, 1999).

[14] Tesić, Mladenka, Interview with Members of UZOJ - Jakuševac Association for Environmental Protection, Zagreb, 2004

against PUTO during 2000 and 2001, related to emissions and hazardous waste storage.[15] In March 2002 the Inspectorate threatened to prohibit the further admission of waste if the storage area was not upgraded to comply with regulations.[16]

In August 2002, a major fire broke out in a storage site, and about 100 tonnes of hazardous waste burned. The fire seems to have been caused by explosions of gases, probably resulting from leaks from containers stored outside of the covered storage area.[17] After this incident the incinerator was finally banned from operating until regulatory requirements are met. The ban is still in place and PUTO was declared bankrupt on 8th July 2004.[18] Although some legal action was taken against PUTO, it was extremely limited given the obviousness of the problems there. Local people still have no real information about the chemicals they were exposed to and about the likely effects of this. There is no reason to believe that if a new incinerator caused environmental and/or health problems, the concerns of local people would be taken into account any more than with PUTO.

This lack of monitoring and enforcement is also shown in the country's hazardous waste problem, in which approximately half of Croatia's hazardous waste is unaccounted for and is suspected to either end up on municipal landfills, be dumped in the countryside, or end up in construction materials. There is no evidence that monitoring and enforcement capacities have improved to the extent that the hazardous waste generated by the incinerator will be handled responsibly, as the monitoring foreseen in the EIA is not very frequent, and will be carried out by the incinerator operator, which leaves plenty of room for abuse if it is not backed up by state monitoring. Until this situation substantially improves and more resources are devoted to monitoring, it is highly irresponsible to build new sources of pollution and hazardous waste.

5) Waste of Energy

Energy recovery from waste is a very inefficient method of utilising the energy embodied in waste products, as the products do not only represent the calories which can be burnt, but also the energy which is needed to make more of the same material from raw materials. For example, it has been estimated that manufacturing newsprint takes over two and a half times the amount of energy generated by burning it, manufacturing glass takes 30 times the energy generated by burning it, and making aluminium 350 times the amount of energy generated when it is burnt.[19] A report by the Sound Resource Management Group Inc. found that "on average, recycling saves three to five times as much energy as is produced by incinerating municipal solid waste"[20] These figures may vary by location and different technologies, but the message is still very clear. The advantage of recycling is recognised in the waste hierarchy but it is hard to see how the incinerator proposed for Zagreb will not end up burning useful materials considering that re-use and recycling is at such a low level in the city.

6) Cost

The total cost of municipal solid waste incineration is significantly higher than for recycling, composting and landfills established according to strict environmental standards, taking

[15] Buksa, Z.: 'Ekoinspekcija upozoravala i tuzila ali bez koristi', Vjesnik, 02.08.2002

[16] Buksa, Z.: 'Ekoinspekcija upozoravala i tuzila ali bez koristi', Vjesnik, 02.08.2002

[17] Klobucar, D: 'Pozar i eksplozije u spalionici opasnog otpada' Večernji List, 02.08.2002

[18] Večernji List: 'Poglavarstvo grada Zagreba za stečaj spalionice PUTO', 10.007.2004

[19] Sound Resource Management Group Inc: Recycling Versus Incineration. Canada, Pollution Probe Ontario, 1992; and Morris, J: Recycling v incineration: an energy conservation analysis. Journal of Hazardous Materials 47, 1996, p. 277-293.

[20] Sound Resource Management Group Inc: Recycling Versus Incineration. Canada, Pollution Probe Ontario, 1992

into account the wide variation in the costs of different schemes.[21] One estimate for the cost of construction of the Zagreb incinerator is €290 000 000[22]. These high costs are of great concern and could seriously impact on the functioning of the waste management system in and around Zagreb. In order to cover the high costs, it will be necessary to charge high tipping costs, and it is far from clear that the citizens and businesses of Zagreb are willing to pay, as there have been no public discussions of the likely costs to citizens and businesses. A World Bank report points out that "An incineration plant involves heavy investments and high operating costs and requires both local and foreign currency throughout its operation. The resulting increase in waste treatment costs will motivate the waste generators to seek alternatives."[23] Without sufficient incentives to reduce and re-use and recycle waste, this means that in reality landfilling, or worse, illegal dumping, would still be a more economical way to dispose of waste. This causes concern that a contract to supply a certain amount of waste to the incinerator may be signed, thus creating a severe disincentive to reduce and recycle waste.

Concluding recommendations:

We recommend that no further preparations for an incinerator should be made in Zagreb at the present time and that in the future no incineration capacity should be considered at least until the following conditions apply:

1) That a waste inventory and predictions for the City of Zagreb have been drawn up and analysed by independent experts, and that a waste strategy for the city has been drawn up *in consultation with interested parties from civil society*.
2) That non-incineration treatment options have been explored for the sewage sludge which would be burnt.
3) That waste prevention targets have been set by the Ministry of the Environment of the Republic of Croatia and that measures for meeting them have been implemented, for example legal stipulations for the availability of re-usable packaging, which are missing from the new Packaging Ordinance.
4) That the City of Zagreb changes the waste collection pricing system from the floor area of the dwelling to the quantity of waste collected.
5) That recycling and composting targets for the City of Zagreb are reviewed according to the outcome of the waste inventory, forecasts, and independent expert analysis.
6) That regular door-to-door recycling and composting collections serve at least 70% of Zagreb residents
7) That door-to-door collections are backed up with financial or penalty incentives to reduce, re-use and recycle waste.
8) That a concerted education programme for the citizens of Zagreb has been implemented, giving advice on the need and means to reduce, re-use and recycle.
9) That the Ministry of the Environment of the Republic of Croatia has an effective inventory of all new hazardous waste in Croatia and that hazardous waste is able to be effectively tracked and monitored.
10) That monitoring and enforcement for environmental offences has been significantly improved.
11) That a specially designed site or sites have been set up to receive the hazardous

[21] T Rand, J. Haukohl, LU .Atarxen: Municipal Solid Waste Incineration: a decision-makers' guide, World Bank, June 2000, p.9, http://www.ramboll.dk/docs/dan/Pressecenter/Publikationer/Faglige/Affald/MSWIncineration-ADecisionMakersGuide.pdf
Friends of the Earth Fact Sheet: "Recycling, can local authorities afford it?", February 2002, p.2 http://www.foe.co.uk/resource/factsheets/recycling_local_authority.pdf

[22] Ministry of Environmental Protection, Physical Planning and Construction: Draft Proposal of the Waste Management Strategy of the Republic of Croatia, Zagreb, March 2005

[23] T Rand, J. Haukohl, LU. Atarxen: Municipal Solid Waste Incineration: a decision-makers' guide, World Bank, June 2000, p.1, http://www.ramboll.dk/docs/dan/Pressecenter/Publikationer/Faglige/Affald/MSWIncineration-ADecisionMakersGuide.pdf

ashes from the incinerator, in which they will not be mixed with municipal waste.

12) That a full public discussion has taken place including predictions of costs for citizens resulting from the incinerator. The public has a full right to know what they will be expected to pay for new service infrastructure.

Even under these conditions, there would be many aspects of incineration which would remain a concern, such as its extremely high costs, the waste of materials it entails, and its contribution to emissions levels of NOx, dioxins and heavy metals, but it would be more appropriate to discuss incineration as a last resort after the above measures have been taken than it is to plan a waste-to-energy plant in Zagreb today.