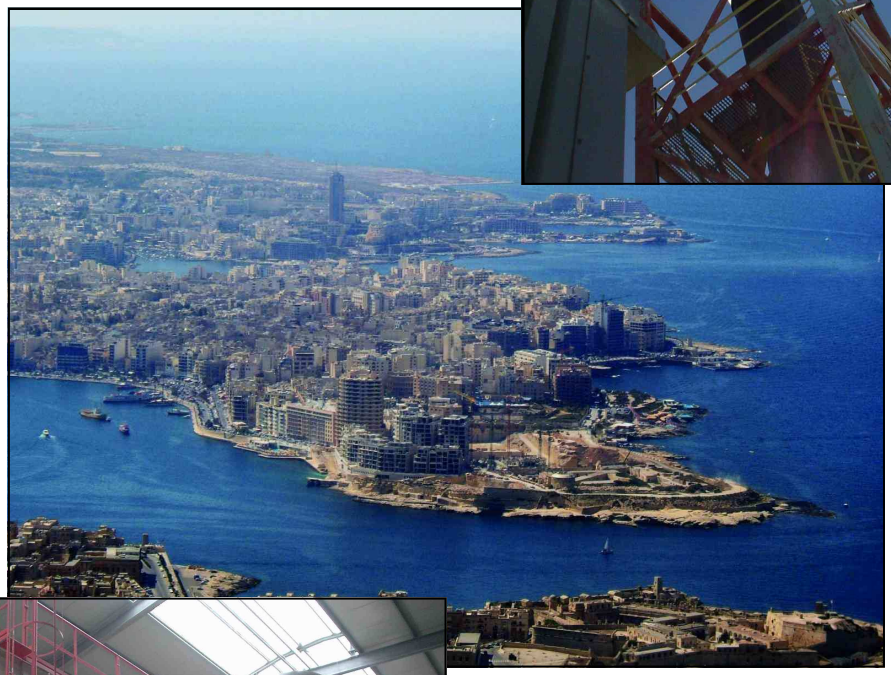
WASTE INCINERATION —
TECHNICAL GUIDELINES



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Twinning Project MT05-IB-EN-01
Assistance to explore long-term projects to manage
Specific waste streams in a more sustainable manner

Project funded by the European Union
and implemented by
the Ministry for Rural Affairs and
the Environment of the Republic of Malta
and Umweltbundesamt GmbH Austria

Abbreviations

As	Arsenic
BAT	Best Available Techniques
Cd	Cadmium
CH_4	Methane
CO_2	Carbon Dioxide
Cr	Chromium
Cu	Copper
ECI	Environment Compatibility Investigation
EIA	Environment Impact Assessment
EIS	Environment Impact Statement
ELV	Emission Limit Values
EPS	Environment Planning Statement
ES	Environmental Statement
GWP	Global Warming potential
HFCs	Fluorohydrocarbons
Hg	Mercury
HHV	Higher Heating Value (Gross Calorific Value)
IPPC	Integrated Pollution Prevention and Control
LHV	Lower Heating Value (Net Calorific Value)
L.N.	Legal Note
MBT	Mechanical-Biological Treatment
MEPA	Malta Environment and Planning Authority
Mn	Mangane
N_2O	Nitrogen Monoxide
N	Nitrogene
Ni	Nickel
NO_x	Nitro-oxygen
Pb	Lead
PCB	Polychlorinated Biphenyls
PCP	Polychlorinated Phenols
PDS	Project Description Statement
Sb	Tin
SF_6	Sulphur hexafluoride
Sn	Tin
SO_2	Sodium Bicarbonate
Ti	Titanium
TOR	Terms of Reference.
WIP	Waste Incineration plants
Zn	Zinc

LIST OF CONTENTS

1. INTRODUCTION

The Directive on the assessment of the effects of certain public and private projects on the environment (EIA Directive) shall apply to the assessment of the environmental effects of those public and private projects which are likely to have significant effects to the environment. Article 5 in connection with Annex IV of the EIA Directive determines the information the developer has to supply.

The requirements are also set forth under Article 13 of L.N. 204 of 2001 – Development Planning Act (Cap. 356) Environmental Impact assessment Regulations, 2001 Arrangement of Regulation, but these requirements are worded in a very general way from the technical point of view.

The **structure** of the guideline "Waste incineration" **follows** that of L.N. 204 of 2001 – Development Planning Act (Cap. 356) **Environmental Impact assessment Regulations**, 2001 Arrangement of Regulation.

One important step during the EIA-process is the preparation of the "**Terms of Reference (TOR**)". The TOR focus on the significant potential impacts which are likely to arise from a particular development project, so they should be considered as project-specific guidelines. The guideline "Waste Incineration" is a **basic example for the elaboration of the TOR** from the technical point of view. The essential technical information to be provided by the project developer shall be set forth in accordance with this outline.

The guideline "Waste Incineration" is a non-binding technical specification and is not considered to be complete. Information and investigations set forth in this guideline need not be submitted by the developer of the project if the developer can prove that particular information is not **relevant** for the project or the submission there of **cannot reasonably be expected** of the developer for the project given **the state of knowledge** and the **investigation methods**.

You will find more detailed information about the EIA-process in chapter 1.1.

The evaluation of the **traffic situation** regarding waste incineration plants is not part of an ES. But it has to be described according to the Structure Plan Policy/Structure Plan Policy Transport Topic Paper = Traffic impact assessment. Nevertheless, this guideline specifies in detail the information regarding the traffic situation which has to be supplied by the developer.

The information specified in the guideline "Waste Incineration" can also be used for the application for an **IPPC permit**. A permit according to the IPPC-Directive must include emission limit values and other technical measures, which have to be based on the best available techniques. The IPPC Reference Document on the Best Available Techniques (BAT) for Waste Incineration provides relevant information concerning best available techniques, which have to be adjusted to the local conditions bearing in mind the balance of costs and advantages inherent within the definition of BAT (see Chapter 7 of the guideline).

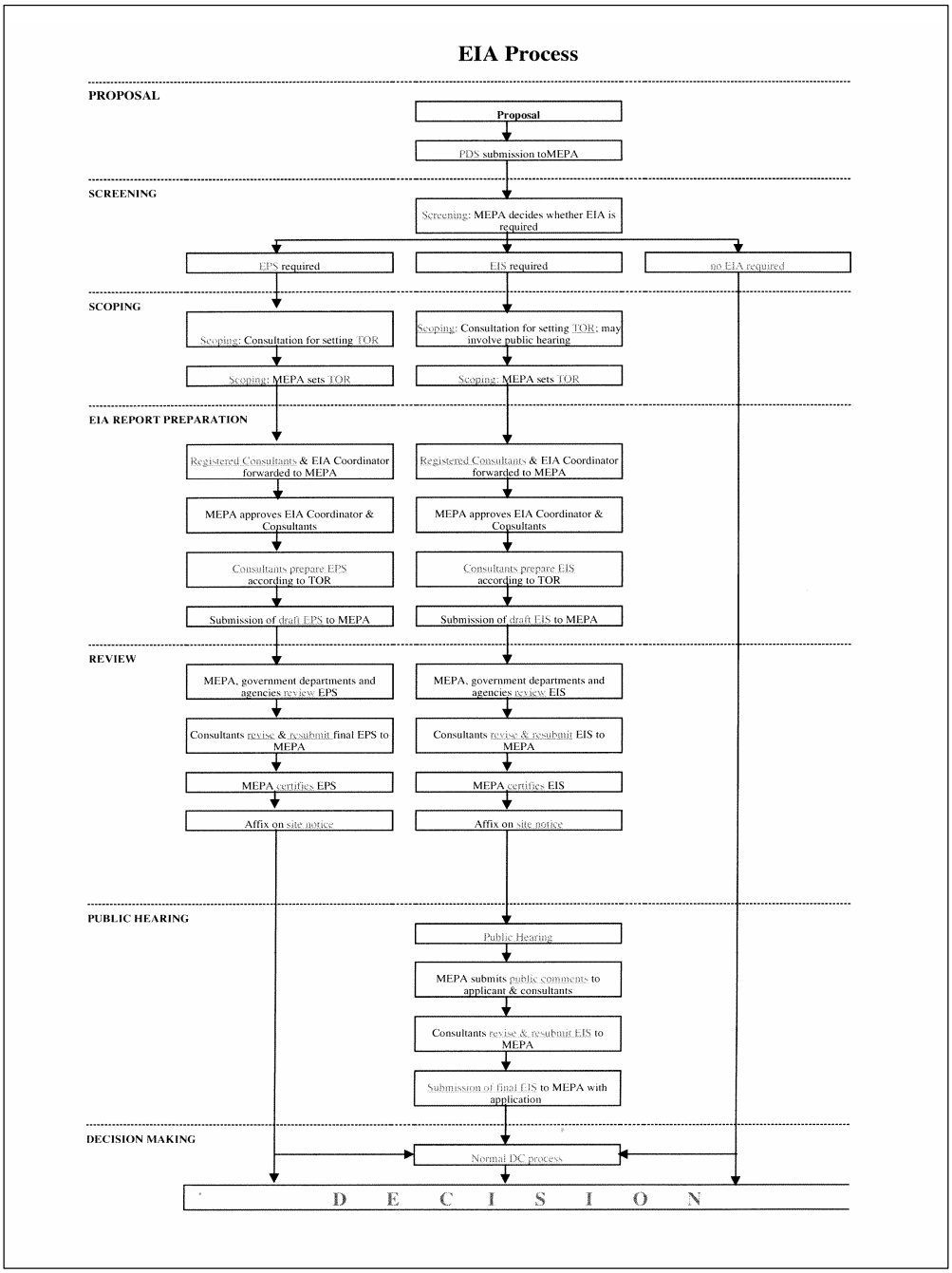
It is strongly recommended that the developer of a waste incineration plant should contact the competent authority as soon as possible when starting a project (MEPA – Malta Environment & Planning Authority; homepage: **www.mepa.org.mt**).

1.1 EIA-process

In this chapter you will find a general description of the EIA-process in Malta. The process description is taken from the MEPA webpage (see **www.mepa.org.mt**) and has been slightly amended with a description of the most important steps concerning the guideline "Waste Incineration".

For further information the developer should contact MEPA – Malta Environment & Planning Authority.

Figure 1: Workflow of the EIA-process in Malta[1]



[1] Taken from the Malta Environment and Planning Authority Website (www.mepa.org.mt)

1.1.1 Environmental Statement (ES)

The outcome of an Environmental Impact Assessment (EIA) is a formal document. This report is referred to in a variety of ways throughout the world, although the term Environmental Statement (ES) is most widely used. An Environmental Statement is an independent study involving the collection and analysis of relevant information, some of which may require original research, to determine baseline conditions and to predict the likely impacts of the development. It is the result of the EIA study presented as a report to inform decisions on a development proposal.

Locally there are two types of Environmental Statements:

- Environmental Impact Statement (EIS)
- Environmental Planning Statement (EPS)

1.1.1.1 Environmental Planning Statement (EPS)

The EPS, also known as a limited EIA, is prepared for projects of a type and scale likely to produce impacts that, although significant, are more limited and more easily assessed. This statement is of a more limited nature, covering fewer topics and will not require a public meeting to discuss its findings, however the public will still be consulted. An EPS is usually required for those developments outlined in Category II of Schedule I in the EIA Regulations.

1.1.1.2 Environmental Impact Statement (EIS)

The EIS, also known as a full EIA, is prepared for development where significant impacts are expected to result from a proposal and a full EIA study is needed to determine the type and magnitude of impacts and how to address them. This Statement is of more detailed nature, covering a range of issues. An EIS is usually required for those developments outlined in Category I of Schedule I in the EIA Regulations.

Once the EIS is complete and accepted by MEPA, a public hearing is organized.

Since the results of the EIS may affect the project's design, there must be a close working contact between the project's architects/designers and the EIA team.

An EIS identifies, describes and assesses the following:

- Proposed development project
- Alternatives to the proposed development project (including alternative sites and technologies)
- Site and surrounding of the proposed development
- Potential impacts to be generated by the development
- Mitigation measures that prevent, minimise or offset any environmental impacts and
- Proposals to monitor the actual effects, should the development take place.

1.1.2 Scoping (ES)

Scoping is that procedure in the Environmental Impact Assessment (EIA) process that establishes the key issues to be addressed in the Environmental Statement (ES) and the framework of approach that has to be taken. Scoping is used to identify significant impacts, key issues, alternatives to a proposal, and the affected and interested population

groups.

1.1.2.1 Scoping (EPS)

Scoping results in the formulation of Terms of Reference (TOR) or guidelines for the preparation of the EPS.

The scoping process is outlined below:

- Assessment of all predictable and/or expected environmental impacts by MEPA based on, but not limited to, the information presented in the Project Description Statement (PDS)
- Relevant government departments and local councils are invited to provide information, within 21 days of notification on what they wish to see included in the TOR
- MEPA formulates the final TOR
- The approved TOR are forwarded to the applicant, the architect/consultants
- The final TOR may be accessed by the public

1.1.2.2 Scoping (EIS)

Scoping results in the formulation of Terms of Reference (TOR) or guidelines for the preparation of the EIS, which further help to focus the study on the more significant issues.

The scoping process is outlined below:

- Assessment of all predictable and/or expected environmental impacts by MEPA based on, but not limited to, the information presented in the Project Description Statement (PDS)
- Relevant government departments and local councils are invited to provide information, within 21 days of notification, on what they wish to see included in the TOR
- The general public is invited, through an advert in the local press to inform the Director of Environment Protection, within 21 days of the publication of the advert, about the issues they wish to be included in the TOR
- For developments of major significance, MEPA may organize a public meeting before setting the TOR
- MEPA formulates the final TOR
- The approved TOR are forwarded to the applicant, the architect/consultants
- The final TOR are fully accessible to the public

1.1.3 Terms of Reference

The result of the scoping exercise is a formal document containing guidelines known as Terms of Reference (TOR) that are prepared for each development that requires an Environmental Impact Assessment (EIA). The TOR focus on the significant potential impacts likely to arise from a particular development project. They ensure that, as much as possible, the impact assessment focuses on relevant issues.

Terms of Reference are not cast in stone: they should be considered as project-specific guidelines. Should consultants deem that certain issues are irrelevant to the development then they can be omitted so long as this is justified. Similarly should the TOR have

overlooked important issues then these should still be included in the EIA. In this report, it is advisable that the consultants keep close contact with MEPA.

The TOR usually require:

- Description of the proposed development
- Description of the proposed site
- Alternatives to the proposed development (including alternative sites and technologies)
- Policy & legislative framework applicable to the development proposal
- Assessment of environmental impacts and risks of the proposed development
- Design of mitigation measures
- Design of monitoring programmes

1.2 Policy Frame

If a developer will build a waste incineration plant different national and international legislation, standards, plans, etc. have to be taken into consideration for the Environmental Impact Statement (EIS). In Malta the most important legislation for this procedure is the L.N. 204 of 2001 – Development Planning Act (Cap. 356) Environmental Impact assessment Regulations, 2001 Arrangement of Regulation. Based on this national legislation the following guideline for waste incineration plants will be explained.

Except L.N. 204 of 2001 the following national and European legislation are important for the Maltese situation.

1.2.1 European Union Directives in the field of Waste

- Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on Waste (Waste Framework Directive)
- Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste (Waste Incineration Directive)
- Council Directive 99/31/EC of 26 April 1999 on the landfill of waste (Landfill Directive)
- Council Directive 96/61/EC concerning Integrated Pollution Prevention and Control (IPPC)

1.2.2 Legal Notice, Plans and Technical Standards

1.2.2.1 Legal Notice for waste

- L.N. 168 of 2002 – Environment Protection Act (Act No. XX of 2001) Waste Management (Landfill) Regulation, 2001 amended by L.N. 289 of 2002 and subsequently amended by L.N. 70 of 2007
- L.N. 217 of 2001 – Environment Protection Act (Act No. XX of 2001) Freedom of Access to information on the Environment Regulations, 2001
- L.N. 230 of 2004 – Environment Protection Act (Cap. 435) Integrated Pollution Prevention and CONTROL (Amendment) Regulations, 2004
- L.N. 329 of 2002 – Environment Protection Act (Act No. XX of 2001) Limitation of emissions of certain pollutants into the air from large combustion plants, 2002

- L.N. 336 of 2001 – Environment Protection Act (Act No. XX of 2001) Waste Management (Incineration) Regulations, 2001
- L.N. 337 of 2001 – Environment Protection Act (Act No. XX of 2001) Waste Management (Permit and Control) Regulations, 2001

1.2.2.2 Legal Notice for other relevant environmental regulations

- L.N. 204 of 2001 – Development Planning Act (Cap. 356) Environmental Impact assessment Regulations, 2001 Arrangement of Regulation
- L.N. 234 of 2002 – Environment Protection Act (Act No. XX of 2001) Integrated Pollution Prevention and Control Regulations, 2002 amended by L.N. 230 of 2004

Air quality:

- L.N. 216 of 2001 **–** Environment Protection Act (Act No. XX of 2001) Ambient Air Quality Assessment and Management Regulations, 2001 amended by L.N. 235 of 2004

Water quality:

- L.N. 194 of 2004 – Environment Protection Act, 2001 (Act No. XX of 2001) Water Policy Framework Regulations, 2004
- L.N. 203 of 2002 – Malta Resources Authority act, 2000 Regulations for the Protection of Groundwater against Pollution caused by Certain Dangerous substances, 2002
- L.N. 213 of 2001 – Environment Protection Act (Act No. XX of 2001) Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment Regulations, 2001
- L.N. 218 of 2001 – Environment Protection Act (Act No. XX of 2001) Limit Values and Quality Objectives for Hexachlorcyclohexan Discharges Regulation, 2001
- L.N. 219 of 2001 – Environment Protection Act (Act No. XX of 2001) Limit Values and Quality Objectives for Mercury Discharges by Sectors other than the Chlor-Alkali Electrolysis Industry Regulation, 2001
- L.N. 221 of 2001 – Environment Protection Act (Act No. XX of 2001) Limit Values and Quality Objectives for Cadmium Discharges Regulation, 2001
- L.N. 227 of 2001 – Environment Protection Act, 2001 (Act No. XX of 2001) Limit Values and Quality Objects for Discharges of Certain Dangerous Substances into the aquatic Environment Regulations, 2001

Noise and health

- L.N. 193 of 2004 – Environment Protection Act (Cap. 435) Assessment and Management of Environment Noise Regulation, 2004
- L.N. 37 of 2003 – Occupational Health & Safety Authority Act (Cap. 424), 2003

Nature Conservation

- L.N. 311 of 2006 – Environment Protection Act (Cap. 435) Development Planning Act (Cap. 356) – Flora, Fauna and Natural Habitats Protection Regulations, 2006

- L.N. 257 of 2003 – Environment Protection Act, 2001 (Cap. 435) Development Planning Act, 1992 (Cap. 356) Flora, Fauna and Natural Habitats Protection Regulations, 2003
- L.N. 203 of 2003 – Environment Protection Act, 2001 (Act No. XX of 2001) Marine Mammals Protection Regulations of 2003
- L.N. 12 of 2001 – Environment Protection Act (Cap. 348) Trees and Woodland (Protection) Regulations, 2001

1.2.2.3 Plans

- Waste Management policy for the Maltese Islands (1998)
- Solid Waste Management Strategy for the Maltese Island (2001)
- Space for waste – The waste Management Subject plan for the Maltese Islands (2001)
- Structure Plan for the Maltese Islands (1990 – 2010)
- Mineral subject Plans for the Maltese Islands (2002)
- Local Plans (e.g. South Malta Local Plan)
- Clinical Waste Management Plan
- Structure Plan Policy/Structure Plan Policy Transport Topic Paper = Traffic impact assessment

1.2.2.4 Technical Standards

The developer or the applicant has to consider – if available – international or European standards (CEN, ISO). For further information contact the Malta Standards Authority (homepage: **http://www.msa.org.mt**).

2 WASTE INCINERATION PLANTS (WIP) – DESCRIPTION OF THE PROJECT

The description of the project constitutes a prerequisite for the other parts of the Environmental Statement (ES) and forms the basis for determining causes of effect and for planning measures to reduce negative impacts. The different parts of the ES are strongly linked to each other and show many interrelations. For example, the description of the flue gas cleaning system forms both part of the project description as well as description of measures to prevent negative impacts on the environment. It is necessary that this description goes far into detail to allow for a plausible and transparent estimation of emissions during normal operation as well as of emissions e.g. during failure of flue gas cleaning devices or measuring systems.

The project description part aims at giving a detailed and consistent survey of the whole project, including consumption of raw materials and energy as well as emissions. Therefore, detailed plans are regarded as parts of the technical application documents.

This chapter shall be applied to waste incineration plants.

According to Articles 14 (1) of LN 204 of 2001, the proposed development should be described. According to Annex IV of Council Directive 2003/35/EC of May 2003 the contents of this chapter should include:

- A description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases;
- A Description of the main characteristics of the production processes, for instance, nature and quality of the material used;
- An estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed project.

2.1 Technical description including land-use requirements during the construction and operational phases

An ES for waste incineration plants should contain the following information:

- Description of the type, scope and objective of the project and the necessity thereof with regard to waste management;
- Description of the location (general map in a scale 1 : 25000, land type categorisation, local development plan, ortho-photograph at a scale 1 : 5,000 with and without inclusion of the project components), possibly inclusion of areas worthy of protection, suspicious areas, dangerous areas and such like in the plan;
- Description of the infrastructure (energy and water supply, storage facilities, etc.)
- Description of the land-use during construction and operation (e.g. storage facilities, roads, parking areas);
- Description of the correlation and the interrelations with other plants or plant components, especially a description of or a reference to the possibility of withdrawing the energy generated for district or process heating or cooling, in other (industrial) plants or in households;
- Description and estimation of the potential of using the heat produced either in district heating networks or as process steam in other industrial plants. Figures shall be given as maximum power [MW] and as yearly produced energy [GWh/a]. In addition to that

the demand for heat shall be estimated for a period of ten years following commissioning of the plant in question. This estimation shall include already known or most probable developments on production and consumption side. Treaties or letters of intent covering use of heat should be added to the project description if existing (notice should be given if these treaties or letters of intent should not be made publicly available). Plans of the district heating/cooling network or process heat distribution system shall be added.

- Description of the delivery of fuels (e.g. gas with pipe lines, transport of fuel oil) and waste (ship, lorry, others);
- Description of the distribution network for electrical energy (if relevant);
- In case of changes of an existing plant: description of existing plants (including plant typ, plant technology, etc.) as well as the date of first commissioning;
- Description of the area and space requirements during the construction and operation phase, especially with regard to ground sealing (e.g. storage space, traffic and parking spaces, construction site installations);
- Duration of the individual phases of the project (planning, construction, operation, post-construction maintenance) and sequence plan for individual phases.

Traffic-related details

- Description of the traffic infrastructure (geographical location with regard to traffic, lorry access) and transport logistics (transport and container systems for the delivery of materials or the removal of residues).

In the practice of preparing an ES, a separate "traffic evaluation" is useful:

- Description of the necessary construction of new or extension of existing traffic routes;
- Traffic volume (road, water) or changes in the traffic volume vis-à-vis the status quo if the plant is constructed.

As a rule, the area investigated with regard to traffic are the traffic routes to the next-higher traffic system.

The illustration of the additional traffic volume in comparison with the status quo is possible in the form of a matrix as set forth in Table 1.

Table1: Matrix for showing the traffic volume

	Traffic volume			**Ratio**	
	Present status	**Construction phase**	**Operational phase**	**Construction phase/ present status**	**Operational phase/ present status**
Lorries					
Cars					
Ships					
Total					

2.2 Description of the main process characteristics, especially related to the amount and quality of input and output streams

This part mainly consists of a short description of the plant, on the basis of plant and process technological properties. All data have to be given in units of the International System (SI). The following properties shall be described.

2.2.1 Overview of the whole plant - description of the materials flow

Table 2 and Table 3 show a summary of the most important technical data of a waste Incineration Plant

Table 2: General technological properties of the incineration plant

Type of incineration plant (e.g. grate firing, rotary kiln, fluidized bed incinerator)	
Plant availability [% or hours/yr]	
Annual time of operation [hours/yr]	
of which: full capacity operation [% or hours/yr]	
Number of scheduled plant shut-downs per year [-/yr]	

Remark: Information about the number of shut-downs per year is relevant, as fossil fuels will be used during each shut-down and start-up period. These generate emissions and have an influence upon the energy balance of the plant.

Table 3: Parameters for 100% capacity with design fuel (waste)

	Number of lines[2]	per line	Total
Maximum thermal input into the plant [MW]			
of which: thermal input by waste [MW]			
of which: thermal input by fuels [MW]			
Nominal capacity of the plant [t/hr]			
Waste capacity at full load with a waste mixture of design LHV [t/hr]			
LHV of the design waste input [MJ/kg]			
Flue gas output at stack [m^3/hr], dry, at reference oxygen content			
Reference oxygen content [% by volume], dry flue gas			
Waste water output of the installation [m^3/hr]			
Fly ash and boiler ash discharge [t/hr]			
Coarse ash and/or slag discharge [t/hr]			
Residue of the flue gas treatment plant (please specify) [t/hr]			
Electric power generation in condensing modus – gross [MW_{el}]			
Maximum production for (district and/or process) heating – gross [MW_{th}]			
Power generation at maximum (district and/or process) heat production – gross [MW_{el}]			

[2] If the lines of a plant are different with regards to incineration technology, flue gas cleaning or the type and amount of wastes/fuels treated, parameters for each line have to be identified separately.

2.2.2 Description of the waste input

- Type, description and name of waste
- Average, maximum, minimum amount of each waste type
- Information about the origin of the waste (producer, process, region etc.)
- Waste codes in L.N. 337 of 2001 – Environment Protection Act (Act No. XX of 2001) Waste Management (Permit and Control) Regulations (2001);
- Maximum LHV of the waste mixtures fed into the plant [MJ/kg];
- Minimum LHV of the waste mixtures fed into the plant [MJ/kg];
- Physical and chemical properties of the waste (mean value/distribution);
- Details of possible seasonal variations in the composition of the waste;
- For hazardous waste: Maximum content of PCB, PCP, chlorine, fluorine, sulphur, heavy metals (including mercury);

2.2.3 Waste delivery and acceptance procedure

- Description of waste delivery - lorry, ship, others [%]
- Description of incoming, outgoing, and on-site traffic, timetable for delivery
- Description of weight control
- Description of the acceptance procedure: control upon delivery, sample-taking, analyses, laboratory equipment

2.2.4 Waste pre-treatment

- Percentage of waste that is subject to external mechanical or mechanical-biological pre-treated prior to delivery to the site [%]
- Percentage of waste that is delivered to the site without pre-treatment [%]
- Percentage of waste that is subject to internal (on-site) pre-treatment [%]
- In case internal (on-site) waste pre-treatment takes place:
  - Description of the pre-treatment plant;
  - Input capacity fort he pre-treatment plant [tons waste/yr];
  - Decription of the output streams of the waste pre-treatment plant;
  - Yield of pre-treated waste to be incinerated [ton/ton waste input into the pre-treatment plant];
  - Electrical energy demand for on-site pre-treatment [kWh/ton waste input];
  - Thermal energy demand for on-site pre-treatment [kWh/ton waste input].

2.2.5 Waste storage, dosage and feeding system

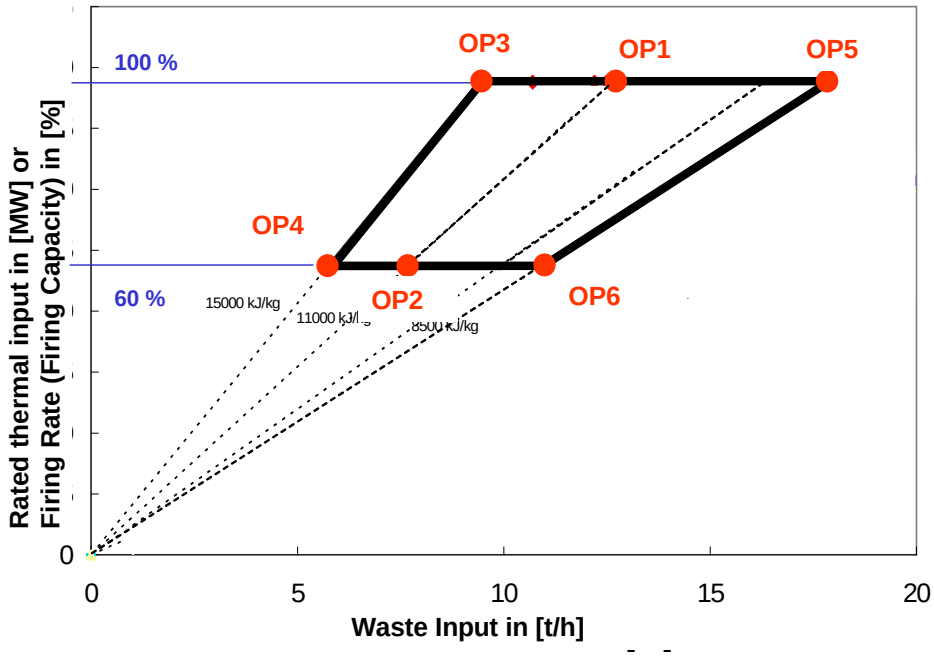
- Description of waste bunker(s) - design, storage capacity [m^3 or t];
- Description of waste storage logistics – average storage time, which waste fractions are stored together etc.;
- Description of measures to mitigate odour emissions from waste storage;
- Description of measures to mitigate dust emissions from waste storage;
- Description of measures to collect and treat waste water from waste storage;
- Description of measures to prevent and extinguish fire in the area of waste storage;

- Description of measures to mitigate emissions from diffuse sources in waste delivery, storage, manipulating and feeding;
- Description of waste transport, dosing, and feeding systems;
- Description of storage logistics.

2.2.6 Firing and combustion air system

- Description of the applied firing process technology (e.g. grate firing, bubbling / circulating fluidized bed, rotary kiln, etc.), furnace temperature, furnace design etc.
- Description of auxiliary burners:
  - number of auxiliary burners;
  - heat capacity [MW];
  - fuel (relevant chemical/physical properties, fuel demand etc.);
- Special technological features of the incineration (e.g. incineration with combustion air of >21% oxygen content etc.)
- Decription of the design waste input – composition, chemical / physical properties etc.
- Furnace Capacity Diagram, which shows the points of operation and thus defines the operating range of the plant. An example of this type of diagram is given in the figure below:
- Description of plant operation at reduced load (i.e. below 100% load) – e.g. different steam parameters, yearly operating time in reduced load [hrs/yr], frequency of reduced load operation [-/yr] etc.
- Minimum waste input [t/h];
- Maximum waste input [t/h];
- Description of combustion air distribution and flue gas recirculation;
- Description of the temperature profile in the flue gas channel (furnace, post combustion chamber, boiler, flue gas treatment plant, stack (including temperature control);
- Calculatory proof that the minimum residence time of the flue gas according to Article 6 (2) of the Waste Incineration Directive is maintained at all times as long as unburned waste is in the combustion chamber.
- Description of measure taken in case the flue gas temperature falls below the defined minimum temperature;
- Description of the system to stop/prevent waste feeding into the plant in case that the flue gas temperature falls below the defined minimum temperature;
- Description of the process control system, including temperature control in the furnace chamber;
- Description of start-up and shut-down operation;
- Description of relevant process parameters monitoring (e.g. furnace temperature flue gas temperature, flue gas volume, water content in the flue gas, pressure, oxygen content etc.)

Figure 2: Typical furnace capacity diagram of a waste incineration plant



- OP1: Design Point: Maximum firing rate (100%), Design Waste Input (average/typical LHV, average/typical waste throughput)
- OP2: Design Waste Input (average/typical LHV, average/typical waste throughput) at minimum boiler load (e.g. 60% capacity)
- OP3: Maximum boiler load with highest possible LHV (= little waste throughput)
- OP4: Minimum boiler load with highest possible LHV (= minimum waste throughput)
- OP5: Maximum boiler load with minimum LHV (= maximum waste throughput)
- OP6: Minimum boiler load with minimum LHV
- The field of operation of the plant is defined by the area between these points of operation.

2.2.7 Information on boiler and energy production (with representative waste input at 100% boiler load)

- Description of the boiler (design, evaporator, superheater, economizer etc.)
- Description of auxiliary boilers;
- Description of integration of the boiler into an already existing on-site water-steam-system (if relevant);
- Description of cooling system;
- Description of turbine / power generator, nominal power [MW_{el}];
- Description of boiler feed-water pre-treatment;
- Boiler feed-water parameters: throughput [t(h], pressure [bar(a)], temperature [℃];
- Saturated steam parameters: throughput [t(h], pressure [bar(a)], temperature [℃];
- Live steam parameters: throughput [t(h], pressure [bar(a)], temperature [℃];
- Live steam parameters at reduced boiler load: throughput [t(h], pressure [bar(a)], temperature [℃];

- Parameters of further steam streams (if relevant): throughput [t(h], pressure [bar(a)], temperature [℃];
- Boiler efficiency [%] with representative waste input at 100% boiler load), before and after boiler cleaning;
- International / European / national standard applied when boiler efficiency will be determined;
- Details of electrical power loss due to heat / steam withdrawal;

2.2.8 Flue gas treatment

- Description of primary emission mitigation measures (e.g. Low-NOx burners etc.);
- Content of air pollutants in the raw flue gas, i.e. after boiler and before entering the flue gas treatment unit;
- Description of the flue gas treatment devices (secondary emission mitigation measures);
- Technological details of the flue gas treatment devices (e.g. maximum flue gas input [Nm3/hr], operating temperature, efficiency, adsorbent, fuel demand for SCR plant etc.)
- Height of stack / point of flue gas release [meters above ground];
- Size of stack opening [m^2];
- Description of flue gas at stack: maximum flue gas temperature [℃], maximum flue gas output [operational m3/hr], measured oxygen content [Vol%], measured water content [Vol%];
- Description of flue gas at stack: maximum flue gas temperature [℃], maximum flue gas output [operational m3/hr, dry], measured oxygen content [Vol%];
- Flue gas output (humid, at reference oxygen content) [Nm3/h], at stack at full load operation with representative waste input;
- Flue gas output at full load operation with representative waste input;
- Maximum flue gas output (dry, at reference oxygen content) [Nm3/h], at stack;
- If other (flue) gases are being discharged via the same flue / via the same stack:
  - Description of theses (flue) gases: origin, amount, temperature, air pollutant content etc.
  - Does flue gas sample-taking take place before or after mixing with these other (flue) gases?
- Description of the point of flue gas sample-taking (location, flue gas velocity at the point of sample-taking [m/s] at maximum and minimum flue gas output);
- Description of operation and efficiency monitoring of the flue gas treatment devices;
- Certificate by an independent and approved expert to show that sample-taking points are in line with international standards;

2.2.9 Waste water treatment

- Water balance for the installation;
- Description of all waste water streams as being fed into the waste water treatment plant (origin, amount, temperature, pollutant content etc.);
- Description of the waste water treatment plant (aggregates, auxiliary agents, technological characteristics, efficiency of the aggregates, residence time etc.);

- Amount of waste water generated per year [m3/a];
- Maximum amount of waste water generated per day [m3/d];
- Way of discharge (direct or into sewage system);
- Description of operation and efficiency monitoring of the waste water treatment aggregates;
- Description of the point of waste water sample-taking;
- If other waste water streams are being discharged / treated via the same system:
  - Description of theses waste water streams: origin, amount, temperature, pollutant content etc.
  - Does waste water sample-taking take place before or after mixing with these other waste water streams?

2.2.10 Description of operating and auxiliary agents

- Quality (concentration, purity etc.), location of use, annual consumption of operating and auxiliary agents for the process [kg/yr or [tons/yr], as e.g. fresh water, urea, ammonia, calcium carbonate, calcium hydrate, activated carbon, hydrochloric acid, sodium hydroxide, sodium phosphate, polyelektrolyt, precipitation agents, fuels etc.

2.2.11 Residues and waste streams generated in the process

- For each residue and waste stream which is being generated by the new installation (e.g. slag, coarse ash, fly ash, boiler ash, residues from flue gas treatment or waste water treatment units, scrap metal etc.) the following parameters have to be specified:
  - Amount of waste / residue generated at full load operation with design waste (mixture) [t/hr];
  - Maximum amount of waste / residue generated per hour [t/hr];
  - Maximum amount of waste / residue generated per year [t/yr];
- Detailed description of the chemical / physical properties of the waste / residue;
- If waste / residues generated in the process are being treated on-site:
  - Description of the waste / residue treatment installation (process, aggregates, devices, agents etc.);
  - Plant capacity [tons input per year];
  - Description (chemical / physical properties, pollutant content etc.) of the input and output streams;
  - Energy demand for the process [kWh/yr];
  - Specific energy demand per kg or per ton of input material [kWh/kg or kWh/t];
  - Intermediate storage of waste / residues generated in the process:
  - Storage area, storage capacity and demand, logistics;
  - Description of the measures taken to mitigate odour, dust and diffuse emissions from the storage area, of measures to collect waste water and prevent accidents and incidents in the storage area;
- Control of relevant chemical / physical parameters of solid and liquid;
- Ways of recovery and / or disposal;
- Description of other waste / residues generated during operation and construction

(waste management plan);

2.2.12 Drawings, plans

The description of the installation has to contain relevant drawings and plans, such as e.g.

- Process flow schemes of the process, showing all material flows;
- Relevant process flow schemes and P&I drawings of sub-processes (such as e.g. combustion, air and flue gas system, water and steam system, energy production etc.), showing material flows, relevant aggregates and monitoring / measuring points;
- Relevant disposition drawings;
- Sankey diagram(s).

2.2.13 Further information

- Descirption of the actual state of the area, where the installation is supposed to be erected;
- Necessary measures that are taken upon definitive cessation of activities to avoid any pollution risk and return the site of operation to a satisfactory state.
- Description of ancillary buildings, such as workshops, laboratories, garages etc.
- Description of possible incidents and accidents (e.g. possible causes, duration, emissions, environmental impact, preventive measures etc.);
- Fire fighting plans.

2.3 Energy demand and energy efficiency

It is recommended to describe all aspects concerning energy - such as the energy demand of the plant, the gross and net energy (electrical power, district and / or process heat) production, energy balance etc. – altogether in this chapter.

The energy balance of the plant gives an overveiw over the energy input into the plant via waste, fuel and operation media as well as all energy (electrical power, district and / or process heat) which is produced. Furthermore, it describes the energy consumption of the process itself.

Energy production and consumption and energy efficiency are important parameters to describe a process and its environmental impact. Especially with regard to climate change, energetic characteristics and the amount of energy consumed, which corresponds to the amount of climate-related emissions to air, are of utmost importance to the EIA.

2.3.1 Energy consumption of the process

- Total electrical energy consumption of the process - [MW_{el}];
- Total heat consumption of the process - [MW_{th}];
- Relevant energy consumers in the process - description of relevant sub-processes, aggregates, amount of energy demand [MWh, kWh, t, m3]
- Description of how the energy demand of the process is covered (internal production,

external suppliers).

2.3.2 Electrical energy (if relevant)

- Maximum power generation (Nominal capacity of the generator) [MW_{el}];
- Actual power production – net [MW_{el}];
- Annual power production – gross [GWh_{el}/yr];
- Annual power production – net (supply to the grid or to external consumers) [GWh_{el}/yr].

2.3.3 Thermal energy[3] (if relevant)

- Maximum possible (district/process) heat production – gross (as designed [MW_{th}];
- Description or evaluation of the potential of possible district heating/cooling or process heat supply at the specific site;
  - Graphic illustration of the district heating network/process heat supply;
  - Number of households/industrial facilities that may be supplied;
  - Energy requirements for district / process heat supply [MW_{th}, GWh_{th}/a], including energy losses due to energy transport
- (District/process) Heat production – net [MW_{th}];
- Annual heat production – gross [GWh_{el}/yr];
- Annual heat production – net (supply to a district heating/cooling system or to external consumers) [GWh_{el}/yr].

2.3.4 Energy efficiency

- Energy balances and energy efficiency criteria shall be given for the most important states of operation, i.e.
  - Full boiler load (100% load) with design waste mixture
  - Minimum boiler load (e.g. 60% - according to the furnace capacity diagram of the plant) with design waste mixture
  - Further relevant states of operation, concerning e.g. special waste mixtures that will be incinerated regularly
- In case of Combined Heat and Power Production (CHP), energy balances and energy efficiency criteria shall be given also for
  - maximum power generation, and
  - maximum district/process heat production.

- The following energy balances / efficiency criteria have to be given for all the states of operation given above:

2.3.4.1 Boiler efficiency [%]:

- Boiler efficiency has to be determined according to European or international standards. The applied standard method has to be named and the calculations have to be shown in the application documents.

[3] This comprises steam production not only for heating but also for cooling purposes.

2.3.4.2 Electrical net efficiency [%]

2.3.4.3 Thermal net efficiency [%]

2.3.4.4 Plant efficiency or Fuel use - net (as designed) [%]:

- The plant efficiency can be calculated e.g. according to the BAT reference document on Waste Incineration, but also according to other international or European standards. The applied standard method has to be named and the calculations have to be shown in the application documents.

2.3.4.5 Annual fuel use - net (yearly average, as designed) [%]:

- The annual fuel use (net) describes the plant efficiency which can be reached as a yearly average. It takes into consideration seasonal differences in waste composition, in the energy demand of the supplied consumers as well as of the process itself, annual shut-down periods and represenets the annual average of plant operation (full load - reduced load, day – night, summer – winter etc.).

2.3.5 Substitution potential

The energy substitution potential should be included in the evaluation of the environmental impact of the project. The advantageous and disadvantageous consequences of the project should be described comprehensively. One approach is to describe the energy substitution and consequent emission substitution potential in the ES.

For this, the following information is required:

- Assessment and description of the current situation: housing structure, energy consumption for district heating / cooling, energy consumption of industrial consumers of electricity and / or steam etc;
- Identification of potential customers for energy delivery (households, industry, power grid etc.);;
- Calculation of the amount of heat to be recovered and electrical energy to be supplied to the grid;
- Calculation of existing emissions from households or industrial plants (present status) on the basis of current and valid emission factors, taking into account seasonal variations and possible changes in the emission situation until the plant is operational;
- Comparison with additional emissions and emission reduction caused by the new plant;
- Comparison of the scenarios with/without the plant
- Calculation and presentation of the emission substitution potential

When taking into account the energy substitution for power production, the current energy mix for the area in question must be taken into consideration.

2.4 Residues and emissions (pollutants, noise, odour, etc.)

This part of the ES contains a description of the residues to be expected as well as the quality and quantity of emissions. It will also be useful to briefly describe the steps taken to avoid and reduce the residues and emissions identified. A more detailed description of measures to be taken against disadvantageous consequences should be contained.

2.4.1 Gaseous and particulate emissions

a) Construction phase

- Emissions during construction
- Emissions from traffic
- Emissions from diffuse sources

b) Operational phase

- Description of emissions released into the air, indicating concentration and loads for all relevant contaminants according to L.N. 336 of 2001 – Environment Protection Act (Act No. XX of 2001) Waste Management (Incineration) Regulations 2001.
  The description should be made with regard to the 100% load operation point with most representative waste input (design waste mix).
  Concentrations and loads for all contaminants according to the Waste Incineration Directive and the Maltese L.N. 336 of 2001 (particulate matter / dust, SO2, NO2, CO, HCl, HF, NH3, PCDD/F, Cd, Tl, Hg, Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V) shall be given. Apart from that, it is recommended to add further contaminants such as e.g. PAHs (Benzo(a)pyren) and PCB to the list of air pollutants.
- Description of monitoring techniques;
- Description of emission calculation on the basis of emission measurements;

The following table contains a proposal of how the emissions can be described. All required data should be given with regard to the following parameters::

- Cleaned flue gas at stack, in full (100%) load, with design waste mix (i.e. the most representative waste/fuel mix);
- Cleaned flue gas at stack, under the most disadvantageous operational conditions regarding air emissions and / or maximum pollutant input via waste / fuel into the plant;

As for the most disadvantageous operational conditions regarding air emissions, especially the operational point in the upper right-hand corner of the furnace capacity diagram has to be taken into consideration. It is characterized by full load or high load respectively operation at minimum LHV of the waste / fuel input, and maximum waste / fuel input. The latter can be either due to maximum ash content or to maximum water content in the waste / fuel input. In case of high ash content, as a rule rather high concentrations of air pollutants will be contained in the flue gas. In case of high water content, high flue gas output and rather high concentrations of pollutants in the flue gas will occur together and have an influence upon flue gas dispersion in the ambient air.

All concentrations have to be given as mg/Nm3 (or ng/Nm3 respectively) with regard to the following reference conditions of the flue gas:

- Temperature: 0 ℃ (i.e. 273,15 K);
- Pressure: 1 atm(a), i.e. 1,013 bar(a);
- Dry flue gas
- Reference oxygen content

Furthermore, emissions from diffuse sources such as e.g. from waste delivery, pre-treatment or storage have to be described.

Table 4: Air emission parameters

Pollutant / Component	Type of average value	Emissions		
		[mg / Nm^3]	[kg / hr]	[t / yr]
Particulate emissions				
VOC				
HCl				
HF				
SO_x as SO_2				
NO_x as NO_2				
CO				
Hg and its compounds, as Hg				
Cd and Tl and their compounds, as Cd and Tl				
Sum of Sb, As, Pb, Cr, Co, Cu, Mn, Ni, and V, and their coumpounds, given as Sb, As, Pb, Cr, Co, Cu, Mn, Ni, and V				
NH_3				
PCDD/F (I-TEF)				
PAHs				
PCBs				
Others				

c) Accidents or abnormal operating conditions

2.4.2 Odour emissions

a) Construction phase

b) Operational phase

2.4.3 Emissions into water

- Description of emissions into water: maximum and average concentrations and loads of relevant parameters (including heat)
- Description of treatment of waste water

2.4.4 Noise

a) Construction phase

b) Operational phase

- Description of sources and quantification (noise charts)

2.4.5 Vibrations

a) Construction phase

b) Operational phase

2.4.6 Heat

- Description of heat emissions into air and water.

2.4.7 Residues and waste

a) Construction phase

- Description of mass, quality and treatment of excavated soil;
- Description of mass, quality and treatment of waste.

b) Operational phase

- Description of mass, quality and treatment of solid residues (including Waste classification number);
- Description of mass, quality and treatment of waste (including Waste classification number);
- Disposal and recovery of solid residues.

Accumulation of residues should be given in specific figures, such as kg/t fuel input, %(mass) of fuel input and %(vol) of fule input. If relevant, chemical and physical properties should be given, such as water content, loss on ignition, density, content of Al (total and elemental), P, Corg, and heavy metals, PCDD/f (I-TEQ), PAH. If possible leaching behaviour should be estimated.

2.5 Increase of immission and overall immission situation

It is preferable to describe the aspects of an increase in immission and of the overall immission in chapter 4 "Description of the environment and impact of the project".

The expected impact of a project should be taken into account when determining the scope of the investigation for an ES, both for recording the present situation and forecasting the overall immission situation. In particular, this should be considered when determining the parameters to be investigated.

2.6 Monitoring measures

Details regarding preservation of evidence and for concomitant monitoring

- o Details regarding the direct monitoring of the plant (such as exhaust gas or waste water emission measurements);
- o Description of measures for the preservation of evidence relevant to the protected object (e.g. bio-indication).

These measures are summarised in Table 5.

Connected to the description of environmental impacts, preservation of evidence enables a comparison of the forecast made in the ECI (Environment Compatibility Investigation) with the actual impact, because the data collected provide a standard for comparing the condition of the environment before start of project.

Table 5: Summary of measures necessary for the preservation of evidence

		Measures for the preservation of evidence
Plant		
	Emissions to air	Monitoring emissions to air
	Emissions to water	Monitoring emissions to water
Protected objects		
	Hunman Beings	Monitoring immission limits Monitoring sound immission limits
	fauna, flora and related habitats (incl. woodland and agri-cultural land)	Monitoring immission limits and approximate values for vegetation and forests (incl. bio-indication) Bio-indication with (cultivated) plants Evaluation of aquatic eco-systems
	Soil	Conducting soil tests and constant monitoring of the soil Measuring depositions
	Water	Monitoring of ground water (above and under the flow of the ground water) Monitoring of surface water
	Air and Climate	meteorological Measurement of, Measurement of immissions of air pollutants (organic parameters, heavy metals, measurement of deposition)
	Landscape	Documentation with photographs

3 ALTERNATIVE SOLUTIONS

Where appropriate, an outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects, should be carried out.

3.1 Zero variant

The developer for the project should submit a description of the advantages and disadvantages of not carrying out the project. In this case a consideration of the energy-economic-situation is recommended.

In addition, it would be useful to describe the following alternatives:

3.2 Technological alternatives

Possible criteria for a comparison of different techniques could be:

- Comparison of emissions;
- Criteria concerning energy economics and energy efficiency;
- Comparison of type, mass and quality of residues and waste;
- Transport of fuels/residues/waste.

3.3 Alternatives for the site

Suitable selection of the site of a thermal power station will have positive effects on energy efficiency thus reducing emissions and impacts on the environment. On the other hand it helps to optimise the overall energy economic concept of a region/state. Highest efficiency of a plant can only be reached if there exists a certain heat demand in the surrounding of the incineration plant. Therefore, it makes sense to carefully compare different potential sites.

With regard to energy efficiency the following considerations should be taken into account (relevant parameters have been described in previous sections):

- Energy efficiency at the date of commissioning;
- Estimation of energy demand for power and heat for a period of at least 10 years after commissioning of the plant (known developments on supply and demand side should be considered);
- Estimation of energy efficiency based on trend data;

- However, other important criteria need to be assessed:
  - Meteorological criteria;
  - Topographical criteria;
  - Ambient air quality;
  - Soil contamination;
  - Traffic situation;
  - Nature conservation;
  - Landscape conservation;
  - Townscape.

4 DESCRIPTION OF THE ENVIRONMENT AND OF THE IMPACT OF THE PROJECT INCLUDING MITIGATION MEASURES

4.1 Present status

According to Articles 15 § (a) of LN 204 of 2001 in combination with Terms of References for the preparation of an ES from MEPA , the present status of different physical features should be described.

The scope of the investigated area and the framework as well as the type of methods used depend on the environmental relevance of the project (e.g. construction of a new waste incineration plant) and the equipment found in each case, sensitivity of the environment and whether it merits protection. When describing the environment that may be affected, the situation prevailing at the time the application is submitted is relevant (reference time).

4.1.1 Population, Land use, including recreational uses

According to TOR the present uses of the proposed site should be described together with a description of residential areas, workplaces, places of worship, commercial, recreational and other uses located within an area of influence from the site. Included should be:

- Nature, type
- magnitude
- proximity to site
- etc.

The description of the population to be protected primarily comprises the living environment of the population in the area under investigation which may be affected by the project.

Noise (level and distribution), odours and oscillations/vibrations can be limited to the investigated project

4.1.1.1 General information

The following general information should be provided:

- Structure and development of settlements (location, population)
- Utilisation of adjoining buildings (residential, other uses requiring increased protection such as hospitals, old people's homes, etc.)

4.1.2 Flora, Fauna and ecosystems (terrestrial and marine), including both habitants and species and, in particular, protected and endangered species and their habitats

The emission of air pollution caused by this project defines the maximum area to be investigated in connection with these organisms and habitats to be protected.

The use of land is usually restricted to the actual site if no other land use by infrastructural supply and disposal activities, other building activities or the temporary establishment of storage sites etc. during the construction phase are registered.

4.1.2.1 Terrestrial habitats

4.1.2.1.1 Flora

Description and ecological evaluation of the biotopes and biotope networks as well as the vegetation by the following criteria (in relation to the overall reference area as well as regional, national (e.g. L.N. 311 of 2006) and international definitions):

- Rareness (Red Lists, degree of jeopardy, protected species and biotopes, species with decreasing numbers);
- Naturalness (types of utilisation, intensity of exploitation, degree of deviation from the potentially natural vegetation);
- Variety (diversity, variety of species vis-à-vis the site-specific (species) spectrum, species placing high ecological demands on the habitat);
- Size of area;
- Possibilities of replacement with regard to time, site and ecology of the island (development times, biotic resettlement, degree of cross-linking, etc.)
- Existing influences (air pollution, noise, vibrations, light, etc.)

4.1.2.1.2 Fauna

Description and ecological evaluation by the following criteria (in relation to the overall reference area as well as regional, national (e.g. L.N. 311 of 2006) and international definitions):

- Rareness (Red Lists, degree of jeopardy, protected species and biotopes, species with decreasing numbers);
- Abundance (density of individuals);
- Structure of dominance (distribution of species/frequency);
- Variety (diversity, variety of species vis-à-vis the site-specific (species) spectrum, species placing high ecological demands on the habitat);
- Functional significance of areas (year-round habitat, part-time habitat);
- Daily and seasonal dynamics (bird migration routes, distribution patterns, radius of activities, networks);
- Possibilities of replacement with regard to time, site and ecology of the island (development periods, biotic resettlement, degree of cross-linking, etc.)
- Existing influences (air pollution, noise, vibrations, light, etc.)
- Wild animals and hunting situation:
  - Population of wild animals;
  - Description, evaluation and losses of habitat;
  - Crossing behaviour (consequences of possible lasting effects);
  - Graphic portrayal of the hunting situation.

4.1.2.1.3 Identification of nature protection areas

Description and illustration of conservation areas identified under national (different Maltese nature conservation Regulations e.g. L.N. 311 of 2006), international or EU law, identification of nature conservation areas (such as nature and landscape conservation areas, nature parks, protected parts of the landscape, natural monuments).

4.1.2.2 Details of the method

- flora and fauna may serve as bio-indicators to show and describe the impact of existing immission. Therefore, the results of any monitoring programmes available should be evaluated.
- Differentiation between the areas at or near the site directly affected by interference with the natural balance and the further removed areas under investigation.
- As a rule, a detailed assessment as described above must be carried out for the site/site environment. Fauna indicator species/groups should be selected and substantiated depending on the conditions of the site.
- Survey results already in existence may be used if they are up to date and sound.

4.1.2.3 Trees

Zoning of the area under investigation in accordance with the specified investigation area for the dispersion of air pollutants.

We may distinguish between the following main areas for a description for the resource "trees":

- Description and evaluation of the condition of trees
- Situation of:
  - Main types of trees
  - Age structure
  - Type of exploitation;
  - Endangered species (abiotic and biotic);
  - Land use and land scaping.
- Description of relevant parameters / limits;

Alternative bio-monitoring methods such as the investigation of e.g. mosses are also possible.

4.1.2.4 Aquatic eco-systems

If there is a risk that aquatic (e.g. marine) eco-systems will be affected, an estimate of the ecological functionality in accordance with local laws concerning water must be carried out. According to TOR by MEPA particular reference is to be made to any species or biotopes/habitat types found in the area under study and listed in relevant nature protection legislation, relevant nature protection treaties and the EU Nature Protection Acquis. Identification of important and/or protected species shall be included as well as of indicator or key species relevant to characterisation of the habitat and monitoring purposes. This shall include adequate maps, plans, diagrams, photographs of the marine biotopes/habitats types of the area.

The assessment of the parameters relevant for evaluation is highly complex and

comprises the following aspects:

- Hydrology
- Morphology of water bodies
- Physical-chemical oxygen balance
- Vitality and eco-toxicology
- Saprobiology
- Macrophytes and algae
- Benthic and Infaunal survey
- Pelagic Organisms Survey
- Fish
  - Lists of species encountered in the survey according to the area were they were encountered;
  - A generic assessment as regards the abundances of species i.e. individuals, frequency, shoals, etc.
  - A qualitative assessment of the above in terms of the ecological niches to which the species pertain
- Flora and fauna of the water body

4.1.3 Soil, agricultural quality and produce

Zoning of the area under investigation according to the specified investigation area for the dispersion of air pollutants

4.1.3.1 General aspects

The following essential elements must be cited when describing the soil in an ES:

4.1.3.1.1 General characterisation

- Present and former forms of soil utilisation and management, agricultural profitability, nutrient status;
- Relief description (slope gradient), tendency towards erosion, geological classification, description under the aspect of soil science and type of soil;
- Details on the soil water balance;
- Relevant aspects of geology, hydrogeology and geotectonics; nature of the subsoil.

4.1.3.1.2 Impact of materials

- Contaminant contents (overall contents, soluble portion), possibly classified by horizons of stages of depth;
- Existence of residual pollution;
- Causes of contamination;
- Parameters influencing the mobility of contaminants (primarily the pH value, cation exchange capacity, calcium content, levels of carbon with organic bonds);
- Parameters describing the microbial metabolisation capacity (e.g. CO_2 respiration, dehydrogenase activity).

4.1.3.2 Examination of soil in an ES

As far as necessary for the specific project, soil samples from the area under investigation will be taken and tested In particular, tests for heavy metals and organic contaminants (PCDD/F and PAH) at the immission maximum will be carried out.

The relevant immission and deposition data for the resource air will be included in the description of the resource soil including agriculture. It is intended to describe or investigate the following parameters:

- Soil description, pH value, type of soil, carbonate content, organic C;
- Heavy metals (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Sn, Ti, V, Zn), organic contaminants.

For the purpose of conservation of evidence, especially with regard to accidents, the present situation should be documented by creating permanent observation spaces, especially in sensitive areas.

4.1.3.3 Agricultural or horticultural production

Portrayal of existing loads on agricultural and horticultural products against the background of the expected additional burden by contaminants (e.g. heavy metals and persistent organic contaminants that might affect humans through the food chain). Agricultural and horticultural products that are conventionally produced in the area and sensitive to accumulation should be taken into account.

4.1.3.3.1 Keeping of livestock

In this respect, organic contamination of fauna products is the focus of interest. Among livestock in the region, suitable fauna products should be examined especially with regard to accumulating organic contaminants. The portrayals might be based, for example, on test results from monitoring programmes. If no data are available for the area under investigation, the necessity and scope of primary surveys should be determined.

4.1.3.3.2 Agriculture

If relevant at the site in question, the agricultural situation in the area under investigation will be described. In addition, the agricultural structure will be shown on the basis of the structural assessment, utilisation of soil and the livestock count:

- Agricultural structure and forms of agricultural production; consolidation and mergers; and the significance of organic agriculture in the region.
- Utilisation of the space;
- Eco-toxicological situation of farming: In particular, there will be portrayal of
  - Existing immission and deposition loads of NO_2, SO_2, HCl, HF;
  - Immission and depositions of heavy metals and organic contaminants;;
  - Concentration or inorganic and organic contaminants in the soil and in flora; in doing so, soil and bio-indicator systems for the conservation of evidence may be used or an investigation of relevant cultivated plants carried out.

4.1.3.3.3 Subsequent checks and monitoring of the environment

One year before implementation of the project, additional continuous tests must be carried out. A selection of cultivated plants representative for the region should be planted under controlled conditions at locations which will presumably be influenced and not influenced by flora and tested for heavy metals and persistent organic contaminants, if necessary also for fluorine.

The present situation shall be assessed for contaminant impact with suitable bio-indicator methods before commencement of the project and continuously checked while flora is operational.

4.1.4 Geology and geomorphology, palaeontology

According to the Terms of References for the preparation of an ES from MEPA the present status should include a survey and characterisation of the site's geology, geomorphology, soils and palaeontology.

The Information for this issue is mostly gained from public records. Sources for geological information could be e.g. Geological Map of the Maltese Island and also samples from laboratories.

4.1.4.1 Geology

The Geological Settings are:

- Stratigraphy
- The geological setting of site, surrounding area and cross section could be shown in the publised geological map for Malta. The results of the setting from stratigraphy (site and surrounding) could be summarised in a table.
- Palaeontology
- Structure
- Resource evaluation

4.1.5 Water and hydrological features

The area under investigation in connection with waste incineration plants will primarily be determined by the extension flow direction and velocity of surface and ground water. This area under investigation may have to be modified in accordance with possible influences via dispersion of air pollutants.

The intensity of the statement and of the necessary tests regarding the resource "water", will mainly be determined by the relevant features of the plant process management.

4.1.5.1 Ground water

When describing the present situation regarding the resource "ground water", it seems useful to first make a classification into

- hydro-geological conditions and ground water balance, and
- quality of the ground water.

4.1.5.1.1 Hydrogeology

- When describing the present situation, the following details should be included:
- Existing national water legislations (e.g. L.N. 203 of 2002 see chapter 1.2.2.2);
- Extensive hydro-geological conditions;
- Hydro-geological conditions at the site;
- Interaction between ground and surface water;
- Ground water balance (formation of new water, direction of flow, strength, per meability, etc.);
- Existing water rights (for water extraction, waste discharge etc)
- Description of conservation, special protection and redevelopment areas;
- Size of the catchment area;
- Specification of water extraction facilities and water utilisation facilities;
- Influence of neighbouring open water bodies (e.g. marine) and the changing surface thereof as well as introduction into the ground water - surface water;
- Hydrological information regarding the amount of rain, surface drainage, seepage rate, evaporation, formation of new ground water.

4.1.5.1.2 Quality of the ground water

If it cannot be ruled out that contaminants will be discharged into the ground water, the parameters established for waste water should first be examined.

On this occasion, reference is made to the significance of describing construction measures in the ES (e.g. sealing of the waste silo) in order to prove that detrimental effects on the ground water have been ruled out.

When portraying the present situation, existing surveys will be taken into account.

As a rule, sampling of the ground water must be carried out before commencement of operations both upstream and downstream of the plant at least once every summer and winter. This is also necessary for reasons of conservation of evidence.

4.1.5.2 Surface water (marine)

The possible impact on surface water bodies and thus the descriptions of the present situation are highly dependent on the method used and the differences in the utilisation of surface water bodies as well as the type of the water body that may be affected. This also results in a wide range when describing the present situation of the surface water bodies in the area under investigation.

- Description of the hydrological situation; description of the quality of the water and water body, collection of relevant quality data (also taking possible flood areas into account);
- If need be, assessment of the water quality;
- Assessment of existing handicaps of the ecological functionality;
- Existing influences (industrial waste water, rain water, water from fire fighting) and water rights;
- Degree of naturalness;
- Significance of the water body to the landscape;
- Recreational function (use);
- Fishing;

- Exploitation rights;
- Details on the structure of the water body;
- Drift and particulates balance.

For plants with waste-water free flue gas purification facilities, the description of the present situation of the surface water bodies may be reduced under certain circumstances.

4.1.6 Cultural heritage sites and real assets

The area under investigation for waste incineration plants is primarily defined by the air path (dispersion of air pollutants). This delimitation should essentially also be selected for the resource "cultural heritage sites and real assets".

An actual situation of the cultural heritage sites, real assets should be described and, where possible, shown in the plan. In particular, these include and should be taken into account in each case:

➢ Cultural Heritage Sites:

Cultural heritage are building monuments, archaeological objects, historical cultivated landscapes and components thereof as well as historical forms of land utilisation.

If there is reason to assume that archaeological deposits may be found at the selected location, such locations should be examined in cooperation with the authorities in charge both before and during the construction phase.

➢ Real Assets

Real assets are social values that had or have considerable functional significance such as bridges, building and towers. They also include infrastructural facilities for supply and disposal that may have to be subjected to structural changes in connection with the project so that a demolition, building or operation permit may be necessary according to other legal regulations.

4.1.7 Landscape and topography, including the coast and submarine features

The area under investigation for waste incineration plants is primarily defined by the air path (dispersion of air pollutants). This delimitation should essentially also be selected for the resource "landscape", taking into account connected landscape units.

Particular attention should be given to the visibility of a location from various directions (visibility relations).

The present situation for the resource "landscape" should be described not only in the geographical sense, but attention should also be given to ecological and utilisation-related aspects and to the scenery (or townscape, depending on the location).

4.1.7.1 General characterisation of the landscape

- Description of the landscape area;
- Main features (water bodies, terraces, coasts, etc.);
- Main landscape structures;
- History of the landscape;
- Protection status (international, national) protection awards.

4.1.7.2 Natural space potential (landscape, coast, marine)

- Nature conservation potential (based on the unspoilt quality, variety of species, valuable areas that are protected or worthy of protection);
- Potential of raw material;
- Biotic yield potential (fertility of the soil);
- Water supply potential (water bodies that may be used under water resources management aspects);
- Potential for energy generation;
- Climatic regeneration potential.

4.1.7.3 Landscape as a natural and cultural space (including coast)

- Description of the landscape elements including anthroprogenic influences (geological-morphological elements, hydrological elements, vegetation elements);
- Natural monuments;
- Elements important under cultural-historical aspects (such as ground monuments, buildings and parks);
- Regional planning and dedication of spaces; infrastructure;
- Utilisation (such as agriculture, fishing).

4.1.7.4 Landscape as a recreational and adventure space

- Suitability for recreational activities and existing leisure facilities;
- Utilisation and facilities for tourism.
- Marine see chapter 4.1.5.2

4.1.7.5 Scenery/aesthetics

- Delimitation of the aesthetic sphere (i.e. the location where the object in question is visible);
- Analysis of the scenery or townscape, taking into account (traditional) sight relations with distinct cultural and material assets (especially in connection with the recreational infrastructure), lookouts and existing disadvantages.

A photographic documentation is suggested for visualisation.

4.1.8 Air, including prevailing meteorological factors and air quality

The area under investigation for waste incineration plants is primarily determined via the air path (dispersion of air pollutants). In order to help delimit the area under investigation, the relevance / irrelevance of the additional immission load may be used.

The area under investigation should be delimited as follows:

The additional load is to be classified as irrelevant if additional immission caused by gaseous or dust contaminants and by the deposition of contaminants in the soil or surface water bodies is

- less than 3 % as a short-term value (< daily mean value) and
- less than 1 % as a long-term value (≥ daily mean value)

of an immission limit for population and the resources "vegetation" or "soil" and "buildings".

The following are to be taken into account:

- Gaseous: SO_2, NO_2, NMVOC, benzene, HCl, PAH, PCB, PCDD/F (I-TEQ), HCB, HF;
- Particulate dust, PM10 and heavy metals;
- Measurement of depositions

There different Maltese legislation e.g. L.N. 163 of 2002 amended by L.N. 231 of 2004 available If no national legal immission limits are available, the Air Quality Guidelines of the World Health Organisation (WHO) may be used alternatively.

As a result, a joint area under investigation is determined for all air contaminants and for the resource "air", respectively, the size of which is determined by the air contaminant the additional immission load of which is classified as not irrelevant at the greatest distance from the envisaged emission source.

4.1.8.1.1 Dissemination of air contaminant emissions caused by the plant

In connection with the project types under consideration here, simulation models for calculating the dissemination of air contaminants have special significance.

Taking the climatic/meteorological conditions including concentration-increasing effects such as calms or layers of atmospheric inversion as well as dissemination class statistics characterising the dissemination conditions into account, a dissemination calculation for air contaminants emitted during the normal operation of the plant must be carried out. Depending on the individual aspect of the project, different emission scenarios should be considered, such as stationary operation (start up and shut down phase / partial load operation) and non-stationary operation (deliveries and removals / load change). Starting values to be taken into account for the dissemination calculation are the relevant emission limits and the guaranteed value of the manufacturer(s) of the plant. Operational values based on the experience with comparable plants may be used in addition.

As a matter of principle, the maximum additional and total immission to be expected must be identified and described, taking seasonal changes into account. In any case, these evaluations must be carried out for all reporting periods used in threshold and guide value formulations.

Likewise, dissemination calculations must be carried out for identifying additional immission loads in case of malfunctions.

The impact of steam emissions from cooling towers on the climate may be estimated on the basis of literature studies and calculations of the drift steam spread.

4.1.8.1.2 Dispersion of air pollution emissions caused by traffic

In order to determine traffic-specific additional emissions of air contaminants, dispersion calculations will usually have to be carried out.

4.1.8.2 Air

The description of the present situation for the resource "air" requires a description of the existing contaminant load (immission concentration and contaminant deposition) and must take into account the emissions related to the project.

First, it is advisable to evaluate all the results of continuous and intermittent measurements carried out in the area under investigation with regard to relevant data on existing contaminations.

If no up-to-date and confirmed data are available, measurements of existing loads must be carried out in accordance with the state of the art with specific quality assurance measures in order to obtain a representative portrayal of the immission situation in the area under investigation.

Any existing contamination should be described on the basis of the following parameters:

- SO_2, particulate dust, PM10, NO, NO_2, CO, benzene, NMVOC (by continuous assessment);
- HCl, HF, benzo(a)pyrene, PCB, PCDD/F, HCB (assessment by spot checks of air contaminants);
- Total dust deposition, dust ingredients: As, Cd, Cr, Cu, Hg, Ni, Mn, Pb, Sn, Zn, Sb, V, Ti, total N (assessment by deposition measurement);
- Existing ozone load.

When describing existing loads, special attention should be given to the evaluation of the air quality in the area of the expected maximum of the additional load (see chapter 4.2.1) and at the location within the area under investigation with the most severe load at present.

4.1.8.3 Climate

The description of the present climatic situation in the area under investigation is important under two aspects:

- for the description of the transmission conditions for air contaminants (as an influential parameter for determining the additional load);
- for the characterisation of the local microclimatic conditions.

Due to strong seasonal variations, meteorological/climatic investigations must be carried out over a longer period of time. In order to identify seasonal influences, meteorological measurements must be carried out over the course of one year.

It will be necessary to check in each individual case whether existing meteorological data may be used for other locations and how long a meteorological investigation for a maximum estimate should take. For the calculation of dispersion with the objective of determining the additional immission load, a dispersion class statistic representative for the location must be used.

In order to describe the present situation, the following information is particularly important, also indicating the location of the measuring points:

- Temperature;
- Humidity;
- Rain;
- Fog;
- Direction and speed of the wind, frequency of calms (taking into account the ground relief and existing buildings):

4.1.8.4 Existing air pollution/health

The quantity of existing air pollution including individual contaminants must be evaluated on the basis of national and international limit values and rules established to protect the inhabitants of the area.

In order to complete the analysis of the present situation, existing surveys regarding conspicuous symptoms or causes of death in the area under investigation may also be evaluated. National statistics permitting a comparison with the conditions in the area under investigation are suitable for such purposes.

4.1.9 Odour, Vibration, Light, etc.

Description and evaluation of the present situation regarding odours, vibrations and possibly light immission, etc.

In order to determine existing odours:

- Evaluate statistics of complaints and surveys;
- Carry out scan surveys in individual cases.

Essential criteria of evaluation:

- Concentration of odours;
- Intensity and quality of odours;
- Duration and frequency of the odour immission.

4.1.10 Noise

Description of the present sound immission situation (measurements of the sound level, background noise levels both in terms of frequency and intensity).

The location and number of the measuring spots are determined by

- Structural conditions of settlement, with special attention to residential areas, possibly individual residential buildings and other sensitive uses in the neighbourhood of the location,
- Should also be provided in the sphere of influence of the traffic (road and water) in the area under investigation.
- Other potential noise sources in the area, including new developments;
- Sensitive receptors including sensitive recreational areas in the vicinity;
- Features that might shield noise.

Sufficient measuring periods are necessary for a reliable data base (continuous long-term 24 hour measurements at selected measuring points). Baseline survey should follow parameters given in BS4142:1997 and other relevant guidelines.

4.1.11 Any others relevant environmental features

4.2 Impact

According to Article 16 L.N. 204 of 2001 – Development Planning Act (Cap. 356) Environmental Impact assessment Regulations, 2001 Arrangement of Regulation, all significant impacts of the proposed development shall be considered and assessed.

Impact

Based on the assessment of the current situation, the impact of the project on the environment for the project stages construction, operation, accident or interrupted operation should be estimated with relevance to the resource to be protected.

Interaction

Interaction is understood to mean the mutual (direct and indirect) correlations between resources to be protected, environmental factors, and components of the ecological system. Accordingly, this also includes feedback effects, cumulative and synergistic effects as well as impact shifts. Depending on the project and the site, a more specific evaluation of the individual instances of interaction may be necessary.

Methods

Forecasts of impact on the environment within the framework of an EIS or EPS are based on a general method which establishes a correlation of the impact causes resulting from an envisaged project during the individual project phases vis-à-vis the condition of the environment during the investigated period. The forecast of the impact on the environment is made by analysing the impact on the environment caused by the project. In doing so, findings from comparable cases are often applied to the actual situation by modelling.

It is important to regard the impacts of construction, operation and accidents by themselves.

According to Article 16 Sub (3) Environmental Impact assessment Regulations hazard and risk assessment are described as Accidents/interruptions of operation in chapter 4.2.1.

4.2.1 Air and climate, including prevailing meteorological factors and air quality

4.2.1.1 Impact resulting from the existence of the project

Construction and Operation:

- Description and evaluation of changes in the micro-climate caused by changes in the surface characteristics (sealing, building).

4.2.1.2 Impact resulting from the use of natural resources

In normal cases, no relevant impact is to be expected.

4.2.1.3 Impact of emissions

4.2.1.3.1 Gaseous and particulate emissions

Climate

- Operation:
  - Description and evaluation of the impact caused by the release of humidity through the chimney (formation of fog or haze).
  - Description and evaluation of the impact of the emission of gases relevant to the climate.

When assessing the impact on the climate, the emission of "greenhouse" gases, especially the 6 Kyoto gases

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Fluorohydrocarbons (HFCs);
- Perfluorohydrocarbons (PFCs);
- Sulphur hexafluoride (SF_6)

should also be taken into account.

In case of waste incineration plants, comparisons with the "zero variant" (dump) or other technologies for waste treatment (e.g. MBT) are of particular interest.

Air

So as to obtain a maximum estimate, unfavourable meteorological conditions for the dispersion of the contaminants close to the ground should be used as a basis. i.e. stable dissemination conditions and low wind speeds.

- Construction
  Description and evaluation of air contaminant immission caused by activities at the construction site and traffic.
- Operation
  Description and evaluation of air contaminant immission caused by the operation of the plant and traffic.

Description of a possible positive impact on the resource air, e.g. by substituting existing emissions.

- Accident / interruption of operations

  Description and evaluation of air contaminant immission caused by interruption of operations, events relevant for a stoppage or malfunctions (e.g. emission of ammonia, fire in the silo, malfunction of flue gas cleaning).

Heat

- Operation
  Identification and evaluation of the increase in air temperature in the neighbourhood of the plant by the release of heat through the chimney. A possible increase in air temperature should be evaluated in relation to the significantly higher temperature of the exhaust gas trail vis-à-vis the air in the neighbourhood.

Table 6: Relevance matrix – resource "air and climate"

	Project phase		
	Construction	**Operation**	**Accident, Interruption of Operations**
Existence of the project	**X**	**X**	
Use of natural resources			
Emissions			
Gaseous and particulate emissions	**X**	**X**	**X**
Odour			
Emissions to water			
Noise			
Vibrations			
Waste, excavated soil			
Heat			

4.2.2 Population, Land use, including recreational uses

4.2.2.1 Impact of the existence of the project

If necessary, the impact on the quality of living in neighbouring settlements and possible detrimental effects on recreational areas must be investigated.

4.2.2.2 Impact of the use of natural resources

As a rule, no relevant impact is expected.

4.2.2.3 Physical effects

If necessary the impact of the development on the surrounding area e.g. earth-moving, stability, deposits and waste must be included.

First the development should be considered in isolation and then assess the impacts arising from the various proposed activities upon each other. It shall then consider the development in a wider context and assess the effects of:

- the development on the surrounding land uses; and
- the effects of the surrounding land uses on the development.
- Final disposal of incineration residues on an engineered landfill for hazardous waste.

4.2.2.4 Impact of emissions

Details regarding the impact of the project on Health and Safety must be provided in compliance with the relevant regulations.

4.2.2.4.1 Gaseous and particulate emissions

- Construction
  Immission forecast, taking into account air pollution emissions caused by incoming and outgoing traffic during the construction phase: Evaluation of the impact on the population concerned under environmental medicine aspects.
- Operation

Immission forecast, taking into account the air pollution emissions caused by the operation of and the traffic to and from the plant: Evaluation of the impact on the population concerned under environmental medicine aspects.

In this respect, the results of the calculation of dispersion (additional immission and depositions) will be taken into account. The determined extent of the air pollution to be expected must be assessed according to national and international guidelines and limits, taking into account the population to be protected.

- Accidents/interruptions of operation
  Immission forecast, taking into account air pollution emissions caused by interruptions of operation or accidents as well as evaluation of the impact on the population concerned under environmental medicine aspects.

4.2.2.4.2 Odour

- Operation
  Estimate of odour emissions caused by the operation of the plant (taking into account possible loading operations): Description and evaluation of the impact on the population concerned.

- **Accidents, malfunctions**
  Estimate of odour emissions resulting from accidents or malfunctions: Description and evaluation of the impact on the population concerned.

4.2.2.4.3 Emissions to water

- Construction, operation and accidents: Description and evaluation of the impact of emissions to water on drinking water during the construction and operational phase or in case of accidents (e.g. if the waste silo leaks).

4.2.2.4.4 Noise

- Construction
  Sound immission forecast, taking into account the sound emissions caused by the operation on the building site and the traffic: Portrayal and evaluation of the additional and the total burden for the construction scenarios with relevance to sound (such as demolition, concrete work on the foundations, boarding and concrete work, overground workings, steel construction).
- Operations
  Sound immission forecast, taking into account the sound emissions caused by the operation of the plant and related traffic: Portrayal and evaluation of the additional and the total burden.
- When making the forecast, the traffic noise caused by the project should also be taken into account. As a matter of principle, all sources of sound on the plant site (inside and outside) must be included both during the construction phase and during the operational phase and the remaining sound level portrayed. The same applies to sound emissions expected in connection with extra traffic. Time limits regarding certain activities or operational modes imposed by the management (day/night) must be observed. The immission must be determined for the immission sites for which an existing burden has already been identified. The evaluation of the forecast results should be made with a view to changes vis-à-vis the existing noise level during day

and night times.

4.2.2.4.5 Vibrations

- Construction
  Estimate of the vibrations caused by work on the building site: description and evaluation of the vibrations on the population affected.
- Operation
  Estimate of the vibrations caused by the operation of the plant: description and evaluation of the vibrations on the population affected.

4.2.2.4.6 Miscellaneous

The impact of possible emissions of light, ionising and non-ionising radiation (if any) must be described.

Table 7: Relevance matrix – population to be protected

	Project phase		
	Construction	**Operation**	**Accident, interruption of operations**
Existence of the project		**X**	**X**
Use of natural resources			
Emissions			
Gaseous and particulate emissions	**X**	**X**	**X**
Odour		**X**	**X**
Emissions to water	**X**	**X**	**X**
Noise	**X**	**X**	
Vibrations	**X**	**X**	
Waste, excavated soil	**X**	**X**	
Heat		**X**	

4.2.3 Flora, Fauna and ecosystems (terrestrial and marine), including both habitants and species and, in particular, protected and endangered species and their habitats

4.2.3.1 Impact resulting from the existence of the project

- During Construction:
  - Description and evaluation of the possible impact of lowering the ground water level;
  - Description and evaluation of the (possibly temporary) and lasting effects.
  - Description and evaluation of the possible impact on benthic, pelagic, infaunal and fish communities. Changes in communities and ecosystems shall be highlighted.
  - Description and evaluation of the possible effects on biological, physico-chemical and hydromorphological characteristics of the coastal water body. Impacts on sediment characteristics on the area should be included.

- During Operation:
  - Description and evaluation of the impact of lowering the ground water level

through the facility or coherent construction measures;
  - Description and evaluation of impact of using land through the facility and coherent construction measures taking up space;
  - Description and evaluation of the impact of lasting effects and the sealing of soil, taking into account traffic routes.
  - Description and evaluation of the possible impact on benthic, pelagic, infaunal and fish communities. Changes in communities and ecosystems shall be haighlighted.
  - Description and evaluation of the possible effects on biological, physico-chemical and hydromorphological characteristics of the coastal water body. Impacts on sediment characteristics on the area should be included.
- Special considerations regarding trees and woodland
- Usage of wood land areas during construction and operation
- Possible impacts on woodland wildlife habitats (noise, traffic, etc.)

4.2.3.2 Impact of the use of natural resources

- Operation;
  Description and evaluation of the impact by extracting water (cooling, process and drinking water withdrawal).

4.2.3.3 Impact of emissions

4.2.3.3.1 Gaseous and particulate emissions

- Construction
  Description and evaluation of the impact by air pollution immission on habitats, fauna, flora or agricultural plants caused by building site activities and traffic.
- Operation
  - Description and evaluation of the impact by air pollution immission on habitats, fauna, flora or agricultural plants caused by building site activities and traffic.
  - In this respect, the identified extent of the expected air pollution (maximum short- and long-term additional and total immission) on the resources to be protected should be evaluated.
  - Estimate of the introduction of acid into plants (used for agriculture).
- Considering the transfer of contaminants (especially heavy metals) from the soil into flora.
- Accidents/interruption of operation
  - Description and evaluation of the impact of air pollutant immissions caused by interruptions of operation, malfunctions or accidents.

4.2.3.3.2 Emissions to water

- Operation
  Description and evaluation of the impact by discharging waste water, especially on aquatic eco-systems.

4.2.3.3.3 Noise

- Construction
  Description and evaluation of the impact caused by sound immission resulting from construction activities and traffic.
- Operation
  Description and evaluation of the impact caused by sound immission resulting from the regular operation of the facility and traffic.

The investigations carried out with regards to the human population to be protected should also include whether relevant changes of the noise situation will influence the fauna. In particular, the impact on sound-sensitive bird species should be taken into account.

4.2.3.3.4 Heat

- Operation
  Description and evaluation of the impact of possible discharge of cooling water.

Table 8: Relevance matrix – resources "fauna", "flora" and their habitats

	Project phase		
	Construction	**Operation**	**Accident, interruption of operations**
Existence of the project	**X**	**X**	
Use of natural resources		**X**	
Emissions			
Gaseous and particulate emissions	**X**	**X**	**X**
Odour			
Emissions to water		**X**	
Noise	**X**	**X**	
Vibrations			
Waste, excavated soil	**X**		
Heat		**X**	

4.2.4 Soil, agricultural quality and produce

4.2.4.1 Impact as a result of the existence of the project

- Construction
  - Description and evaluation of the (temporary) sealing of the soil and traffic space;
  - Description of soil consumption during the construction phase;
  - Details regarding the use or disposal of excavated material.
- Operation
  - Description and evaluation of the (temporary) sealing of the soil by buildings and traffic space (including rail links and roads);
  - Description of the soil consumption, especially the consumption of agricultural acreage;
  - Changes to the soil during construction and operation;
  - Description of possible lasting effects.

4.2.4.2 Impact resulting from the use of natural resources

In this respect, the impact on the function of the soil as a supplier of raw materials must

be investigated.

4.2.4.3 Impact resulting from emissions

4.2.4.3.1 Gaseous and particulate emissions

- Construction
  Description and evaluation of the impact of air pollution immission caused by activities at the construction site and traffic.
- Operation/accident
  Immission forecast for the soil: Description of the impact on the soil characteristics established during assessment of the present situation and evaluation of the additional contaminant loads. Reference will be made to the results of the dispersion calculation (additional immission and depositions). The following aspects will receive special attention:
  - Forecast of the immission and deposition of: NO_2, total N, SO_2, HCl, HF and heavy metals;
  - Evaluation of the acid and nitrogen load on the soil. These should be evaluated on the basis of “Critical Loads”;
  - Description of the impact of the heavy metal load to the soil;
  - Description of the impact resulting from the load of organic contaminants, especially of PCDD/F;
  - Forecast of the accumulation of potential contaminants in the soil;
  - Forecast of the transfer of contaminants from the soil into plants;
  - Forecast of the transfer of contaminants from the soil into ground water.

4.2.4.3.2 Emissions to water

- Construction
  Impact of emissions to water on the resource "soil" (e.g. by contamination of the soil during the construction phase.)
- Operation/accident
  Impact of emissions to water during operation or in case of an accident (e.g. leakage from the waste silo) on the resource "soil"; if possible also considering direct or indirect influences on the ground water.

Table 9: Relevance matrix – resource soil

	Project phase		
	Construction	**Operation**	**Accident, interruption of operations**
Existence of the project	**X**	**X**	
Use of natural resources			
Emissions			
Gaseous and particulate emissions	**X**	**X**	**X**
Odour			
Emissions to water	**X**		**X**
Noise			
Vibrations			
Waste, excavated soil	**X**		
Heat			

4.2.5 Geology and geomorphology, palaeontology

This assessment shall include the impacts of the geology including the economic feasibility of the reuse of the excavated material, giving due consideration to all possible alternative uses. The assessment shall also investigate the effects and risks of excavations on the stability of the surrounding land, given the type of rock in the area.

This should comprise palaeontological, geomorphological, and physiographic aspects. The assessment of significance of impacts (positive and negative) should also include

- soil and coastal erosion
- slope stability / instability.

If the impact assessment predicts potential hazards like slope instability or subsidence a risk assessment should be carried out.

4.2.6 Water and hydrological features

4.2.6.1 Impact as a result of the existence of the project

- Construction and operation
  Description of the impact onto the ground water, e.g. impact on the rate of formation of new ground water and the water balance; changes of flow characteristics, impact of the sealing of soil.

4.2.6.2 Impact as a result of using natural resources

- Operation
  Description of extractions - envisaged extracted quantities of cooling water, water for fighting fires, drinking water, etc

4.2.6.3 Impact of emissions

4.2.6.3.1 Emissions to water

Construction / operation / accident

An EIS / EPS must include a portrayal of the following impact on the resource "water":

- Immission forecast for the water, including a risk estimate of transfer of contaminants from the soil into the ground water;
- Description of the impact of a possible discharge of contaminants into the (ground) water, for example if the waste silo leaks;
- In case of accidents: taking into account the possible impact of water used for fire fighting.

4.2.6.3.2 Gaseous and particulate emissions

Construction / operation / accident

- Description of the possible impact of gaseous and particulate emissions on water bodies during the construction and operational phase as well as in case of accidents.

4.2.6.3.3 Heat

- Operation
  Description of the possible impact of increasing the temperature of a water body (marine) by discharging cooling water.

Table 10: Relevance matrix – resource "water"

	Project phase		
	Construction	**Operation**	**Accident, interruption of operation**
Existence of the project	**X**	**X**	
Use of natural resources		**X**	
Emissions			
Gaseous and particulate emissions	**X**	**X**	**X**
Odour			
Emissions to water	**X**	**X**	**X**
Noise			
Vibrations			
Waste, excavated soil	**X**	**X**	
Heat		**X**	

4.2.7 Cultural heritage and protected sites and areas

4.2.7.1 Impact resulting from the existence of the project

- Construction/operation
  Description and evaluation of the impact of land use (damages, destruction) on real and cultural assets; description and evaluation of visual changes of the landscape and townscape in the context of cultural assets (monuments, etc.)

4.2.7.2 Impact resulting from the use of natural resources

Under normal conditions, no relevant impact is to be expected.

4.2.7.3 Impact caused by emissions

4.2.7.3.1 Gaseous and particulate emissions

- Construction/operation
  Description and evaluation of the air contaminant immission caused by building activities, operation of the plant and traffic (lorries, cars and ships).

4.2.7.3.2 Vibrations

- Construction/Operation
  Description and evaluation of the vibrations caused by construction activities and the operation of the plant.

Table 11: Relevance matrix – resource "material and cultural assets"

	Project phase		
	Construction	**Operation**	**Accident, interruption of operation**
Existence of the project	**X**	**X**	
Use of natural resources			
Emissions			
Gaseous and particulate emissions	**X**	**X**	
Odour			
Emissions to water			
Noise			
Vibrations	**X**	**X**	
Waste, excavated soil			
Heat			

4.2.8 Landscape and topography, including the coast and submarine features

4.2.8.1 Impact resulting from the existence of the project

- Construction and operation

Description and evaluation of the impact caused on:

- The natural space potential;
- Landscape as a natural and cultural space;
- Landscape as a recreational and adventure space;
- Scenery/aesthetics (for visualisation, for example by photomontage).

4.2.8.2 Impact resulting from the utilisation of natural resources

As a rule, no relevant impact is to be expected.

4.2.8.3 Impact caused by emissions

As a rule, no relevant impact is to be expected.

Table 12: Relevance matrix – resource landscape

	Project phase		
	Construction	**Operation**	**Accident, interruption of operations**
Existence of the project	**X**	**X**	
Use of natural resources			
Emissions			
Gaseous and particulate emissions			
Odour			
Emissions to water			
Noise			
Vibrations			
Waste, excavated soil			
Heat			

4.3 Mitigation Measures

According to Article 17 of LN 204/ 2001 the consultants shall state clearly what significance they attribute to these effects and the mitigation measures they propose to be incorporated in the development and evaluate their effectiveness.

The description of measures for offsetting detrimental effects on the environment (for example as a result of unavoidable interference with the nature and landscape balance) depends on each individual case so that the following comments should be seen as a framework for orientation.

4.3.1 Population

4.3.1.1 Measures against detrimental effects

As far as the avoidance of detrimental effects on the population to be protected is concerned, an ES will focus especially on the following aspects:

- Choice of location, measures for planting grass, trees or shrubs, compensating measures, architectural design and integration of the plant into the landscape/townscape (see fauna and plants be protected and their habitat as well as landscape);
- Measures for avoiding detrimental effects on the water (see "water" as a resource to be protected);
- Measures for decreasing the emission of polluting contaminants (see "air" and "climate" as resources to be protected);
- Measures for decreasing the emission of odours from waste incineration plants:
  - Selection of appropriate container systems (e.g. sealed containers);
  - Useful measures for storing areas (e.g. casings, self-closing doors in the hall where the waste is delivered);
  - Guiding malodorous air from relevant areas of the plant via the combustion line(s), approach in case of malfunction of the combustion line(s) and, for example, waste residues in the silo.
- Measures for avoiding/reducing the impact caused by vibrations (proper selection of the site, building site management, technical design of the plant);
- Measures for avoiding/reducing the impact caused by sound emissions (traffic on the site of the plant, selection of routes for incoming and outgoing traffic, building site management, times of operation, technically useful design of the plant, encapsulation, sound insulation of building components).

4.3.2 Flora, Fauna and ecosystems (terrestrial and marine), including both habitants and species and, in particular, protected and endangered species and their habitats

4.3.2.1 Measures against detrimental effects

In order to avoid detrimental effects on the resources "fauna", "flora" and their habitats, an ES will especially describe the following aspects:

- Measures to avoid detrimental effects on water (see resource "water");

- Measures to reduce the emission of contaminants polluting the air (see resource "air and climate");
- Measures for avoiding/reducing the effects of sound emission and vibrations (see "population to be protected");
- Avoidance/reduction of detrimental effects by proper selection of the location;
- Avoidance of unnecessary use of land;
- Avoidance of lasting effects;
- Measures for planting grass, shrubs and trees;
- Compensating measures, establishing new biotopes, replanting of trees;
- Description of measures for the conservation of evidence.

4.3.3 Soil, agricultural quality and produce

4.3.3.1 Measures against detrimental effects

In order to avoid detrimental effects on the resource "soil", an ES will focus on the following aspects when describing the project:

- Avoidance/reduction of detrimental effects by appropriate selection of the location;
- Avoidance of unnecessary use of land (see resource flora and fauna, biotopes and eco-systems):
- Avoidance of lasting effects;
- Steps for reducing emissions of polluting contaminants (see resources "air" and "climate");
- Steps for avoiding the emission of contaminated water into the soil (sealing of the waste silo; precautionary measures for malfunctions).

4.3.4 Water and hydrological features

4.3.4.1 Measures against detrimental effects

As far as the avoidance of detrimental effects on the resource water is concerned, an ES should especially include the following aspects:

- Measures for protecting the ground water (sealing of the foundations and the waste silo, etc.)
- Operating the flue gas cleaning plant without generating waste water;
- Other measures for avoiding negative effects on the resource water.

4.3.5 Air and climate, including prevailing meteorological factors and air quality

In order to avoid detrimental effects on the resources air and climate, an ES should place particular emphasis on the following aspects:

4.3.5.1 Reduction of the emission of air-polluting contaminants

- Organisational measures during the construction period (wetting of dusty areas)
- Emissions through the chimney: For example, control of the thermal treatment process (residence times, treatment temperature), flue gas cleaning (separation and retention of dust, scrubber, reduction or elimination of nitrogen);

- Diffuse emissions: Exhaustion of air from relevant sections of the plant (such as the waste silo, reception area, possibly the sludge silo) and use as combustion air;
- Air contaminants caused by traffic: Traffic management on site, selection of routes for arrivals and departures.

4.3.5.2 Avoidance/reduction of an impact on the climate

- Macro-climate: Selection of the location, consideration of heat extraction for off-site heating or cooling purposes..
- Micro-climate: Selection of the location, placement of the buildings, possibly planting grass, shrubs and trees around the plant.

4.3.5.3 Measures for monitoring the quality of the air

For waste incineration plants, the following continuous and intermittent monitoring measures are usually called for:

- Continuous measurements
  - in purified exhaust gas: dust, HCl, SO_2, CO, CO_2, NO_x (given as NO_2), hydrocarbons not combusted, oxygen, combustion gas temperature;
  - in the post-combustion chamber: combustion gas temperature.
- Intermittent measurements: HF, NH_3, Pb, Zn, Cr, As, Co, Ni, Cd, Hg, Cu and Mn, PCDD and PCDF.

Individual measurements should be carried out for the operation conditions in which the plant is verifiable mainly operated. The individual measurements with the necessary quality assurance steps must be carried out in accordance with the state of the art.

4.3.6 Landscape and topography, including the coast and submarine features

4.3.6.1 Measures against detrimental effects

As far as the avoidance of detrimental effects on the resource landscape is concerned, the following aspects should be emphasised in an ES:

- Selection of the location, avoidance of unnecessary use of land, avoidance of lasting effects, integration of the plant into the landscape, measures for planting grass, shrubs and trees, compensating measures, replanting of temporarily cleared spaces (see resource "fauna", "flora" and their habitats);
- Suitable selection of the location with a view to integrate it into existing structures;
- Architectural design of the plant.

4.3.7 Cultural heritage and protected sites and areas

4.3.7.1 Measures against detrimental effects

With a view to avoide detrimental effects on the resource real and cultural assets, an ES shall especially describe the following aspects:

- appropriate selection of the location in order to avoid damages to real and cultural assets,
- measures for reducing emissions (especially SO_2), and

- the avoidance of vibrations.

4.3.8 Any other relevant environmental features

4.3.9 Summary of Impacts and Mitigation

In the following table you can find a summary of the impacts.

Table 13: Summary of the impacts (by MEPA), part 1

Predicted Impact	Beneficial/ Adverse	Cons/Operation	Extent of Impact	Direct/ Indirect	Short-/ Longterm	Permanent/ Temporary

Table 14: Summary of the impacts (by MEPA), part 2

Reversible/ Irriversible	Policy Importance	Probability of Impact Occurring	Significance of Impact	Proposed Mitigation Measures	Significance of Residual Impact

5 NON-TECHNICAL SUMMARY

According to Article 20 § (b) Sub. (1) Environmental Impact Assessment Regluations, 2001 Arrangement of Regulation, a non-technical summary has to be presented in Maltese and English language. The objective of this summary is closely related to the legal right to information and involvement of the public in an EIA process.

This summarised description shall give those parties involved in the process who are not technical experts easy access to the results of the investigations carried out by the developer in connection with the project. Therefore, it is essential to process the vast amount of information gathered in connection with an EIS/EPS in compact form and to publicise it in a way that is easy to understand. Therefore, a minimum of technical and scientific terms should be used and a form of presentation with a high content of information selected (structure, the use of colour as a design element, graphic illustrations, etc.)

The summary should be conceived as a separate and conclusive document.

Requirements of a non-technical summary:

- Completeness;
- Clear structure and outline:
  - Description of the project;
  - Alternative solutions;
  - Description of the present situation, the key impact and the mitigation measures classified by resources worth protecting; and
  - Description of the interaction between the resources concerned.
- Comprehensibility, no technical terms;
- Comprehensibility lists of data and detailed explanations of scientific reasoning
- Compact wording, concentration on the essentials;
- No cross-references to individual technical reports;
- Clear layout both from a factual and optical point of view.

6 SHORT DESCRIPTION OF POSSIBLE DIFFICULTIES

Problems may arise in connection with drawing up an ES which (in the opinion of the developer or the consultant) may prevent a conclusive evaluation of facts.

In particular, this is related to missing data and "technical gaps". However, any problems that have arisen must be explained in a comprehensible manner. Therefore, the "burden of proof" of an EIS/EPS is not unlimited, but focused on that information and descriptions which are obtainable on the basis of existing or accessible knowledge.

7 BEST AVAILABLE TECHNIQUES (BAT) FOR WASTE INCINERATION

An application according to the IPPC-Directive must include expected emission values and a description of technical measures, which have to be based on the best available techniques. The IPPC Reference Document on the Best Available Techniques (BREF) for Waste Incineration provides relevant information concerning best available techniques.

The information provided in the BREF for Waste Incineration is intended to be used as an input to the determination of BAT and the setting of BAT-based permit conditions.

Chapter 5 of this BREF presents the techniques and the emission and consumption levels that are considered to be compatible with BAT in a general sense, which the developer has to consider. The purpose is thus to provide general indications regarding the emission and consumption levels that can be considered as an appropriate reference point to assist in the determination of BAT-based permit conditions.

The applicant will have to take into account the local, site-specific factors such as the technical characteristics of the installation concerned, its geographical location and the local environmental conditions and clearly indicate in the IPPC application the reason for choosing one technique over the other.

For the interpretation of the emission and performance levels associated with the use of BAT as reported in the BREF it is essential to consider the following:

- The BREF does not propose emission limit values (ELV) as the Directive 2000/76/EC on the incineration of waste does but emission and performance levels associated with the use of BAT. The emission and performance levels given in the BREF are the operational performance levels that would normally be anticipated from the application of BAT. The higher ELVs have given rise to this level of performance. In a hypothetical example, if the ELV for HCl is set at 10 mg/Nm^3, a supplier of a particular technology may, as part of their equipment supply contract, choose to provide a performance guarantee in the region of 7 - 8 mg/Nm^3. In such a situation the plant might then typically operate at 1 - 5 mg/Nm^3 with some transient variations above this.
- Emission or consumption levels “associated with best available techniques” represent the environmental performance of the application of the techniques described, bearing in mind the balance of costs and advantages inherent within the definition of BAT (taking into account the local, site-specific factors such as the technical characteristics of the installation concerned, its geographical location and the local environmental conditions).
- The emission and performance levels associated with the use of BAT are given with specific reference conditions, for example emissions to air are standardised at 11 % Oxygen, dry gas, 273K and 101.3kPa.

The BREF does not deal with site selection criteria for waste incineration plants, but it is the case that for some of the BAT to be fulfilled, special site conditions are required (e. g. efficient use of energy). BAT includes both the technology used and the way in which the installation is designed, built, maintained, managed, operated and decommissioned.

The BAT include generic BAT for all types of waste incineration installations and specific BAT for certain waste types (municipal waste incineration, pre-treated or selected municipal waste incineration, hazardous waste incineration, sewage sludge incineration, clinical waste incineration).

The BAT in the area of waste incineration is determined by 82 numbers in Chapter 5 of the BREF. Since BAT changes over time, the BREF may be updated from time to time.

In practice the developer has to start with the combination of the generic BAT with the waste type specific BAT and to adjust to the local conditions.

Please note:

When describing the project according to chapter 2 the best available techniques have to be considered and BAT is determined in the 82 numbers in chapter 5 of the BREF.

Below you can find a classification of these 82 numbers to the different parts of chapter 2.

Generic BAT (are considered to be generally applicable to all types of waste incineration installations)

- Ad chapter 2.1 “A description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases”

BAT-number:	56

- Ad chapter 2.2 “A Description of the main characteristics of the production processes, for instance, nature and quality of the material used”

BAT-number:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 (table 5.2), 36, 37 (table 5.3), 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48 (table 5.4), 49

- Ad chapter 2.3 “An estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed project”

BAT-number:	50, 51, 52, 53, 54, 55

Specific BAT for municipal waste incineration

- Ad 2.2 “A Description of the main characteristics of the production processes, for instance, nature and quality of the material used”

BAT-number:	57, 58, 59, 60, 61, 62, 63

Specific BAT for pre-treated or selected municipal waste incineration

- Ad 2.2 “A Description of the main characteristics of the production processes, for instance, nature and quality of the material used”

BAT-number:	64, 65, 66, 67, 68

Specific BAT for hazardous waste incineration

- Ad 2.2 “A Description of the main characteristics of the production processes, for instance, nature and quality of the material used”

BAT-number:	69, 70, 71, 72, 73, 74, 75

Specific BAT for sewage sludge incineration

- Ad 2.2. “A Description of the main characteristics of the production processes, for

instance, nature and quality of the material used”

BAT-number:	76,77

Specific BAT for clinical waste incineration

- Ad 2.2 “A Description of the main characteristics of the production processes, for instance, nature and quality of the material used”

BAT-number:	78, 79, 80, 81, 82

8 LIST OF REFERENCES

(1) Council Directive 97/11/EC of March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment

(2) European Commission (2006): Integrated pollution Prevention Control – Reference Document on the Best Available Techniques for Waste Incineration, Brussels. (**http://eippcb.jrc.es/pages/FActivities.htm**)

(3) Malta (2001): Development Planning Act (Cap. 356) – environmental Impact assessment Regulations, 2001. Arrangement of Regulations, Valetta.

(4) MEPA (2007): Description of Project at Location – Terms of Reference fort he Preparation of an Environmental Impact/Planning Statement (Draft)

(5) Umweltbundesamt (2001): BE-196 Leitfaden zur Erstellung von Umweltverträglichkeitserklärungen für Abfallverbrennungsanlagen und thermische Kraftwerke, Umweltbundesamt, Wien.

(6) Umweltbundesamt (2007, to be published): Leitfaden zur Erstellung von Umweltverträglichkeitserklärungen für Verbrennungs- und Mitverbrennungsanlagen, thermische Kraftwerke und Feuerungsanlagen (Draft)

(7) Umweltbundesamt (2007, to be published): UVE-Leitfaden. Eine Information zur Umweltverträglichkeitserklärung. Überarbeitete Fassung 2007 (Draft)