Commission of European Communities, for and on behalf of the Government of Albania,

Ref.: EuropeAid/124909/C/SER/AL

Implementation of the National Plan for Approximation of Environmental Legislation in Albania

Component B: Implementation Planning

Sector: Waste Management

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Implementation of the National Plan for Approximation of Environmental Legislation in Albania

DIRECTIVE SPECIFIC IMPLEMENTATION PLAN

Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste

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List of Abbreviations

BAT	Best Available Techniques
BOT	build – operate - transfer
CA	Competent Authority
CARDS	Community Assistance for Reconstruction Development and Stabilization
CDF	Confined Disposal Facility
CDW	Construction and Demolition Waste
CF	Cohesion Fund
CoM	Council of Ministers
CP	Collection Point
DCM	Decision of Council of Ministers
DfID	Department for International Development (UK)
DG	Directorate General
DSIP	Directive Specific Implementation Plan
EAN	Environmental Agencies' Network
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECJ	European Court of Justice
EEA	European Environmental Agency
EEC	European Economic Community
EFA	Environment and Forests Agency
EI	Environmental Inspectorate
EIA	Environmental Impact Assessment
EIB	European Investment Bank
ELPA	Environmental Legislation and Planning (project)
ELV	Emission Limit Value
EMAS	Environmental Management Audit Schemes
EPR	Environmental Performance Review
ERDF	European Regional Development Fund
EU	European Union
EWC	European Waste Catalogue
ftpe	full-time person equivalent
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HE	Health Establishment
HW	Hazardous Waste
IFC	International Finance Corporation
IFI	International financial institution
INPAEL	Implementation of National Plan for the Approximation of Environmental Legislation

IPA	Instrument for Pre-accession Assistance
IPC	Industrial Pollution Control
IPH	Institute of Public Health
IPPC	Integrated Pollution Prevention and Control
ISPA	Instrument for Structural Policies for Pre-Accession
KfW	Kreditanstalt für Wiederaufbau
LGU	Local Government Unit
LIFE	Legal Instrument for Environment
MAFF	Multi-annual Financial Framework
MAP	Mediterranean Action Plan
METE	Ministry of Economy, Trade and Energetics
MoAFCP	Ministry of Agriculture, Food and Consumer Protection
MoD	Ministry of Defence
MoEFWA	Ministry of Environment, Forests and Water Administration
MoF	Ministry of Finance
MoH	Ministry of Health
MoPWTT	Ministry of Public Works, Transport and Telecommunications
MoU	Memorandum of Understanding
MS	Member State
MSW	Municipal Solid Waste
MTF	Medium Term Financing
NAPISAA	National Action Plan for the Implementation of the Stabilization and Association Agreement
NEAP	National Environmental Action Plan
NES	National Environmental Strategy
NfPO	Non for Profit Organization
NGO	Non-Governmental Organisation
PEPSE	Private Enterprise Partnership for Southeast Europe
PHARE	Poland and Hungary Assistance for the Restructuring of the Economy
PPP	Public Private Partnership
PVC	Poly Vinyl Chloride
PPWD	Packaging and Packaging Waste Directive
REA	Regional Environmental Agency
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
REC	Regional Environmental Centre
RoA	Republic of Albania
RoHS	Restriction of Hazardous Substances
S	Senior
SAA	Stabilization and Association Agreement
SAPARD	Special Accession Programme for Agriculture and Rural Development

SIDA	Swedish International Development Assistance
SME	Small and Medium Enterprise
SoER	State of Environment Report
TA	Technical Assistance
TAT	Technical Assistance Team
ToC	Table of Concordance
ToR	Terms of Reference
UNDP	United Nation Development Programme
UNECE	United Nations Commission for Europe
UNEP	United Nations Environment Program
WB	World Bank
WEEE	Waste Electric and Electronic Equipment
WID	Waste Incineration Directive
WMP	Waste Management Plan
WtoE	waste-to-energy

Introduction

This report presents the results of the legal, administrative and institutional assessment of the current state of approximation of the Directive 2000/76/EC on the incineration of waste and the overall plan to obtain full approximation in preparation to the country's accession to the EU.

The report highlights the gaps and problems/weaknesses that may hinder the effective transposition and implementation of the Directive and, therefore, identifies the capacity enhancements needed to ensure its effective and efficient implementation. The report also provides the best estimates of costs and benefits that can be made at the present time.

The report draws on the examination of relevant available documentation, together with numerous contacts and detailed discussions held both within the Technical Assistance Team (TAT) and between TAT members and a wide range of key officials.

The report is divided in 3 main sections. Section 1 provides the requirements of the Incineration Directive; section 2 provides an overview of the current existing situation with incinerators in Albania, including the current status of waste policy, roles' share between stakeholders, legal framework, status of implementation of waste legislation and investments in Albania. Section 3 is about the approximation plan for this directive in Albania, including transposition and implementation, cost estimates and potential funding resources for the implementation of this directive in Albania, as well as the benefits from its implementation.

The document is accompanied by 1 annex.

Executive summary

The aim of the Waste Incineration Directive (WID) is to prevent or to limit negative environmental effects, in particular pollution by emissions to air, soil, surface water and groundwater, and the resulting risks to human health, from the incineration and co-incineration of waste. It covers both incineration and co-incineration plants.

Incineration plant means any stationary or mobile technical unit or equipment for the thermal treatment of waste, with or without recovery of the combustion heat generated, but excluding *inter alia*:

- vegetable waste from agriculture and forestry;
- vegetable waste from the food processing industry, if the heat generated is recovered;
- fibrous vegetable waste from virgin pulp production and from production of paper from pulp, if it is co-incinerated at the place of production and the heat generated is recovered;
- wood waste with the exception of wood waste which may contain halogenated organic compounds or heavy metals as a result of treatment with wood preservatives or coating, and which includes in particular such wood waste originating from construction and demolition waste;
- animal carcasses as regulated by Directive 90/667/EEC without prejudice to its future amendments;
- Experimental plants used for research, development and testing in order to improve the incineration process and which treat less than 50 tonnes of waste per year.

A co-incineration plant means any stationary or mobile plant whose main purpose is the generation of energy or production of material products and which uses wastes as a regular or additional fuel or in which waste is thermally treated for the purpose of disposal.

In practical terms the Directive will apply to three categories of installation in Albania in the future:

(a) installations for the large-scale treatment of (mainly) municipal waste,
(b) healthcare waste incinerators,
(c) industrial installations such as cement kilns or power plants which agree to co-incinerate specific types of waste as a fuel, as a means of waste treatment, or both.

Note that the burning of certain types of vegetable wastes from industry falls under the WID if energy is not recovered. While it is quite possible that such practices occur in Albania at present, the advent of the WID is likely to put a stop to this (assuming that the Directive is properly enforced) as the need to comply with the WID would impose considerable costs on them. While the upgrading of such installations so that they recover energy in the future is a likely consequence of the WID, it is not an action necessary for implementation, and is not treated as

such in this DSIP. Nor is any attempt made to estimate the cost of such works, partly because of the lack of data, but partly because the payback period for such an investment is likely to be very short.

In the subsections below, the actions necessary for implementation in respect of each of the three categories above are considered.

Investment costs for the implementation of Incineration Directive are rather costly than the implementation of the Landfill Directive. So are the re-current costs, too. However, incineration of waste as a recovery process – i.e. waste to energy (WtoE) - generates energy and/or heat that when used beneficially do generate incomes, by decreasing the overall recurrent/operational costs. Therefore, the difference between the annualized costs of the incinerator and the landfill can get smaller.

It has been estimated that the implementation of this directive in Albania will not require extra staff. It can be covered by the same number of additional staff foreseen for the implementation of the Waste Framework Directive 2008/98/EC.

It has been estimated that about 12 regional waste disposal facilities are needed in Albania. Two waste disposal options are possible for Albania:

1. The first one, considers only landfilling of waste, with no incineration taking place, except for the already existing incinerators and/or the adaptation of the existing furnaces and boilers (e.g. in a cement factory) for co-incineration. The investments and operational costs of the later are unknown at this moment and need to be determined following relevant feasibility studies.
2. The second option, considers there may about 11 regional landfills and only 1 incinerator (a Waste to Energy Plant). However, such decision needs to be made following the findings of the relevant feasibility study, which has been estimated to cost about 1.5-2 MEUR.

If the first option (all landfills) will be decided, the one-off costs for the implementation of the Incineration Directive (studies and auditing sampling) is estimated to be about 750,000 EUR while the recurrent costs 12,000 EUR/year.

If the second option (landfills + 1 WtoE) will be decided, the estimated one-off incremental capital cost for that WtoE could be over €100 million, but an offsetting saving on capital costs might be more than €2 million/year if it is possible to use beneficially the heat output of the incinerator.

As already mentioned, waste can also be co-incinerated in furnaces or boilers, e.g. in cement factories. The number of cement factories recently built in Albania are an encouraging indication that co-incineration can be used as an option for waste recovery. Of course, the effectiveness of such options needs to be estimated on a case by case bases following feasibility studies.

1 Requirement of the EU Legislation

1.1 EU Legislation Covered

This DSIP covers the implementation of the Directive 2000/76/EC on the incineration of waste.

1.2 Direct Requirements of Legislation

The aim of Directive 2000/76/EC on the incineration of waste is to prevent or to limit as far as possible negative effects on the environment, in particular pollution by emissions into air, soil, surface water and groundwater, and the resulting risks to human health from the incineration and co-incineration of waste.

Member States were required to give effect to the Directive as from 28 December 2002 at the latest. The Directive provides for transition periods, whereby the Directive will apply:

- For new plants – as from 28 December 2002
- For existing plants – as from 28 December 2005.

The Directive establishes emission limit values (ELVs) for emissions to air and discharges to water.

The Directive makes a clear distinction between:

- incineration plants – which may or may not recover heat generated by combustion; and
- co-incineration plants – whose main purpose is energy generation or the production of material products and, either uses waste as a regular or additional fuel or in which waste is thermally treated for the purpose of disposal. This may include, for example, cement kilns, steel or power plants.

The Directive does not apply to experimental plants used for research, development and testing and which treat less than 50 tonnes of waste per year. It also does not apply to plants treating only:

- vegetable waste from agriculture and forestry
- vegetable waste from the food processing industry, if the heat generated is recovered
- fibrous vegetable waste from virgin pulp production and from production of paper from pulp, if it is co-incinerated at the place of production and the heat generated is recovered
- certain wood wastes
- cork waste
- radioactive waste

- animal carcasses
- waste resulting from the exploitation of/for oil and gas from off-shore installations and incinerated on board the installation.

All incineration and co-incineration plants must be authorised and have an operating permit issued by the Competent Authority. The application for the permit must include a description of the measures to be taken to ensure:

- that the plant is designed, equipped and will be operated in accordance with the requirements of the Directive
- that the heat generated is recovered as far as practicable, e.g. through combined heat and power
- that residues will be minimised
- the appropriate disposal of residues which cannot be prevented, reduced or recycled.

The operating permit must:

- list the categories of waste which may be treated
- include the total waste (co-) incinerating capacity of the plant
- specify the sampling and measurement procedures for the air and water pollutants
- where relevant, list the quantities of different categories of hazardous waste which may be treated.

Before hazardous waste can be accepted at a plant, the operator must ensure that he has available all the prescribed administrative information on the generating process, information on the physical and chemical composition of the hazardous waste, and information on the hazardous characteristics of the waste. The operator must also check the documentation for the hazardous waste and take samples which must be kept for at least 1 month after the incineration.

To ensure complete waste combustion, all plants must keep the (co-) incineration gases at a temperature of least 850C for at least 2 seconds. If hazardous waste with a content of more than 1% of halogenated organic substances, expressed as chlorine, is incinerated then the temperature has to be raised to 1,100C for at least 2 seconds. The Directive sets out conditions to be met during start-up and shut-down, and during abnormal operating conditions.

The ELVs for incineration plant emissions to air are set out in Annex V, which must not be exceeded. These include dust, total organic carbon, nitrogen oxides, sulphur dioxide and hydrogen chloride, certain heavy metals, dioxins and furans and carbon monoxide.

The ELVs for co-incineration plant emissions to air are set out in Annex II. In addition, special conditions are laid down relating to cement kilns, combustion plants co-incinerating waste and other industrial sectors co-incinerating waste.

The discharge of waste water from the cleaning of exhaust gases from incineration and co-incineration plants must also be authorised. These discharges must be limited as far as practicable and at least in accordance with the ELVs set down in Annex IV for suspended solids, certain heavy metals and dioxins and furans. The diluting of waste waters so as to comply with these ELVs is prohibited. Contaminated rain-water and fire-fighting water must be collected and analysed before being discharged.

Residues from the (co-) incineration plant must be minimised both in their amount and their harmfulness. When dry residues are transported, precautions must be taken to prevent their dispersal in the environment. Tests must be carried out to establish the physical and chemical characteristics and the polluting potential of the residues.

The Directive sets out the detailed requirements for control and monitoring, the parameters and pollutants to be monitored and the frequency of such monitoring.

Applications for new permits must be made available to the public so that the public may comment before the Competent Authority reaches a decision. That decision and the permit must be also made available to the public.

For plants with a nominal capacity of two tonnes or more per hour, the operator must provide the Competent Authority with an annual report on the functioning and monitoring of the plant. This report must be made available to the public. A list of plants with a nominal capacity below this threshold must be drawn up by the Competent Authority and made available to the public.

1.3 Indirect Requirements / Implications

Municipalities and waste producers will have to take the required precautions for separation of waste at source and prevention of harmful effect on environment and human health.

1.4 Links with Other Legislation

Links with other legislation within this sector:

- Waste Framework Directive (2008/98/EC repealing Directives 75/439/EEC, 91/689/EEC and 2006/12/EC);
- Landfill Directive (1999/31/EC);
- Regulation on the Shipment of Waste (EC/1013/2006 and repealing EEC/259/93).

Links with other legislation within other sectors:

- National Emission Ceilings for Certain Atmospheric Pollutants Directive 2001/81/EC;
- Integrated Pollution Prevention and Control (IPPC) Directive (2008/1/EC);
- Environmental Impact Assessment (EIA) Directive (85/337/EEC as amended);
- Strategic Environmental Assessment (SEA) Directive on the assessment of certain plans and programs (2001/42/EC);
- Access to Environmental Information Directive (2003/4/EC);
- Water Framework Directive (2000/60/EC, as amended).

2 Present Situation

2.1 Government Policy

The Constitution of RoA approved by referendum in 1998 inspired by principles of Agenda 21 and by the international environmental conventions has sanctioned the aim of the state "for a healthy and ecologically suitable environment for present and future generations" and "for the rational utilisation of ...natural resources, based on the principle of sustainable development" (Article 59.1/d,dh). It also has sanctioned the right of each individual "to be informed of the state of the environment and its protection"(Article 56).

Albania's current waste policy is based on European policy. The main objective of the government is to fulfill the obligations agreed to in the SAA (Article 108) stating that "The Parties shall develop and strengthen their co-operation in the vital task of combating environmental degradation, with the view of promoting environmental sustainability. Co-operation will mainly focus on priority areas related to the Community *Acquis* in the field of environment. The statement covers all issues under the Environmental *Acquis*, therefore waste management, too.

The need for improvement in the waste management area has been also recalled in different reports of the European Commission for Albania. EC Progress Reports of 2006, 2007 and 2008, which:

- encourage the "construction of infrastructure for urban waste handling; selective collection of waste, recycling and disposal;
- emphasize the fact that uncontrolled dumping and burning of waste continue to pose environmental and health risks;
- emphasize that no clear strategy for the safe disposal of hazardous waste is developed.

An "Inter-sectoral Environmental Strategy; National Strategy for Development and Integration" was approved by the Council of Ministers (Decision 847, dt.29.11.2007). It was partly dedicated to waste management and aimed to achieve:

- By 2009: safe landfilling of 75% of hazardous waste; reliable data on hazardous waste; recycling of 10% of urban waste; improved conditions at the authorized landfill;
- By 2010: safe disposal of 50% of the waste to controled landfills;
- By 2012: avoidance of waste disposal in illegal sites; construction of 5 sanitary landfills.

A separate National Waste Strategy document and a National Waste Management Plan were drafted in 2010 by the INPAEL project team. At the moment of writing this plan, the waste

strategy and plan are being discussed with the line ministries and different actors. Both the strategy and the plan are subject to approval by the Council of Ministers.

The waste strategy will cover the period 2010 to 2025 which is seen as the important period prior to and immediately following EU Accession during which time the government of Albania has made waste management a priority issue and where significant effort will be made to radically improve the current situation.

The strategy is based on the four founding policy pillars of the National Policy on waste:

- Planning
- Education
- Resourcing
- Legislation

In the above regard the government is committed to a programme of environmental improvement as part of a wider political agenda to gain full EU membership for Albania. This will involve the implementation of an integrated planning approach to waste management at a National, Regional and Local level.

Targets set in the NWMP reflect the targets set in different EU waste Directives.

2.2 Roles & Responsibilities

Roles and responsibilities of different authorities under the current legislation (as of the date this DSIP was finalised), have been described in great details in the DSIP on Waste Framework Directive and in the DSIP on Landfill Directive. None of those roles and responsibilities covers directly the incineration of waste, which is the reason this sub-section has been made so brief.

Current staffing and capacities at different stakeholders
No staff or capacities have been yet built or dedicated to the implementation of this Directive in Albania.

2.3 Current Legal Framework

A summary of current Waste Legislation in Albania is given below.

1. Law nr.8934, date 05.09.2002 “On environment protection”, amended by law nr.9890, date 20.3.2008 and Law no.9983, date 8.9.2008. (to be replaced soon by the new draft law “On environmental protection”
2. Law nr. 9010, date 13.02.2003 “On the environmental administration of solid waste” (to be replaced soon by the new draft law “On integrated waste management).
3. Law nr.9537, dated 18.5.2006 “On hazardous waste administration (to be replaced soon by the new draft law “On integrated waste management)”
4. Regulation nr.1, date 30/3/2007 “On the treatment of construction and demolition waste from creation and transportation to disposal”
5. Regulation no.6, dt. 30.11.2007 “On the administration of hospital waste”

6. Guideline nr.6, dt.27.11.2007 “On the approval of the rules, content and deadlines for the drafting of plans for solid waste administration”
7. Law No.8094, dt.21.03.1996 “On the public removal of waste”
8. Law No.9663, dt.18.12.2006 “On concessions”. Between others, the law covers public services and waste management, too, implying construction of waste treatment facilities, too.
9. Law no.8652, dt.31.07.2000 “On the organization and functioning of the local government”.
10. Law no.10199, dt. 23.04.2009 “On territory planning”

Following Law 9010, article 11 and 20, disposal is the last option in the hierarchy of waste management. Burning of waste in special facilities is the last disposal option accepted by article 11 of this law.

Regulation no.6, dt. 30.11.2007 “On the administration of hospital waste” accepts the use of incinerators for hospital waste and defines some basic conditions for their proper use. Table 6.1 “Cremator” of the DCM nr. 435, dt. 12.09.2002 “On the approval of air emission norms in the RoA” sets the standards for the use of incinerators for hospital waste.

Disposal operations are not dealt in detail by the Law 9010. They are introduced in annex II of Law 9537 that lists the waste disposal activities. Incineration on land or at sea is 8th on the list.

From the description of the legal requirements on the incineration of waste it is evident that no single act is fully dedicated to landfilling of waste, though three of them deal very little with it as a waste disposal option and very few requirements are set to different actors in this regard.

2.4 Current implementation status

A number of different documents, including the EC progress Reports have evaluated that current implementation of waste legislation is low and recommendations have been made to improve the situation. However, it must be noted that no implementation measures have been taken so far on the Incineration Directive.

2.5 Current investment status

No investments have been made so far on incinerating facilities, except those on a couple of old incinerators of hospital waste.

2.6 Municipal waste incineration

2.6.1 General

Incineration with energy recovery can be considered an alternative to landfill as a means of disposal of municipal waste. The recovery of energy is both compelling in economic terms and a legal requirement (Article 6(6)) of the WID requires that any heat generated by the incineration or co-incineration process must be recovered as far as practicable).

Since incineration is an alternative to landfill for the disposal of waste[1] it should be considered in the option analysis which is carried out explicitly or implicitly when waste management systems are being planned.

Per unit of waste disposed, the direct investment costs of incineration are much higher than those of landfill. Given the low mean incomes and scarcity of financial resources in Albania, this appears *prima facie* to rule incineration out from a role in Albania's waste management in the future. But there are a number of factors which mean that the real difference in costs is not as great as appears from a comparison of these direct investment costs only. These are as follows.

The Landfill Directive requires member states to take measures to ensure that "only waste that has been subject to treatment is landfilled". Treatment may include pre-sorting, mechanical-biological treatment, stabilisation, etc, but any treatment involves costs.

The Landfill Directive places quantitative limits on the landfill of biodegradable waste. Meeting these limits may be troublesome and costly: it may involve persuading households to separate kitchen and garden waste from other forms of waste, collecting biowaste separately and establishing large centralised composting facilities. There is a danger that these plants will produce a product (compost) of unsatisfactory quality and/or for which there is no market, i.e. ending up as waste anyway.

The Packaging and Packaging Waste Directive (PPWD) sets minimum standards for the recycling/recovery of packaging waste (PW). This considerably reduces the amount of packaging waste which may be landfilled. This means that systems must be established for removing most PW before it is landfilled. However the requirement is only partially avoided by incineration since this counts as 'recovery' (as energy) but not as 'recycling' (energy recovery is explicitly excluded from the definition of recycling). The PPWD requires that much of the recovery is through recycling. However some plastic packaging waste cannot be recycled and incinerating this waste makes a positive contribution to meeting the PPWD targets without the need for establishing the need for expensive separate collection systems.

When Albania starts to install more sewage treatment capacity it will have to find a solution for its sewage sludge. This can be quite troublesome, and incineration could be a convenient solution.

The energy which can be recovered from incineration provides cost offsets which significantly enhance the economics of incineration. Part of this energy can be recovered in the form of power, which is normally highly marketable as long as there are no institutional impediments. The rest is also recoverable, but in a lower grade form, as heat. This may be useable for certain space heating or industrial applications, but the existence of a market is much less certain. Since three-quarters of the useable energy output of such an installation is in the form of heat rather than of

[1] Incineration is defined, in Directive 2008/98/EC on Waste, as a disposal operation. However it is not final in the sense that landfill is. Incineration causes chemical and physical changes in waste, converting it into bottom ash, fly ash (a form of hazardous waste) water vapour, carbon dioxide and smaller quantities of a number of other substances. In a modern incineration plant almost all the fly ash and most of the pollutants are captured or neutralised in the pollution control equipment, but significant quantities of solid waste (bottom ash, fly ash) remain. These wastes amount to some 25% by weight, but less than 10% by volume of the original waste. Incineration therefore does not completely dispense with the need for landfill, but does reduce it by about 90%. There may be scope for using bottom ash as a secondary building material (aggregate).

power, the assumption about the marketability of the heat output has a major impact on the economics.

Incineration with heat recovery is classified as a recovery operation in Directive 2008/98/EC on Waste (see Annex II), provided it meets a specified efficiency criterion[2]. This in itself makes it preferable to landfill since waste management favours recovery over disposal. However incineration can lead to recyclable materials being burned and this is undesirable even if the energy content is recovered, since recovery is below recycling in the 'waste hierarchy'.

[2] The energy efficiency η must be at least 65%, where η is given by
η = (Ep - (Ef + Ei))/(0,97 × (Ew + Ef))
where:

Ep = annual energy produced as heat or electricity. Electricity output is multiplied by 2.6 and useful heat output is multiplied by 1.1;
Ef = annual energy input to the system from fuels contributing to the production of steam (GJ/year);
Ew = net calorific value of the waste treated;
Ei = annual energy imported excluding Ew and Ef;
0.97 is a factor accounting for energy losses in bottom ash and radiation.

The box below gives some of the pros and cons of incineration compared with landfill.

Waste incineration – pros

- Incineration is much less space-extensive than landfill. Finding space for additional landfills in densely populated areas can be difficult.
- Incineration can be a convenient way of dealing with some awkward waste streams, e.g. sewage sludge, tyres, spent lubricants.
- Incineration is a very effective way of meeting the limits on landfill of biodegradable waste (separate collection not necessary).
- Technology is now sufficiently advanced that modern, well managed incinerators make only a small contribution to local concentrations of air pollutants.
- Incineration plants can generate electricity and heat, thereby reducing the need for fossil fuels.
- Positive in climate terms. Energy generated from biomass (a significant part of the municipal waste stream) is carbon-neutral. Furthermore landfills (even those which collect landfill gas) emit methane, a powerful greenhouse gas, whereas incinerators do not. Every ton of MSW incinerated prevents about one ton of carbon dioxide equivalent from being released to the atmosphere.
- It may be possible to use bottom ash as a construction aggregate.
- Energy is recovered from non-recyclable packaging waste, this contributing to the PPWD targets.
- Metals can be recovered for recycling from bottom ash. Metals can be recovered from ash which would be difficult to recycle through conventional means, as attached combustible material is burnt off.
- The volume of combusted waste is reduced by approximately 90%, increasing the life of landfills.

Waste incineration – cons

- Incineration is costly and has high capital requirements. Where a landfill serving 400,000 people might cost €10,000,000, the capital cost of an incinerator with energy recovery might be 10 times as high.
- Incinerators need to run almost continuously, because they may emit dioxins and furans during start-up and shutdown. This means that the continuity of the waste supply has to be assured. There may be a temptation to burn the entire waste stream without separating out recyclables. Prevention, waste minimisation, reuse and recycling of waste should all be preferred to incineration according to the waste hierarchy. Some argue that incinerators and other waste treatment technologies are barriers to recycling and separation beyond particular levels, and that waste resources are sacrificed for energy production.
- The claim that the environmental and health impacts are very low is contested by some. Incinerators emit some heavy metals such as vanadium, manganese, chromium, nickel, arsenic, mercury, lead, and cadmium, which can be toxic at very low levels. There are also concerns about fine and ultrafine particles, which are not specifically regulated by the WID.
- The fly ash collected by the pollution control system is hazardous waste and must be safely disposed of.
- Incinerator bottom ash can have significant levels of heavy metals. Some contest that it can be used safely in products.
- The location of an incinerator may generate greater resistance in the local community than even a landfill. This may lengthen the project preparation stage.
- Incinerators may be aesthetically unattractive, and are more visually intrusive. They require a chimney stack.

It is clear that Albania will not be able to rely exclusively, or even predominantly, on incineration for the disposal of waste. But there could be a role for, say, one or even two incineration installations in Albania as part of an effective overall strategy for dealing with waste in an EU-compliant manner. As a first indication a cost comparison was made of incineration vs. landfill. Because an incinerator does not simply substitute for a landfill but means other changes in the waste treatment cycle the comparison involves other waste management elements. The costing is appended as Annex 1 to this document.

On the assumptions made the total cost of waste treatment in the incineration scenario works out about 50% higher than in the landfill option, i.e. about €90/tonne waste (incineration) compared with €60/tonne (landfill). However one crucial assumption is the conservative one that it will only be possible to use the electricity output from the installation, not the heat. The reason for this assumption is that the heat is (in industrial terms) relatively low grade: very suitable for district heating (for which there is no infrastructure in Albania), but less suitable for industrial use. The economics are sensitive to this assumption since 75% of the useful energy output of incineration is in the form of heat.

It is evident from the above that the evaluation of such a possibility is quite a complex matter, and needs to be studied in greater detail and greater specifics. There is a proposal outstanding by the government of Albania for a prefeasibility study which would look at the viability of including incineration as part of an integrated waste management strategy.

2.7 Healthcare waste incineration

Healthcare generates a number of different types of waste stream, some of which are hazardous, one of these latter being infectious waste. Non-hazardous healthcare waste can be treated in the same way as similar non-healthcare waste. Traditionally infectious waste arising from hospitals and other healthcare institutions (as well as some other healthcare waste streams) has often been incinerated. However the stringent requirements of the Waste Incineration Directive have made incineration more costly, and have made it impractical to produce small incinerators at the individual hospital level.

The treatment of hazardous healthcare waste was considered in the Directive 2008/98/EC on Waste, since this contains the primary EU legislation on hazardous waste. It was suggested there that lower-cost alternatives be considered for infectious waste. It is therefore not envisaged that incinerators will come into widespread use in Albania. An apparatus will nevertheless be needed to deal with permitting and enforcement. For example Sarande hospital will acquire a waste incinerator.

2.8 Co-incineration of waste by industrial installations

Some industrial installations with combustion plant have combustion conditions in their furnaces or boilers which allow them to use certain waste streams as fuels while at the same time disposing of the waste in an acceptable manner. Examples of such installations are cement kilns and power stations. The waste must have a certain calorific value, and this means that mixed municipal waste does not constitute a suitable fuel. But there are certain waste streams with a high calorific value which pose problems, for example because they are hazardous or not permitted to be landfilled. Examples include:

- waste tyres (same calorific value as coal per unit weight, landfill prohibited under Landfill Directive);
- used lubricants(hazardous waste, landfill prohibited under Landfill Directive);
- sewage sludge (large volumes potentially, problematic to landfill because of limits on biodegradable waste);
- combustible hazardous waste;

Where these waste cannot be beneficially reused then using them as an alternative fuel in such installations can be interesting for both the waste holder and the industrial installation – the former because it represents an acceptable form of disposal with energy recovery, the latter because the waste can be a low cost or negative-cost source of energy.

A general discussion was held with the Titan Antea cement factory in Fushe-Kruje about whether there was any interest on the part of cement factories in Albania to use waste streams as an alternative fuel. The company confirmed that there is scope for such activities in Albania and expressed its own corporate interest in using waste streams such as tyres and sewage sludge as a source of energy.

3 Approximation Plan

3.1 Overall Plan and Milestones

With the signing of the SAA with the European Communities in 12 June 2006, Albania has strongly reconfirmed the already clearly expressed political commitment to the EU membership.

The National Plan for the Implementation of the SAA (a dynamic plan updated annually to reflect both changes of the *Acquis* and progress in the country) also provides a strong confirmation of the ability and dedication of all relevant institutions and civil servants to respond to the requirements of the EU integration process.

One of the main conditions for EU membership is the approximation of EU legislation, a process consisting of three main components: a) legal transposition, b) practical implementation, and 3) enforcement.

Transposition is the formal incorporation of the European legislation into the country legislation. This phase calls for the approval of laws, decisions, regulations and guidelines or other regulatory instruments that pave the way to the implementation of the *Acquis communautaire*.

Implementation implies on one hand the establishment of governmental structures and administrative processes for the implementation of legislation. This phase includes measures for institutional building and budgetary expenses related to recruitment of staff, monitoring equipment, training, etc.

Another aspect of implementation is the practical measures, i.e. the physical changes necessary to implement legislation. This includes the construction activities and the acquisition of the equipment and installations needed to put into effect the provisions of the Directive, for example the construction of new sanitary landfills which meet the standards laid down in the legislation, or the provisions of systems for dealing with waste streams which may no longer be landfilled.

Enforcement implies measures for monitoring, controlling and inspecting activities or plants that are subject to legislation. Through enforcement measures any transgression of the legislation is verified and sanctions are set for the non-compliance with the legislation.

Though these measures appear consecutive (as in fact they are to a certain degree), they are also interconnected and interdependent. For the transposition to be effective, all practical aspects of implementation, enforcement and existing capacities must be taken properly into account.

According to the EC, "…Effective enforcement implies that Law transgressors be subject to a credible risk that they may be discovered and punished in a way that will at least deprive them from any economic benefit they obtain through the Law transgression".

3.2 Transposition Plan

A National Action Plan for the Implementation of the Stabilization and Association Agreement 2008-2014 (NAPISAA) contains an overall plan to obtain full approximation, taking into account past and ongoing approximation projects, and was approved in October 2008. It consists of a legal transposition plan and an implementation plan (including enforcement). A special chapter is dedicated to waste management. The plan covers three phases: 2008-2009 (short-term); 2010-2011 (medium-term); 2012-2013 Long-term. Actions have been planned for the legislative initiatives and implementation measures.

The NAPISAA sets out a programme for transposing European waste legislation during the 3 phases mentioned above.

The terms of reference of the INPAEL project provide for the full transposition of European waste legislation into the planning for the short-term period 2009-2010.

With regard to the incineration of waste, INPAEL has drafted the:

- New Law on Integrated Waste Management,
- Draft DCM on Incineration of Waste
- Ministerial Order on the Format to be used in preparing reports on the implementation of the DCM "On the Incineration of Waste"

The above drafts have transposed the:

- Waste Framework Directive
- Incineration Directive,
- Commission Decision of 20/II/2006 laying down a questionnaire to be used for reporting on the implementation of Directive 2000/76/EC on the incineration of waste.

The Incineration Directive is one of the cost-heavy directives as it requires the construction of capital-intensive facilities. For measures that cannot be introduced or implemented immediately in the conditions of Albania because of the high capital requirements (or indeed for other technical reasons), **transitional periods have been set,** so as to give both government and operators the time needed for compliance. Most recent acceding countries have requested and been granted significant transition periods (10½ years in the case of Romania).

The legal gap analysis presented in Sub-Chapter 2.3 helps to identify the gaps between the Directive requirements and what the current Albanian legislation provides for. Their comparison was the bases on which the new draft DCM on Incineration of waste was prepared, as well as for deciding on the required future actions that will enable full transposition of other waste related EU legislation. Those actions were prepared in close cooperation with the officials of the MoEFWA. The actions were presented to the members of the Waste Management Working Group to comment and give their validation. It should be noted that some of the proposed actions might already have been accomplished at the time of reporting.

3.3 Implementation Plan

In order to plan for the implementation of the Incineration Directive it is necessary to identify the actions which will be necessary to achieve full implementation. These actions are presented in the table below together with a short description, the responsible institution and a proposed implementation period. The implementation period is given in relative rather than absolute years, the year 00 representing the year in which implementation commences. The list of actions was drafted by the INPAEL staff and presented to the Waste Management Working Group for comments. The actions are grouped according to six main categories, i.e.:

1. Assign competences, establish administrative structures, build capacity
2. Permitting
3. Actions relating to existing installations
4. Actions relating to new installations
5. Inspection and enforcement
6. Communication and reporting

The table shows the various actions and sub-actions required for implementation of the Directive, together with the Article(s) which specifically creates the need for that action, the institution responsible in the first place for that action and the year or period of years when implementation is envisaged.

Table 3.1: Implementation and enforcement actions

Action no.	Description of action	Article(s)	Responsible Institution	When?
1	**Assign competences, establish administrative structures, build capacity**			0
1.1	Designate competent authorities	General	Government of Albania	0
1.2	Appoint personnel at MoEFWA, assign tasks	General	MoEFWA	3
1.3	Technical assistance and training	General		3
2	**Permitting**			
2.1	Appoint staff for permitting	4	Environment Agency	4
2.2	Training of permitting staff, development of procedures	General	Environment Agency	4-5
3	**Existing installations subject to the Waste Incineration Directive**			
3.1	Inventories/survey/assess existing installations which fall under the WID	General	MoEFWA	4
4	**New installations**			
4.1	Prefeasibility study for a waste-to-energy plant in Albania	General	MoEFWA	0
4.2	Feasibility study and other preparations for a waste-to-energy plant in Albania	General	MoEFWA	1-2
4.3	Construction of one waste-to-energy plant in Albania	General	MoEFWA/ local authorities	4
4.4	Modifications to industrial installations to make them able to process waste tyres and other waste fractions	20(1)	Cement kilns, power plants	3

5	**Monitoring, inspection and enforcement**			
5.1	Inspection capacity	General	Inspectorate	5
5.2	Audit sampling and analysis	General	Inspectorate	5
6	**Communication and reporting**			
6.1	Reporting by competent authority (CA) to the Commission	15	MoEFWA	7
6.2	Reporting by operators to the CA	12(2)	Operators	6
6.3	Information to be made available to the public by the CA	12(1), 12(2)	MoEFWA	7

The implementation actions are considered in somewhat more detail below, and an attempt is made to identify and estimate the approximate costs involved.

1 Assign competences, establish administrative structures, build capacity,

1.1 Designate competent authorities

These include:

- the authority responsible for planning
- a competent permitting authority: new waste incinerators are expected to fall within the IPPC regime[3], and their permitting will therefore be the task of the Environment Agency. The workload is expected to be light as very few if any new incinerators are, on our assumptions, likely to be constructed. The changes which need to be made to the permits of existing installations which decide to co-incinerate waste should be fairly modest. For the purpose of the costing it is assumed that the 2 persons allowed for in the Directive on Waste (see activity 5 in DSIP for the Directive on Waste (2008/98/EC)) will be sufficient for this purpose to cover this activity. The cost of the necessary training is also included in the DSIP for the Directive on Waste
- a competent inspection authority

1.2 Appoint personnel at MoEFWA, assign tasks

The main tasks will be:

- contributing to the waste management planning in so far as it relates to incineration;
- facilitating the allocation and disbursement of monies from the state budget to fund or co-fund any investment in municipal incineration equipment;
- reporting to the European Commission and to national and European statistical offices on the quantities of waste being incinerated or co-incinerated, and how much of this is biodegradable waste, how much is paper and cardboard packaging waste, how much is plastic packaging waste and whether the incinerator meet the WID criterion for recovery;
- ensure that the permit application procedure conforms to Article 4 of the WID and that the application contains all the necessary information, including a description of measures to be taken to ensure that the plant is designed, equipped and operated in accordance with the provisions of the WID; that the heat is, where possible, recovered through combined heat and power; that the amount of residues is minimised, especially through recycling;

[3] In fact only incinerators with a capacity in excess of 1 ton waste/hour are subject to IPPC, but it is unlikely that incinerators with a capacity of less than 1 tons/hour will be constructed given the costs needed to comply with the WID.

and that residues are disposed of in accordance with relevant EC legislation. Permits shall not be granted unless the proposed measurement techniques for emissions into air and water comply with Annex III (Art. 4(2,3));

- ensure that the implementation of the WID is closely co-ordinated with other permit and monitoring schemes, including, notably, 2008/1/EC (IPPC) and 85/337/EEC on EIA (and see also the SEA Directive 2001/42/EC on the assessment of certain plans and programmes);
- ensure co-ordination with the implementation measures under directives establishing emission limit values for certain pollutants, i.e. Directive 1999/30/EC on limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air and Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air;
- endeavour to take an integrated approach to monitoring and reporting obligations arising from various sectoral legislation, including the Regulation on the European Pollutant Release and Transfer Register (No. 166/2006); the decision on the waste questionnaire (e.g. under the Directive on End-of-Life Vehicles); and the Access to Environmental Information Directive (2003/4/EC);
- ensure that the permit for an incineration or co-incineration plant takes into account the applicable requirements established in Directive 91/271/EEC on urban wastewater treatment, Directive 1999/31/EC on the landfilling of waste, and Directive 2006/11/EC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community.

In the DSIP for the Directive on Waste it was assumed that 6 ftpe would be taken on in the Waste Department at the MoEFWA. It is assumed that 1 ftpe of these would be assigned to the implementation of the Landfill Directive and the WID, so no further personnel need to be counted under the WID.

1.3 Technical assistance and training

Some technical assistance and training is likely to be required to support the competent authority in implementing this directive. Activities would include:

- identifying existing installations subject to the WID;
- preparation of a strategy to achieve the objectives of the directive;
- preparing procedures for permitting and inspection;
- preparing technical guidance notes;
- training for competent authority and inspectors and permitting officials;
- ensuring that laboratories involved in sampling and analysis use approved methods and operate a proper quality assurance/ quality control systems.
- in the case of the 'incineration scenario', issue guidance on the design, equipment and operation of waste incinerators and the use of waste heat
- Provide support in drafting detailed technical regulations as necessary

A certain amount of training will have to be provided not only to the persons referred to in Activity 1 but also to support Environment Agency personnel carry out the permitting function (activity 2) and inspectors who will be involved in enforcing the WID.

A nominal one-off sum of €400,000 is proposed for technical assistance, plus an annual budget of €2000/year for training.

2 Permitting

All waste incinerators with a capacity exceeding 1 ton of waste per day fall within the IPPC regime. Large companies which have prospects of meeting the requirements of the WID (power stations, cement kilns) will also be subject to IPPC (by virtue of their core activity, not by virtue of the fact that they co-incinerate). It can therefore be assumed that all permitting requirements will be included in the IPPC permit.

There will also be a number of smaller non-IPPC enterprises which currently co-fire combustible wastes such as used lubricating oils. These will generally have to discontinue such co-firing after the WID comes into force.

2.1 Appoint staff for permitting

The additional staff required to deal with the IPPC permitting are attributable to the IPPC Directive and not the WID. No additional costs.

2.2 Training of permitting staff, development of procedures

This will include training on the WID, model rules, etc. It will also draft operating procedures, design of a record-keeping system, etc. Costs already included in activity 1.3 above.

3 Existing installations subject to the Waste Incineration Directive

3.1 Inventorise/survey/assess existing installations which fall under the WID

This would be a consultancy assignment for national consultants. The existing installations are likely to include:

- several existing incinerators in hospitals which are obsolete in relation to the WID and which have no chance of refurbishment to become compliant;
- the incinerator at Sarande hospital, which is likely to be compliant;
- enterprises which are currently firing or co-firing furnaces and boilers with fuels which are defined as waste; these enterprises will have to choose between discontinuing their use of such fuels or complying with the WID; most if not all of these enterprises will do the former.

The inventory would include the vital statistics of the combustion installations concerned, a description of the types and quantities of fuels burned, environmental permit(s) applying, any details of present air pollution equipment and emissions data and an assessment of whether there is likely to be any interest or possibility to take measures to comply with the WID.

The cost of this activity is assumed to be €150,000.

4 New installations subject to the WID

4.1 *Prefeasibility study for a waste-to-energy plant in Albania*

A prefeasibility study would be conducted in a selected waste area(s) to establish whether the appropriate legislative, planning, economic, waste quantity, waste composition and infrastructure elements exist to support the design, construction and operation of a waste to energy plant in Albania.

The study would determine whether (subject to a full feasibility study) there could be a role for incineration within the overall waste management system in Albania or whether incineration is a complete non-starter for economic or other reasons.

A proposal for financial support for such a study has already been drafted by INPAEL project team and submitted to the MoEFWA for funding by the Delegation of the European Commission in Tirana or any other interested donor. The estimated cost of the study is €200,000.

4.2 *Feasibility study and other preparations for a waste-to-energy plant in Albania*
If the prefeasibility study concludes that incineration could play a useful role in Albania's waste management system and the agreement of the actors concerned is obtained then further preparations for such an installation could start. This would include a full feasibility study, EIA and public hearings, negotiation of the financing arrangements, IPPC application, etc.

The cost of preparing the project could be of the order of €1 – 2 million.

4.3 *Construction of one waste-to-energy plant in Albania*
In this DSIP and the DSIP for the Landfill Directive it is stated that two scenarios are considered, a landfill scenario in which Albania relies 100% on landfill for waste disposal and an incineration scenario, in which 1 waste incinerator with energy recovery is constructed.

In the former case then there is no action here, but in the latter then it is assumed that the incinerator will have a service area which generates about 160,000 tonnes/year of municipal waste, i.e. an area with a population of perhaps 650,000. We consider here what the incremental cost might be of the incineration scenario over the landfill scenario. Of course the prefeasibility and feasibility studies will make it much clearer what the cost implications will be, but on the basis of Annex 1 it appears that that there will be an incremental capital cost which could be over €100 million, but an offsetting saving on capital costs which might be around €2 million/year if it is not possible to use the heat output of the incinerator, but the saving could be significantly greater if this heat could be used beneficially.

4.4 Modifications to industrial installations to make them able to process waste tyres and other waste fractions
This possibility was discussed in section 3.3. Industrial installations which wish to burn waste will usually have to make some modifications to their plant (storage facilities, feed mechanism for the new fuel, tyre shredder, etc.). They will also have to apply for a permit under the WID. They will also have to enter into negotiations with potential suppliers of the waste stream to negotiate mutually acceptable terms, including whether the supplier is able to charge a positive price for the waste material or has to pay the installation for taking and disposing of the material. From a waste management planning point-of-view, however, this is unimportant. What is important is that a solution is found of benefit to both parties which complies with waste legislation and which involves no cost to the public administration. The cost to the operator of the industrial installation can be assumed to be nil or negative (i.e. a financial benefit) since he is under no obligation to take in the waste stream. It is assumed that the supplier of the tyres is the tyre or automotive industry which has been obliged by law to take back or collect waste tyres. The collection costs plus any charge that has to be paid to an installation which burns them can be assumed to be passed on to the consumer, i.e. the tyre user. This is in accordance with the polluter pays

principle. The increase in the price of tyres resulting from the need to deal properly with them in the waste phase might typically be of the order of €200/tonne.

5 Monitoring, inspection and enforcement

It is assumed that monitoring and inspection will rely heavily upon self-monitoring by the operators. The monitoring methods adopted will be specified in the permit, according to the type of facility. It will be the responsibility of operators to propose sampling methodologies in the permit application. Audit sampling may also be undertaken by the competent authority

5.1 Inspection capacity

No additional inspection capacity is assumed to be necessary beyond the 4 ftpe assumed for waste management in the DSIP for the Directive on Waste 2008/98/EC. The main duties will be:

- ensure that industrial and other installations which have co-incinerated or use as fuel substances defined as waste, and which have not a permit for this under the WID cease to do so;
- ensure that any installations which have a permit under the WID are monitoring emissions and acting in other regards in accordance with the permit conditions.
- Ensure that the analysis of the results of control and monitoring procedures is subject to quality control by competent laboratories;

5.2 Audit sampling

There will be some additional expenses associated with audit sampling and testing by the inspection service. Assume costs of €10,000/year.

6 Reporting and information

6.1 Reporting by competent authority (CA) to the Commission

- Report to the Commission on the implementation of the WID (the first report covered the period 2003 to 2005), in accordance with the relevant questionnaire (Art. 15).

6.2 *Reporting by operators to the CA*

- For plants with a capacity of two tonnes waste or more per hour, the operator must provide the competent authority with an annual report on the functioning and monitoring of the plant

6.3 Information to be made available to the public by the CA

- Applications for new permits must be made accessible to the public, so that the public may comment before the competent authority reaches a decision (Art. 12(1)).
- Reports referred to in 6.2 must be made available to the public by the CA.
- A list of plants with a nominal capacity of less than two tonnes per hour must be drawn up by the CA and made available to the public (Art. 12(2)).

No significant additional costs.

3.4 Summary of costs

The costs of implementing the Incineration Directive depend on the number of installations established in Albania which are subject to the WID. In any case Directive 2000/76/EC on the incineration of waste has been transposed into Albanian national legislation with the support of the INPAEL project by 2011, so that there will be no additional costs relating to the primary legislation, but it is possible that this legislation may need to be supported by some detailed regulations with specific technical requirements, for example concerning the carrying out of measurements of air and water pollutants, including technical requirements for measuring equipment and its maintenance and for analytical laboratories. Any necessary support could be provided by activity 1.3 described above.

The total costs are therefore as follows:

Action no.	Description	One-off costs (€)	Recurrent costs (€/year)	Remarks
1.2	Additional personnel MoEFWA	-	-	1 of the 6 ftpe already costed in the Directive on Waste
1.3	TA and training	400,000	2,000	
2.1	Additional personnel permitting	-	-	
3.1	Inventory of existing installations	150,000	-	
4.1	Prefeasibility study WtoE plant	200,000	-	
4.3	Modifications to industrial installations for co-incineration	?	?	Not known, but these costs will be a voluntary expenditure by the industry concerned taken as a commercial investment decision, the cost being passed on to waste holders (tyre industry, WWTP operators, etc.)
5.2	Audit sampling		10,000	
The above are the costs for the 'landfill scenario' (all municipal waste disposed to landfill). The costs below are the incremental costs of the 'incineration scenario' in which 1 incinerator is deployed instead of 1 landfill				
4.2	Feasibility study WtoE plant	1,500,000	-	This action is contingent on a positive outcome from the prefeasibility study
4.3	Construction of one waste-to-energy plant in Albania	€100+ million	Offsetting reduction in recurrent costs	Incremental cost of building 1 WtoE plant instead of one landfill

Therefore, the estimated approximation costs for the WID in the case of adoption of the landfill or incineration scenario are as follows:

Scenario	One-off costs (€)	Recurrent costs (€/year)
Landfill	750,000 +	12,000
Incineration	101+ million	Offsetting recurrent costs, the amount of which depend on the individual project, and which will be clarified by the prefeasibility and feasibility studies.

3.5 Benefits

The benefits from implementing this Directive are:

- The provision of an alternative to landfill as a means of disposing of waste.
- The assurance that when waste is burned, either as a means of disposing of that waste or of exploiting its calorific value or both, this is done as safely as possible, with minimum emissions of pollution to the atmosphere, water or soil.
- The assurance that when waste is incinerated the maximum energy is recovered, thereby reducing the demand for fossil and other non-renewable energy sources.
- Reduced greenhouse gas emissions as a result of the reduced landfill of biodegradable waste and therefore reduced emissions of landfill gas (rich in methane, a strong greenhouse gas).
- Reduced health and safety risks to waste management workers and to citizens living close to waste disposal facilities and the population at large.
- Reduction in the land required for waste disposal as a result of the reduced requirements for landfill.
- The provision of a safe disposal route for a number of awkward waste streams, waste oils, tyres, sewage sludge.

3.6 Key Issues and Uncertainties

Success in implementing the Landfill Directive will depend particularly on three crucial factors.

1. Having appropriate trained personnel in place charged with implementing waste policy and legislation, and able to operate effectively.
Employment costs are relatively modest compared with the total implementation costs. And yet at present there are no persons at the MoEFWA engaged full time on waste management. There are always pressures to reduce costs in the civil service, but without a proper administrative infrastructure there is no hope of tackling what is widely agreed to be Albania's biggest environmental problem.

2. Devoting adequate financial resources to waste management
As is clear from the above, implementing the Landfill Directive will be a major financial challenge. There is the prospect of significant future funding from the EU and, at least until accession, from the wider donor community. But these must be leveraged with Albanian funding also. EU funding will increasingly require national co-funding. This means that firm commitments must be made and the financial resources earmarked for waste management in a sufficiently flexible manner that the funds really do materialise for well-prepared projects. This means a project pipeline funding mechanism with the limited resources going to well-prepared projects, rather than an *ad hoc* and piecemeal approach.

3. *Having an adequate inspection force with the independence, legal powers and the financial and human resources which allow it to carry out its statutory duties*
This means ensuring an adequate budget is available, capacity-building and training.

ANNEX 1: Cost comparison of Waste-to-Energy with landfill for Albania

Annex COMP - Cost comparison of Waste-to-Energy with landfill for Albania

Introduction

An element of waste management planning is an options analysis, i.e. a consideration of the various strategic options available for managing waste under different headings, evaluating the economic, constitutional and technological advantages and disadvantages of these options and choosing the best option.

One major area where alternative options are available is disposal, the options being landfill (LA) and waste-to-energy (WtoE) or incineration with energy recovery. Per unit of waste disposed, the direct investment costs of WtoE are much higher than LA. This has often resulted in WtoE being ruled out from the outset as an option in the accession countries. But there are a number of factors which mean that the real difference in costs is not as great as appears from a comparison of these direct investment costs only. These are as follows.

1. The Landfill Directive requires member states to take measures to ensure that “only waste that has been subject to treatment is landfilled”. Treatment may include pre-sorting, mechanical-biological treatment, stabilisation, etc, but any treatment involves costs.
2. The Landfill Directive places quantitative limits on the landfill of biodegradable waste. Meeting these limits may be troublesome and costly: it may involve persuading households to separate kitchen and garden waste from other forms of waste, collecting biowaste separately and establishing large centralised composting facilities. There is a danger that these plants will produce a product (compost) of unsatisfactory quality and/or for which there is no market.
3. The Packaging and Packaging Waste Directive (PPWD) sets minimum standards for the recycling/recovery of packaging waste (PW). This considerably reduces the amount of waste which may be landfilled. This means that systems must be established for removing most PW before it is landfilled. However the requirement is only partially avoided by WtoE since this counts as ‘recovery’ (as energy) but not as ‘recycling’ (energy recovery explicitly excluded from definition). The PPWD requires that much of the recovery is through recycling.
4. When Albania starts to install more sewage treatment capacity it will have to find a solution for its sewage sludge. This can be quite troublesome, and incineration would be a convenient solution.
5. The energy recovered in WtoE provides significant cost offsets

General approach

- Costing is made for some future year in which Albania is assumed to be fully bound by EU legislation.
- A notional waste planning area is considered corresponding to the catchment area needed to sustain an incinerator with optimum capacity. This is assumed to be 160,000 t/y

- Waste streams considered are:
  - o household (HH) waste, including PW and biodegradable waste from households;
  - o institutional waste similar in composition to household waste
  - o industrial waste suitable for landfill or incineration (i.e. after removal of recyclables)
  - o sewage sludge.
- There is no door-to-door collection. All waste is assumed to be collected in communal waste containers (1.1 m^3) placed close to housing.
- Two scenarios are considered:
  1. WtoE scenario: all above waste streams go to WtoE plant, no separate collection
  2. Incineration scenario: Sufficient PW and biowaste is collected separately to meet PPWD and LD targets respectively, residue goes to landfill.

The detailed assumptions and calculations are set out in the Appendix. Results and discussion below.

Results and discussion

The overall figures are:

Waste to energy scenario

Component/category	**Capital**		**O&M costs**	**Total annualised costs**
	Amount	Amortisation period (years)		
Containers and hardstands	2,412,600		90,473	418,832
Containers	1,809,450	8		
Hardstands	603,150	20		
Collection vehicles	3,645,000	10	1,049,921	1,521,966
Transfer stations	1,600,000		160,000	282,892
Civil works (90%)	1,440,000	25		
Equipment (10%)	160,000	10		
Transport vehicles	880,000	10		
WtoE plant	150,000,000	25	8,175,000	18,817,869
Credit for electricity sales			-6,525,000	-6,525,000
Total	162,110,200		2,950,394	**14,516,559**
Annualised cost, € per ton waste				**91**

Landfill scenario

Component	Capital cost (€)	O&M costs (€)	Total annualised cost (€/y)	
PW collection	1,430,000	763,554	948,746	
Biowaste collection	1,104,559	363,178	509,058	
Residue collection	4,379,592	1,183,002	1,748,651	
Transfer stations	1,760,000	160,000	295,181	
Transport to landfill	440,000	298,633	366,711	
Landfill*	10,000,000	500,000	1,928,315	**
Sorting plant	1,500,000	250,000	515,192	
Composting plant	7,318,028	704,000	1,875,574	
Anaerobic digestion of sewage sludge	7,570,265	821,854	1,429,312	
Total	**35,502,444**		**9,616,740**	

* Includes 1st cell only

** includes cost of final cover, monitoring and aftercare

Discussion

1. The best measure of costs is the total annualised cost, since this takes account of the different lifetimes of the various investment categories. On this basis the WtoE option is 50% more expensive than the Landfill option. In terms of upfront investment the WtoE option is over 4 times as high, but the economics is considerably improved by the sale of electricity generated. In the case of landfill some of the costs are deferred (closure and final cover, subsequent cells) but these deferred costs are fully reflected in the annualised cost figures in the tables.

2. Note that the costs of the WtoE option relative to the landfill option are arguably understated, since no provision is made for the recycling of household PW. Although it is assumed that industry will recycle its PW, this will not be enough to meet the overall targets. Although there is recovery as energy, the PPWD requires most recovery to be as material recycling. Of course the PPWD targets apply nationally, not at each waste planning level, but failing to meet recycling targets in a region with an incinerator will impose additional efforts and therefore costs on other regions.

3. The WtoE plant generates heat (in theory utilisable) as well as electricity. No credit is taken for this heat in the costing however (unlike in Denmark and other countries where it has been possible to use this for district heating). The heat will be relatively low grade, there is no district or central heating infrastructure in Albania, the space heating season is relatively short. However this makes the economics significantly less attractive than where the heat can be used.

4. Raising the kind of capital needed for the WtoE option in Albania would pose a huge challenge.

ANNEX: Comparison of WtoE with landfill – assumptions and costings

General assumptions

The following quantitative assumptions are made (note: these figures can be modified because calculation is done in Excel spreadsheet):

Item	Value	Units	Remarks
HH waste generated per inhabitant	250	kg/inh/y	Average rate for entire country, urban and rural
Composition of household waste:			
biowaste	50%		
metal PW	2%		
plastic PW	12%		
paper and board PW	5%		
glass PW	5%		
total PW	24%		
non-PW non-biodegradable waste	26%		
Similar institutional waste ratio	15%		Similar institutional waste as a % of HH waste
Industrial waste suitable for landfill or WtoE	20%		After removal of recyclable fractions, hazardous waste
Sewage sludge (as dry matter) generated per inhabitant connected to sewage treatment plant	20	kg/ connected inh/y	
Dry matter proportion in 'dewatered' sludge	33%		
Connection rate sewage treatment	70%		Remember this is some 'equilibrium' year in the future

Calculation of size (population) of waste planning area considered

Consider size of population required to support a WtoE plant of capacity 160,000ton/y. Assume that this plant will treat household waste,

Waste type	As % of HH waste	kg/inh/y	Remarks
HH waste		250.0	
incl. PW	24%	60.0	
Similar institutional waste suitable for landfill or WtoE	15%	37.5	
Industrial waste	20%	50.0	After removal of recyclable fractions, hazardous waste
Sewage sludge		42.4	Assumes 70% of population connected to sewage treatment plant
Total waste for incineration		379.9	
		t/year	
Capacity of WtoE plant of viable size		160,000	

Option 1: All waste to WtoE
The main facilities required are:

- collection containers and hardstands
- collection vehicles
- transfer stations
- transport vehicles
- WtoE plant

Collection containers and hardstands
The costs are estimated in the table below.

Container volume	1100	litres	Largest standard container size for residual waste
Waste generation rate HH and similar	287.5	kg/inh/y	
=	0.79	kg/inh/d	
Mean density of waste	0.20	kg/l	
Assumed fill rate at lift	75%		Leaves margin for variability

			Collections 4 or 6 times per week
Max. interval between lifts	2	days	
Persons served by 1 container	105		
Population served by WtoE installation	421,137		
No. of containers required for planning area	4,021		
			Assume €450/container, and that one-half require engineered hardstand @ €300/hardstand-unit
Capital cost per container	450	€	
Capital cost per hardstand	300	€	
Total capital costs	2,412,600	€	
		€/y	5% of cost of containers for cleaning and small repairs
O&M costs	90,473		

Collection vehicles
Costing is based on 3-axle 24m^3 compactor trucks (in practice, smaller vehicles will sometimes be necessary, particularly in rural areas).

Calculation of capacity of 1 truck operating 1.5 shifts/day is shown below

Truck capacity - by volume	24	m3
Density of compacted waste	0.5	t/m3
Truck capacity - by weight	12	t
Capacity utilisation	90%	
Availability	95%	
Truckloads/shift	1	
Shifts/day	1.5	
Days/year	300	
Capacity of each truck	**4617**	**t/y**

Calculation of number and costs of trucks required
Only HH waste and similar institutional waste will be collected (other streams will be delivered to waste disposal facility).

We therefore have:

Per capita waste to be collected	287.5	kg/ inh/y	HH waste and similar waste
No. of inhabitants	421,137		
Total waste for collection	121,077	t	
Capacity of 1 truck	4,617	t/y	
No. of trucks required	27		
Capital cost per truck	135,000	€	

Total capital costs of collection trucks	3,645,000	€	
Operating costs per truck	38,886	€/y	1.5 shifts/d, 300 d/y, driver (€350/m) plus 2 crew (305/m), 6 l/h, maintenance 7.5%, tyres and other materials €2000/y, 7.5% loading for admin.
Total operating costs	1,049,921	€/y	

Transfer stations

The number of transfer stations is not a sensitive assumption because it will be the same for both the LA and the WtoE options.

Assume:

- 4 transfer stations are needed to optimise the transport of waste to the final disposal facility
- 80% of generated waste goes via transfer station, rest is delivered directly by collection trucks

Capital cost per transfer station = €400,000 (civil works for access road can be a source of variability)
O&M cost per transfer station = €40,000 p.a.

Total capital cost = €1,600,000
Total O&M cost = €160,000

Transport vehicles

Assume mean distance from each transfer station to disposal facility is 45 km, 2 round trips per shift, 2 shifts/day

Throughput of each TS =	32,000	t/y	
Working days per year	300	days	6 days/week
Daily throughput	107	t/d	
Distance to disposal facility	45	km	
Mean travel speed	40	km/h	
Time for round trip	3.8	hours	
Round trips/shift	2		
Shifts/day	2		
Vehicle capacity	20	tons	Truck-trailer carrying 2 10t containers
Capacity of 1 truck-shift	40	tons	
Capacity of 1 truckday	80		0.75 h loading, 0.75 h unloading,

Trucks per TS	2		
Total trucks required	8		
Capital cost per truck	110,000	€	
Total capital cost	**880,000**	**€**	
O&M costs			
Truck maintenance and insurance	5%	of invest.	44,000
Fuel lubricants			332,800
Drivers			144,000
Admin	5%	of O&M costs	26,040
Total O&M costs			**546,840**

WtoE plant

Capacity of plant = 160,000 tons/year
Capital cost = €150,000,000
Operating costs = 2.0 – 2.5% of investment plus € 30 – 40 / ton waste p.a.
Heat value of waste = 70 MW
Electrical output = 15 MW
Heat output = 47 MW
Ash disposal costs:

- 140 €/ton for fly ash (hazardous) and up to 90 €/ton for bottom ash (Sweden)
- 85 €/ton for fly ash (specific site in Norway)
- 20 €/ton for fly ash (operator's own landfill)

[Figures from Grontmij Sweden]

Assume:

- heat output is wasted.
- Solid residues are 25% (by weight) of input waste, 80% bottom ash, 20% fly ash
- O&M costs and offset revenue for electricity sales are as shown below

We have:

Capacity	160,000	t/y
Capital cost	**150,000,000**	**€**
Utilisation rate	100%	
Waste incinerated	160,000	t/y
Total ash	25%	of input
Bottom ash proportion	80%	
Fly ash proportion	20%	
Bottom ash produced	32,000	t/y
Fly ash produced	8,000	t/y
O&M costs		**€/y**
2.25%	of investment	3,375,000
22	€/ton waste	3,520,000

80	€/ton fly ash	640,000
20	€/ton bottom ash	640,000
Total		**8,175,000**

Revenue for electricity generated @ €0.05/kWh = 47MW*8700 hours/year x 1000 x €0.05 = €6,525,000

Overall costs of Option 1

Component/category	**Capital**		**O&M costs**	**Total annualised costs**
	Amount	Amortisation period (years)		
Containers and hardstands	2,412,600		90,473	418,832
Containers	1,809,450	8		
Hardstands	603,150	20		
Collection vehicles	3,645,000	10	1,049,921	1,521,966
Transfer stations	1,600,000		160,000	282,892
Civil works (90%)	1,440,000	25		
Equipment (10%)	160,000	10		
Transport vehicles	880,000	10		
WtoE plant	150,000,000	25	8,175,000	18,817,869
Credit for electricity sales			-6,525,000	-6,525,000
Total	162,110,200		2,950,394	**14,516,559**
Annualised cost, € per ton waste				**91**

Option 2: Separate collection of PW and biowaste, all remaining waste goes to LA

The facilities to be costed in this option are

- facilities for separate collection of PW (containers, transport vehicles)
- facilities for collecting biowaste separately
- facilities for collecting residue
- transfer stations
- transport vehicles
- landfill
- sorting plant
- composting plant
- anaerobic digestion of sewage sludge

Packaging waste

The overall quantitative targets in the PPWD targets are as follows:

- o at least 60% total PW recovered
- o at least 55% total PW recycled
- o at least 60% glass recycled
- o at least 22.5% plastic recycled (as plastic)
- o at least 15% wood recycled

It is assumed that industry will be made responsible for recycling its own PW, and that it will recycle 90% of its waste.

This leaves the following targets for households:

	HH waste	Industry	Total	Min. recovery	Min. recycling	Target	Shortfall as plastic recycling	Industry recycles	HHs recycle	As % of HH waste
	tons	tons	tons			tons	tons	90%	tons	
metal PW	2,106	1,404	3,509		50%	1,755	1,755	1,263	491	23%
plastic PW	12,634	8,423	21,057		22.5%	4,738	12,985	7,580	5,405	43%
paper and board PW	5,264	3,509	8,774		60%	5,264	5,264	3,159	2,106	40%
glass PW	5,264	3,509	8,774		60%	5,264	5,264	3,159	2,106	40%
Total PW =	25,268	16,845	42,114	60%		25,268	25,268	15,161	10,107	40%

Households are assumed to be asked to segregate their biowaste, and it will be collected separately. It is assumed that these targets can be achieved by establishing facilities for the collection of (a) glass (separate containers for clear, green and brown glass) and (b) plastic and metal packaging in all areas, and for (c) paper and cardboard in urban areas only, with a density of 1 per 500 inhabitants.

We therefore have the following costs:

Metal and plastic	No. of hardstand units	Unit cost (€)	Total cost (€)	Amort. period (years)	(€/year)	(€/year)
hardstands	674	300	202,146	20		16,221
containers	842	300	252,682	8	12,634	51,730
trucks (capacity of 1 truck = 693 t/y)	9	130,000	1,170,000	10	624,726	776,246
Paper and board						
hardstands	168	300	50,536	20		4,055
containers	337	300	101,073	8	5,054	20,692
trucks (capacity of 1 truck = 2886 t/y)	1	130,000	130,000	10	69,414	86,250
Glass						
hardstands	2,021	300	606,437	20		48,662
containers	2,527	500	1,263,410	8	63,170	258,648
trucks (capacity of 1 truck = 3324 t/y)	1	130,000	130,000	10	69,414	86,250
Total			3,906,283		844,412	1,348,752

Biowaste

Measures have to be put in place to limit the landfill of biowaste to 35% of total 1995 biowaste generated. Assume that 1995v level is equal to the 'equilibrium' level.

It is assumed that:

- industrial waste looks after itself (is regulated separately);
- PPWD targets for paper and cardboard are met (no additional costs);
- home composting is promoted in rural areas, with a take-up of 60% (90% efficient; no additional cost);
- the balance will be achieved by separate collection in urban areas. See table below:

	Total waste (t/year)	**%**	**K&G waste (t/year)**
HH K&G waste	105,284	50%	52,642
Similar institutional waste	15,793	25%	3,948
HH paper PW	105,284	5%	5,264
Industry paper PW			3,509
Other paper			4,387
Total biowaste			69,751
Amount to be diverted		65%	45,338
Of which:			
Industry PW			-3,159
HH paper PW			-2,106
Other paper		65%	-2,851
Home composting rural areas		54%	-17,909
Balance to be diverted from urban HH and institutional		77%	19,313

77% of the biowaste from urban households and the similar institutional stream must be collected, i.e. 85% of these target groups with an efficiency of 90%.

Equipment needed to collect this waste and costs:

	No. of units	.....Capital..... Unit cost (€)	Total cost (€)	Amort. period (years)	O&M costs (€/year)	Total annualised costs (€/year)
Containers (one for each 200 persons)	716	450	322,169	8	16,108	65,955
Hardstands	358	300	107,390	20	0	8,617
Trucks	5	135,000	675,000	10	347,070	434,486
Total			1,104,559		363,178	509,058

Residue collection

Calculation of quantity of residue for collection	
	tons
HH waste	105,284
Similar institutional waste	15,793
Less PW collected separately	-11,623
Less biowaste collected separately	-19,313
Less biowaste home composted	-17,909
Total residue	72,231

Only need 80% as many containers as in Option 1

We therefore have:

	No. of units	.....Capital..... Unit cost (€)	Total cost (€)	Amort. period (years)	O&M costs (€/year)	Total annualised costs (€/year)
Containers	3,217	450	1,447,560	8	72,378	296,347
Hardstands	2,573	300	772,032	20	0	61,950
Trucks	16	135,000	2,160,000	10	1,110,624	1,390,354
Total			4,379,592		1,183,002	1,748,651

Transport is costed on basis that biowaste is also taken via transfer stations, since it is assumed that there will only be a single composting plant in the area.

Transfer stations

Assume 10% increase in capital cost of transfer stations under option 1, to allow for fact that it has to deal with two separate waste streams (biowaste and residue), so:

Total capital cost = €1,760,000
Total O&M cost = €160,000

Transport vehicles

Costs as follows:

Throughput of each TS =	18,309	t/y	
Working days per year	300	days	6 days/week
Daily throughput	61	t/d	
Distance to disposal facility	45	km	
Mean travel speed	40	km/h	
Time for round trip	3.8	hours	
Round trips/shift	2		
Shifts/day	2		
Vehicle capacity	20	tons	Truck-trailer carrying 2 10t containers
Capacity of 1 truck-shift	40	tons	
Capacity of 1 truckday	80		0.75 h loading, 0.75 h unloading,
Trucks per TS	1		
Total trucks required	4		
Capital cost per truck	110,000	€	
Total capital cost	**440,000**	**€**	
O&M costs			
Truck maintenance and insurance	5%	of invest.	22,000
Fuel lubricants			190,413
Drivers			72,000
Admin	5%	of O&M costs	14,221
Total O&M costs			**298,633**

Landfill

Consider first cell of landfill (say 10 years' capacity), plus machinery, equipment and installations.

Calculation of capacity of first cell

Annual waste going to landfill	Tons/year
Residue	72,231
Industrial waste	21,057
Sewage sludge	17,866
Annual total	111,154
x 10 years = cell capacity	1,111,543

The total costs, including final cover, landscaping, monitoring and aftercare are given below.

		Capital costs €	Amort-isation (years)	Annualised cost per year of operation (€)
Estimated total initial cost	100%	10,000,000		
Civil engineering 1st cell	50%	5,000,000	10	647,523
Civil engineering entire landfill	33%	3,300,000	30	214,670
Fixed equipment and installations	10%	1,000,000	15	96,342
Mobile equipment	7%	700,000	10	90,653
Final cover and landscaping		4,000,000		318,018
Monitoring and aftercare. yrs 11-40		50,000	per year	61,109
Total capital costs		10,000,000		1,428,315
Operating costs		500,000	per year	500,000
Total				**1,928,315**

Sorting plant

A sorting plant will be built to upgrade the pre-sorted packaging waste to enhance its recycle value.

Capacity of plant = 6,000 t/y plastic and metal packaging + 2,100 t/y. (This is somewhat on the small size, but a larger unit could take on material from sorting from other areas.)

Estimated capital costs = €1.5 million (civil works €600,000, fixed equipment €800,000, mobile equipment €100,000)
Operating costs = €250,000 p.a.

So:

Sorting plant	**Capital costs €**	**Amortisation (years)**	**Annualised cost per year of operation (€)**
Civil works	600,000	25	42,571
Fixed equipment	800,000	15	77,074
Mobile equipment	100,000	10	12,950
Total capital costs	1,500,000		132,596
Operating costs	250,000	per year	250,000
Total			**515,192**

Composting plant

Capacity of plant = 18,000 t/yr biowaste input
Estimated investment = €7,100,000
Fixed operating costs = €200,000
Variable operating costs = €28/ton

No explicit account taken of revenue from sale of compost

Anaerobic digestion of sewage sludge

In the absence of an incineration facility it is assumed that after dewatering the sewage sludge will be processed in an anaerobic digester (at WWTP) and would then be landfilled.

Estimated costs of anaerobic digestion

Required anaerobic digestion capacity ≈ 20,000 t/y

For a unit this size
unit annualised capital costs = 34€/t
unit O&M costs = 46 €/t (this allows a credit for biogas collected)

Giving

	€	**years**	**€/y**
total capital costs	7,570,265	20	607,458
total O&M costs			821,854

Overall costs of Option 2

Component	Capital cost (€)	O&M costs (€)	Total annualised cost (€/y)	
PW collection	1,430,000	763,554	948,746	
Biowaste collection	1,104,559	363,178	509,058	
Residue collection	4,379,592	1,183,002	1,748,651	
Transfer stations	1,760,000	160,000	295,181	
Transport to landfill	440,000	298,633	366,711	
Landfill*	10,000,000	500,000	1,928,315	**
Sorting plant	1,500,000	250,000	515,192	
Composting plant	7,318,028	704,000	1,875,574	
Anaerobic digestion of sewage sludge	7,570,265	821,854	1,429,312	
Total	**35,502,444**		**9,616,740**	

* Includes 1st cell only

** includes cost of final cover, monitoring and aftercare