Manual for the Preparation of Waste Sector Projects for the Cohesion Fund

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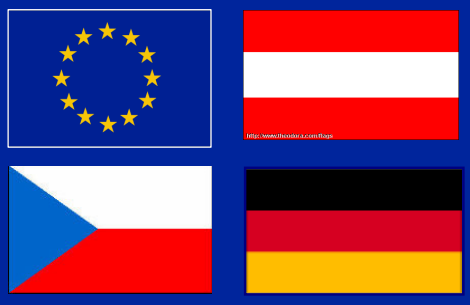
8 November 2004

Twinning project

FINANCING TOOLS

to implement *acquis*
in the environment sector

Waste Management



Twinning project number: CZ02/IB/EN/04

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Summary

This main purpose of this Manual is to assist investors and public authorities in the preparation of high-quality projects in the waste management sector for support from the Cohesion Fund. A second objective is to provide additional information on how to comply with the requirements of the "*Guidance setting minimum criteria for residual municipal solid waste projects submitted for support from the Cohesion Fund*" ('the Guidance'), which is expected to be issued by the Ministry of Environment before the end of 2004. Some basic information is also provided concerning funding from Operational Programme Infrastructure in the waste management area.

The Manual brings together the experience and outputs from the work undertaken by the Twinning Project '*Financing Tools to Implement Acquis in the Environment Sector*' from February 2003 to July 2004. In particular, the Twinning team participated in the early stages of development of two pilot projects for the disposal of residual municipal solid waste (MSW), in the Hradec Králové and Pilsen regions (as well as some other projects in the waste sector). A third objective is therefore to bring together relevant documents and outputs from the Twinning project in a single place, linked together by cross-references (hyperlinks in the electronic version). The Manual also makes reference to the experience of other EC Member States, especially Austria.

Waste management as a whole covers a wide variety of waste types, including municipal, industrial, construction and demolition wastes, agricultural wastes and others. Because of the polluter pays and the producer responsibility principles, however, the main need for public investments is in the management of municipal solid wastes, where the municipal authorities have primary responsibility for management. The focus of the Manual is therefore in this area.

The Manual begins with a brief summary of Czech and EU policy and legislation in relation to waste management, because these set the objectives that drive the proposed investments and standards that they must comply with. The Czech Republic already has a well-established and functioning infrastructure for municipal waste management, but one which relies to a large extent on landfill as the main disposal option. For this reason the EC Landfill Directive is the main legislative driver for change and the Manual provides guidance on how projects should be developed to meet the targets for reduction in landfilled biodegradable MSW.

The work undertaken by the Twinning team on the pilot projects was at a relatively early stage of project development. The emphasis was on the link between the proposed projects and the regional waste management plans (which were being finalised at this time) and on a comparison of options for achieving the necessary objectives. All projects of this type must go through these stages (as required by the Guidance) and so the Manual is also focused on these earlier stages of project preparation – project identification and project definition.

After describing the objectives set by legislation, the Manual presents the main approaches for how to meet the targets for reducing the landfill of biodegradable municipal waste. Section 4 explains how important it is to expand separate collection and recycling / recovery of biodegradable wastes as a cost-effective contribution to meeting the targets. An example is presented showing that, if it costs CZK 2 000 per tonne for the stabilisation of residual (mixed) MSW, it can be cost effective to spend up to CZK 2 500 per tonne for the separate collection and recycling / recovery of biodegradable wastes (especially paper, card and biowaste). Section 5 goes on to describe the main technical options for stabilisation of residual MSW – mechanical-biological and thermal treatment. Mechanical-biological treatment is understood primarily as a means of stabilising waste prior to final disposal, i.e. reducing its biodegradability, not as a form of recovery.

In Section 6 the Manual continues with a calculation of how much additional capacity is likely to be needed at national level for the stabilisation and disposal of residual MSW (this part of the Manual is the same as the relevant chapter of the Guidance). The conclusion is that the Czech Republic will need to invest between CZK 2 and 3 billion (€ 65m - € 95m) by the end of 2012 in order to procure a further 100 000 to 200 000 tonnes/year of treatment capacities, so as to meet the 2013 target for the landfilling of biodegradable municipal wastes. These figures assume that ambitious targets for separate collection and recycling / recovery will be met. Because the planning of large waste management facilities is a lengthy process, including both environmental impact assessment and IPPC permitting, not to mention the need to raise the necessary capital, the planning of new capacities must start now if the Czech Republic is to comply on time.

Section 7 puts the process of project preparation into the context of the regional waste management planning process. The purpose of the section is to explain how the development of investment projects (associated with MSW) should be an integral part of the waste management planning process. The section stresses in particular the need to plan separate collection and recycling / recovery activities at the same time as planning facilities for the treatment of residual MSW. It also lists the benefits to be gained for municipalities by forming associations for the purposes of waste management.

The following Section explains how to undertake a basic assessment of different options in order to achieve a given target (or targets). At the heart of the assessment process lies the consistent assessment of costs, based always on the same system boundaries. The general approach is described and detailed examples are presented (with full documentation available on the CD that accompanies this Manual). The outcome of the cost assessment is a calculation of the cost per tonne of waste treated, taking account of both capital (once-off investment) costs and operating costs. It is explained how the sensitivity of the result should be tested with respect to a set of key input assumptions and parameters; such a sensitivity analysis can also serve as the basis for a simplified assessment of the risks associated with the project. The comparison of the costs of different options should always be done without consideration of any grant or other support, in order to determine the economically most advantageous option for society as a whole.

The impact of grant support (for investment costs) should be considered as a second step. Different rates of grant support should be considered with the aim of finding what rate of support leads to a price that will be cost-competitive with the alternative. The alternative is landfill, but at a cost reflecting higher technical standards and the increase in the mandatory charges given by current legislation. After a brief description of how selected environmental impacts can be assessed, the Section explains how a multi-criteria analysis can be used to assist in making the choice of the preferred option, taking into account not only cost-effectiveness but other criteria as well. It concludes with an overview of the requirements for the economic analysis of projects for the Cohesion Fund and for OP Infrastructure.

The main conclusions and recommendations from the Manual are as follows:

- Public funds should be focused primarily in the area of municipal solid waste, where the largest investments will be needed and where the producer responsibility and polluter pays principles do not rule out public funding.
- The planning of these investments must be an integral part of the regional waste management planning process. One of the key aims of this process should be to determine and implement the right level of separate collection (and recycling/recovery) activity, since this can be much more cost-effective than treatment of residual MSW.

- Nevertheless it is unrealistic to expect that the Czech Republic will comply with the 2013 target for reduction of landfilled biodegradable MSW without also investing in facilities for the treatment of residual MSW. Planning for these facilities must start now (2004) if they are to be available in time to contribute to meeting the target.
- Before a commitment is made to a particular project, a comparison of options must be undertaken following a set of basic principles (as set out in Guidance to be issued by the Ministry of Environment).
- Projects dealing only with residual MSW are acceptable for Cohesion Fund support. Projects that also include complementary elements of separate collection (and recycling / recovery) are however preferred (all other things being equal). It is nevertheless recognised that 'integrated' projects containing both elements are likely to be more complex and so more difficult to prepare and implement successfully.
- Particular care must be taken when preparing projects for support from the Cohesion Fund to respect the polluter pays principle, especially if wastes other than municipal wastes are involved.
- Care must also be given when considering the role of the private sector in EC-funded projects. Cohesion Fund projects must respect the European Commission's approach to Public Private Partnerships and public procurement requirements. Projects for OP Infrastructure must respect (complex) State Aid rules, which may in practice limit the level of support that is possible to give to private applicants to less than 35% of eligible costs.

Technical note:

The hyperlinks in this text (shown underlined and in blue) are automatic links to other related documents. It is necessary to update the 'hyperlink base' in the MS Word menu 'File – Properties – Hyperlink base' depending on where the files for the Manual are located on the computer in question. For instance, if the Manual were located in 'C:\Manual', this is what should be entered as the hyperlink base. Hold down the 'Ctrl' key whilst clicking on the link.

Content

List of Abbreviations

BPEO	Best Practicable Environmental Option
BRKO	Biologicky Rozložitelných Komunálních Odpadů (biodegradable municipal solid waste)
CBA	Cost Benefit Analysis
CF	Cohesion Fund
CR	Czech Republic
EC	European Community
MBT	Mechanical / Biological Treatment of waste
MBTh	Mechanical / Biological / Thermal Treatment of waste
MoE	Ministry of Environment
MoF	Ministry of Finance
MSW	Municipal Solid Waste
NWMP	National Waste Management Plan
OP-Infra	Operational Programme Infrastructure
RA	Regional Authority
RDF	Refuse Derived Fuel
RWMP	Regional Waste Management Plan
RWMS	Regional Waste Management Strategy (Koncepce)
SEA	Strategic Environmental Assessment
SEF	State Environmental Fund
WMP	Waste Management Plan(s)

1. Available EU funds

The two main EU funds available for the waste management sector are the Cohesion Fund and Operational Programme Infrastructure – OP Infra (part of the European Regional Development Fund). The following table gives an overview of these two programmes.

There are of course other sources of grant finance for waste management projects, notably the national funding programme of the State Environmental Fund.

This Manual is primarily aimed to assist in the preparation of projects for the Cohesion Fund.

Table 1: Overview about the two main EC funds for the waste management sector - Cohesion Fund and OP Infrastructure

	Cohesion Fund	OP Infrastructure
Legal Basis	EC Regulations 1164/94, 1264/1999	EC Regulation 1260/1999, 1783/1999
Size of investment	Larger than €10m (Kc 320m)	Up to €10m (Kc 320 Mio)
Decision making	European Commission	Czech authorities
Managing Authority in the CR	Ministry for Regional Development	Ministry of Environment
Relevant implementation bodies	Ministry of Environment, State Environment Fund	State Environment Fund
Typical types of projects	• Integrated waste management systems including a number of elements (group projects) • Complete waste management centres consisting of a number of plants like composting, mechanical-biological treatment, sorting, demolition waste recovery, etc. • Incineration plants for residual municipal solid waste and other types of waste (reconstruction and construction)	Elements of integrated waste management systems, including waste collection, recovery and recycling, for instance: • Municipal collection yards • Anaerobic digestion plants
Maximum subsidy		
Private Investors	Not eligible – see MoE Directive 6/2004	35%
Public Investors	80% (for income-generating projects in the Czech Republic)	50%

2. EC-Legislation, key principles and main targets

2.1. KEY PRINCIPLES

There are a number of key principles that need to be taken into account in establishing and implementing a strategic plan for managing wastes. These are:

- European Waste Hierarchy
- Best Practicable Environmental Option (BPEO)
- Sustainable development
- Proximity principle and self-sufficiency
- Precautionary principle
- Polluter pays principle
- Producer Responsibility

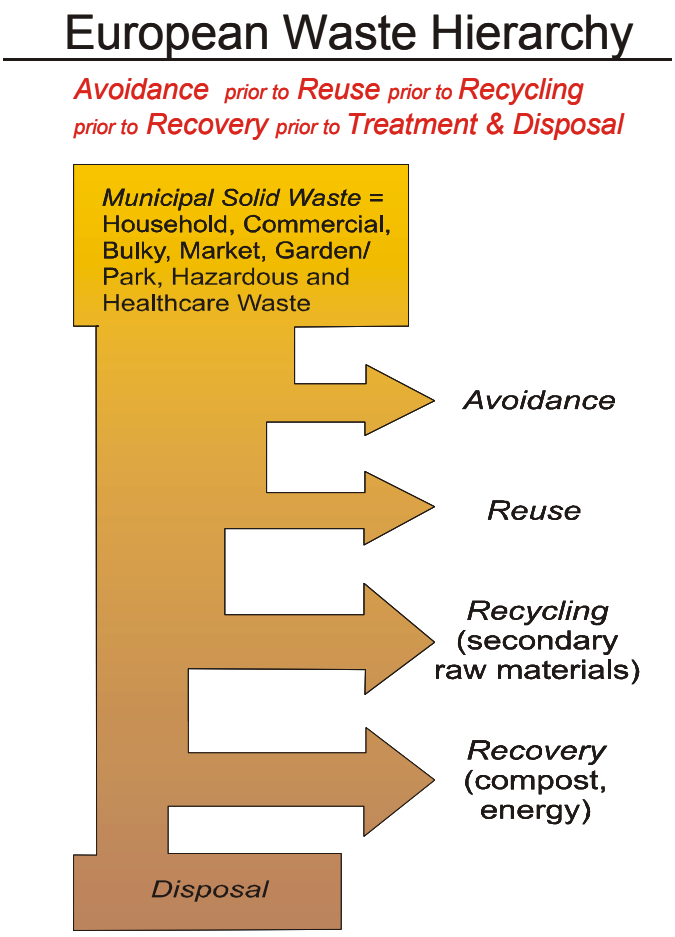
It has to be stressed that projects asking for support from EC-funds have to consider these key principles. The consideration of the key-principles has to be part of the project description.

The key principles are explained briefly below.

European Waste Hierarchy

This hierarchy as a general guideline which has been developed over the last two decades in various European member states, and provides a preferred order of priorities for selecting and deciding upon waste management practices. These are shown in the figure below:

Figure 1 The European Waste Hierarchy



1. Waste avoidance / prevention / reduction – minimising the use of resources, and reducing the quantities and / or hazardous qualities of the wastes generated

2. Reuse – Using products or items again for the same or different purposes

3. Recycling – Reprocessing of waste materials for use as a feedstock in the manufacture of the same or a different product

4. Recovery – Obtaining value from wastes by composting, energy recovery or other technologies

5. Disposal – If there is no other appropriate solution, the disposal of waste by landfilling with or without prior treatment (incineration, MBth-treatment)

This Waste Hierarchy needs to be considered in conjunction with other principles, in particular the 'Best Practicable Environmental Option (BPEO)'.

Best Practicable Environmental Option (BPEO)

The Best Practicable Environmental Option (BPEO) is the outcome of a systematic and consultative decision-making process that emphasises the protection and conservation of the environment across land, air and water. The BPEO process establishes for a given set of objectives the option (or combination of options) that provides the greatest benefits or least damage to the environment as a whole, at acceptable cost, in the long term as well as in the short term.

Sustainable Development

The term 'sustainable development' is generally understood to mean development pursued in a manner that, in meeting present needs, does not compromise the ability of future generations to meet their own needs.

With respect to these criteria, sustainable waste management means first of all using resources more efficiently, reducing the amount of waste we produce and, where waste is generated, dealing with it in a way that will help to achieve the goal of sustainable development.

Proximity Principle and Self-Sufficiency

The proximity principle means that waste should be treated or disposed of as near as possible to the point where it arises. Communities should recognise that management of the waste they produce is an issue that they must deal with. Local / regional authorities and businesses should keep the proximity principle in mind when they consider the requirements for, and location of, waste management facilities. The principle aims to avoid the adverse environmental impacts of unnecessary waste transport. However, the environmental impacts of transporting wastes depend on the mode of transport adopted. For example, a longer journey by rail may be environmentally preferable to a shorter journey by road.

The application of the principle will therefore vary according to the waste concerned, the volume and the potential environmental impact of the method of waste disposal and mode of transport. There also has to be a balance between the proximity principle and economies of scale. In some cases, economies of scale may mean that some specialist treatment, recovery or disposal operations may be located far from the point where the waste arises.

The overall aim of the proximity principle is to move as far as practicable towards self-sufficiency in sustainable waste management, both nationally and regionally.

Precautionary Principle

The UN Conference on Environment and Development, in the Rio Declaration (1992), defined the precautionary principle as "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation". The principle involves taking precautions now to avoid possible environmental damage or harm to human health in the future, even although the scientific basis for taking the precautions may be inconclusive.

Polluter Pays Principle

The polluter pays principle means that the polluter should bear the full cost of the consequences of their actions. The potential environmental and human health costs of producing, treating and disposing of waste should therefore be reflected in the price of products and the charges associated with the management of wastes. This principle is particularly relevant in the provision of grant support for waste management projects – grant support is primarily intended to ease the cost burden on households as waste producers, not on industry (where EC policy and legislation generally require strict application of the 'polluter pays' principle on internal-market grounds).

Producer Responsibility

The principle of 'Producer Responsibility' means that the manufacturers, importers, distributors and retailers of products that give rise to the generation of wastes, should take collective

responsibility for those wastes, rather than expecting the community to bear the burden of arranging and paying for waste collection, treatment and disposal.

The meaning of 'producer' in this context is much broader than the normal sense. Considering the life cycle of a product from its manufacture until the end of its useful life, it is not only the manufacturer who influences the waste generating and management characteristics of a product – others also play a significant role. However, it is the manufacturer who has the dominant role, since it is the manufacturer who takes the key decisions concerning the design and composition of the product that largely determine its waste generating potential and management characteristics.

This principle therefore implies that waste producers should take responsibility for:

- Minimising their waste arisings.
- Designing and developing goods which are inherently recyclable and do not contain materials that pose an unnecessary risk or burden for the environment.
- Developing markets for the re-use and recycling of the goods they produce.

2.2. EUROPEAN POLICY & LEGISLATION

The last two frame development programs of the EC are the 5th and the 6th Action Programme for the Environment. The most important parts for Waste Management are described briefly in the following paragraphs.

European Union policy on waste management is set out in broad terms in the Fifth Action Programme for the Environment (1992-1999), 'Towards Sustainability', (COM (92) 93) and more specifically in the Community Strategy for Waste Management[1].

Chapter 5.7 of the Action Programme deals specifically with waste management. This reaffirmed the hierarchy of waste management options (see above) already laid down in the Community Strategy, and set some specific performance targets for waste including:

- stabilising the production of municipal waste at the 1985 level of 300 kg / cap. /annum
- recycling 50% of paper, glass and plastics
- ending the export of waste for disposal outside the EU
- a 90% reduction in dioxin emissions (from incineration)
- increased recycling of consumer products and development of the market for recycled products
- an EU-wide infrastructure for the safe collection, separation and disposal of hazardous waste
- the banning of certain wastes from landfill.

Specific policy proposals concerning waste were presented in the Community Waste Management Strategy, which was published in 1989. Its principles were reflected in the amendment Waste Framework Directive (91/156/EEC), which gave concrete legal expression to the concept of the waste hierarchy and to the principles of proximity and self-sufficiency.

In July 1996 the Commission issued a new Community Waste Strategy to replace the 1989 document. This new Strategy confirms the original waste hierarchy: materials recovery (recycling) is placed above energy recovery in the hierarchy, but recognises that in some circumstances, economic and environmental factors will mean that incineration with energy

[1] First published as a Commission Communication to Council SEC (89) 934 Final

recovery will be the most appropriate option. The strategy emphasises that "particular care should be taken to avoid as much as possible incineration options without energy recovery". It suggests that only wastes above a certain calorific value should be considered as wastes for energy recovery. Landfill is viewed as an option of last resort: the Strategy recommends pre-treatment of all wastes prior to landfilling, and proposes that only non-recoverable or inert wastes be landfilled. Producer responsibility is a major theme of the Strategy. The manufacturer and others in the supply chain are viewed as playing a key role in moving towards a 'closed loop', both by ensuring that resources are used efficiently and that products are collected and re-used or recycled once they become waste.

In January 2001, the Commission published a Sixth Action Programme for the Environment (2001-2010), 'Environment 2010: Our future, Our choice', (COM (2001) 31). This was approved in June 2001. The Programme's objectives and targets relating to waste are reproduced in Table 2.

Table 2: Waste-Related Objectives and Targets in the 6th Action Programme for the Environment, 2001-2010

Objectives:
• To decouple the generation of waste from economic growth and achieve a significant overall reduction in the volumes of waste generated through improved waste prevention initiatives, better resource efficiency, and a shift to more sustainable consumption patterns.
For wastes that are still generated, to achieve a situation where:
• The wastes are non-hazardous or at least present only very low risks to the environment and health;
• The majority of the wastes are either reintroduced into the economic cycle, especially by recycling, or are returned to the environment in a useful (e.g. composting) or harmless form;
• The quantities of waste that still need to go to final disposal are reduced to an absolute minimum and are safely destroyed or disposed of;
• Waste is treated as closely as possible to where it is generated.
Targets – within a general strategy of waste prevention and increased recycling, to achieve in the lifetime of the programme a significant reduction in the quantity of waste going to final disposal and in the volumes of hazardous waste generated.
• Reduce the quantity of waste going to final disposal by around 20% by 2010 compared to 2000, and in the order of 50% by 2050;
• Reduce the volumes of hazardous waste generated by around 20% by 2010 compared to 2000 and in the order of 50% by 2020.

The principles of the EU's waste management policies and strategy are implemented primarily (but not exclusively) by EC Directives, Regulations and Decisions that create binding legal obligations on Member States. A summary of the main items of existing EU legislation relating to waste management is presented in the Annex – EC Legislation Relating to Waste Management.

There are also a number of proposed EC directives relating specifically to wastes, including:

- A proposed directive on *hazardous municipal waste collection* – this envisages the separate collection of a range of hazardous materials / used products typically arising in municipal waste.
- A working paper on the *biological treatment of "biowaste"* – this envisages a range of measures to promote and manage the recovery and recycling of biodegradable wastes, including home composting and the separate collection of the biodegradable fractions of municipal, commercial and industrial wastes.

2.3. EC LANDFILL DIRECTIVE

The Landfill Directive is one of the most important directives for the organisation of municipal waste management systems. It consists of two main parts:

- an objective based part which gives targets for the reduction of landfilled biodegradable MSW on a national scale; and
- a prescriptive part which defines the technical standard of landfills and the after care period as well as after care funding.

2.3.1. Objective based targets

The objective based part requires wide-ranging changes in the public waste management. The targets require manor changes in the collection systems as well as in treatment facilities. The targets are defined as follows:

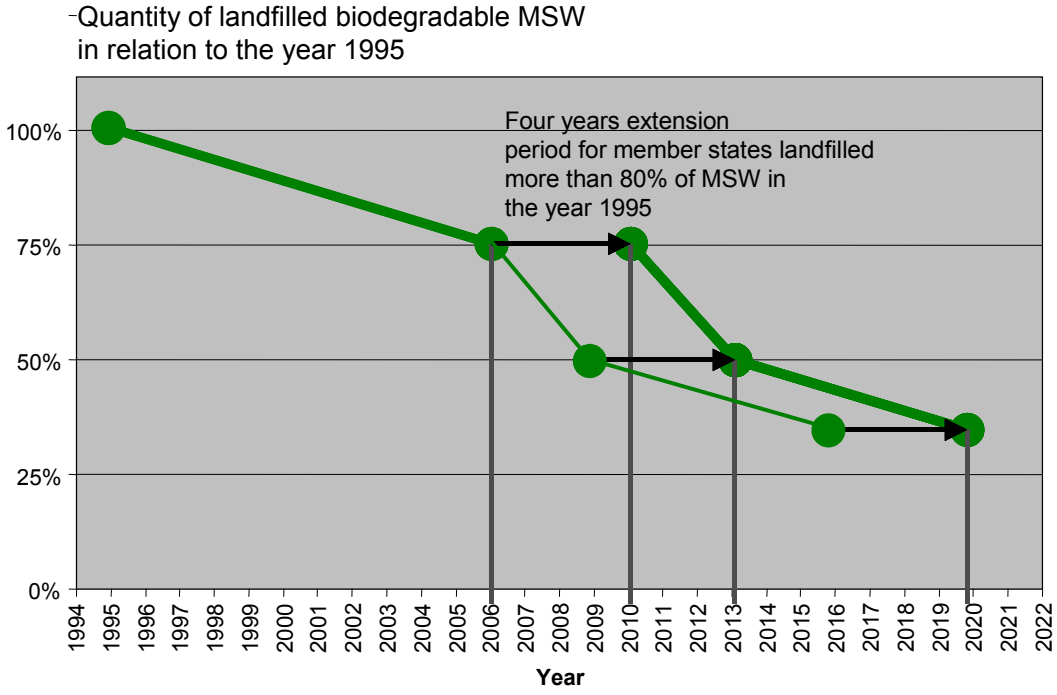
The quantity of landfilled biodegradable MSW of EC member states has to be reduced to at most

- *75 % by the year 2010*
- *50 % by the year 2013*
- *35 % by the year 2020*

compared to the 1995 baseline established by the Directive.

These years reflect the four-year extension provided for in the Directive for states that landfilled more than 80% of MSW in 1995, which the Czech Republic has decided to make use of.

Figure 2 Targets given by the EC Landfill Directive



For the Czech Republic a baseline of 1.53 Mio t of biodegradable parts of MSW has been agreed. The reduction rates are calculated from this basis. So the quantity of biodegradable parts of MSW have to be reduced below the following figures:

- 1 147 500 t/a in the period 2010-2012
- 765 000 t/a in the period 2013-2019
- 535 500 t/a from the year 2020

Following the Waste Management Hierarchy (see chapter 2) the reduction of landfilled biodegradable parts of MSW has to be reached primarily by waste minimisation and separate collection and waste recovery.

The Landfill Directive itself requires in article 5 (1) that the reduction targets should be kept mainly by recycling, composting, biogas production or energy recovery.

Examples are the separate collection of paper and cardboard for the purpose of recycling or the separate collection of biowaste for the purpose of composting or anaerobic digestion.

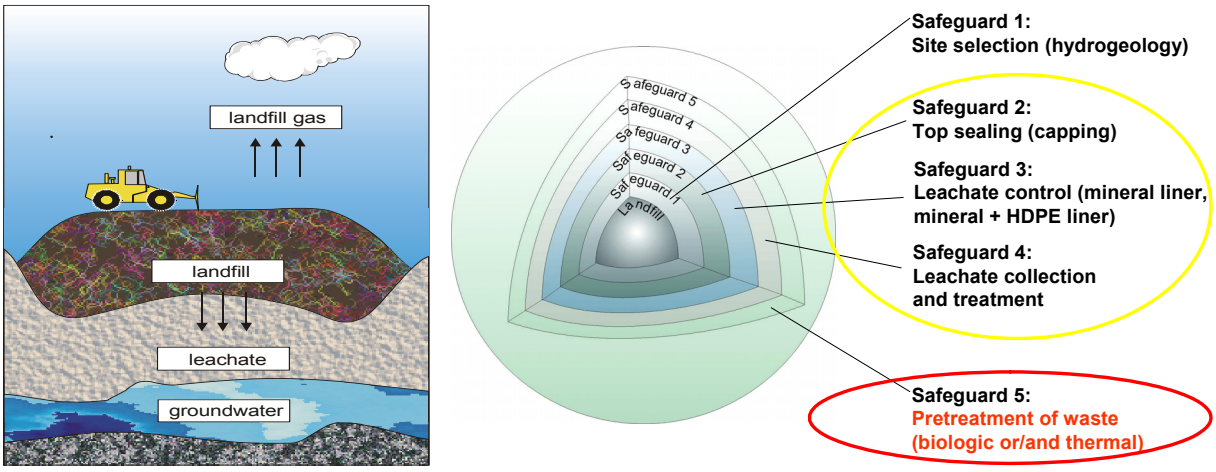
The parts of biodegradable MSW that are not separately collected and recycled (and which form part of the residual MSW) have to be stabilised in suitable technical facilities, in the amount needed to meet the reduction targets. Therefore two main technologies are available (see chapter 5). The Landfill Directive in fact requires (in Article 6) that only treated residual MSW be landfilled, but does not define in detail what is meant by 'treated'.

2.3.2. Technical Standard

The prescriptive part of the Landfill Directive describes the Technical Standard of Landfills, the after care and after care funding.

The technical standard follows the concept of the so called multi barrier system. It is shown in the following figure. Safeguards 1-4 are described in the technical standard of the location of a landfill and of the landfill itself. Safeguard 5 is described as the objective based part of the directive like described above.

Figure 3 Barrier-system according to EC Landfill Directive



The system "landfill" The multi barrier system of EC Landfilling Directive

3. Czech Legislation

3.1. ACT ON WASTE

The Act on Waste (185 Act on 15 May 2001 on Waste and Amendment of Some other Acts) in the version of Act 188/2004 follows the principles and the hierarchy of the EC.

In sections 10 and 11 of the Act the Waste Prevention and Waste Recovery Priority are defined (see Box 1) which follows the following **Waste Management Hierarchy:**

1. Waste prevention and waste minimisation
2. Material recovery
3. Other recovery (thermal)
4. Disposal with high protection of human health and friendly to the environment
5. Landfilling of residues from final waste treatment

Box 1 Provisions of the Waste Act implementing the Waste Hierarchy

Section 10
Prevention of Waste Production

(1) Everyone is obliged in connection with his/her activities or within the scope of his/her competence to prevent production of waste, to reduce the amount of waste and its hazardous properties of waste, the production of which cannot be prevented, must be recovered or disposed of in a manner which is not endangering human health and environment and which is in compliance with this Act and special regulations. 15)

(2) A legal entity and a natural person authorised to do business which produces products is obliged to produce the products in a manner reducing the generation of unrecoverable waste from these products, particularly of hazardous waste.

(3) A legal entity and a natural person authorised to do business and engaged in product production, import or introduction to the market, is obliged to provide the information on the manner of the unused product parts recovery or disposal in the product-accompanying documents, on product packaging, in user guide or in another appropriate manner.

Section 11
Waste Recovery Priority

(1) **Under this Act, everyone is obliged in connection with his/her activities or within the scope of his/her competence to ensure waste recovery prior to its disposal. Material recovery has priority to any other recovery.**

(2) Compliance with the obligations stipulated under par. 1 shall not be requested if the technical or economic preconditions of compliance are missing in the given time and location and if compliance with the waste management plans under part seven of this Act is ensured.

(3) In considering the appropriateness of waste disposal methods, **a method ensuring higher protection of human health and more friendly to the environment shall always be given priority. Only such waste may be land filled for which there is no other disposal method available or which would represent higher environmental or human health hazard**, if landfilling the waste does not breach this Act or the executive legal regulations.

3.2. NATIONAL WASTE MANAGEMENT PLAN OF THE CZECH REPUBLIC

The National Waste Management Plan – Binding Part defines targets which are very important for all waste management. The most important targets for the public (municipal) waste management beyond legal requirements of EC regulations and national acts are:

- Recycling of at least 50 % of MSW
- Create Integrated Waste Management Systems

3.2.1. Recycling Target of 50 %

Chapter 3.6: "*In the interests of achieving the target of increasing recovery of wastes with preference for recycling to 55% of all waste produced by the year 2012 and* ***increase the material recovery of municipal waste to 50% by 2010*** *compared with 2000*"

From the view of the Ministry of Environment article 3.6 of the binding part is to be understood in that way that at least 50 % of MSW have to be recycled in any way. This includes the recycling of separate collected paper, glass, metals, plastics, clothes, wood etc. as well as the composting and/or anaerobic digestion of biowaste.

The target and the methods how to meet it is discussed later.

3.2.2. Integrated Waste Management Systems

Chapter 3.4: "*In the interests of achieving the target to create integrated systems of waste management at a regional level and connect them to a national establishment for waste management in the framework of the level of equipping of the territory*" (sorted by the requirements of the waste management hierarchy):

l) provide for separate collection of the recoverable components of municipal waste through sufficiently numerous and accessible networks of collection sites, under the assumption of use of the existing systems of waste collection and accumulation and, where feasible, also systems of collection of selected products, provided for by obliged persons, i.e. producers, importers and distributors;

m) provide for the necessary capacity for treatment of wastes suitable for processing as fuel unless their material recovery is more suitable;

n) provide for the use of suitable and available technologies for the use of fuels produced from wastes;

i) do not provide support for the construction of new incinerators of municipal waste from state funds;

j) do not provide support for the construction of new waste landfills from state funds;

b) design new installations in accordance with the best available technologies as an integral part of the integrated system of waste management in a given territory;

c) utilise existing installations that comply with the required technical level pursuant to point b);

3.3. EXPORT AND IMPORT OF WASTE

3.3.1. Legal Requirements

In general import and export of wastes follows the notification needs of EC regulations.

In section 54 of the Waste Act it is required *that waste produced within the Czech Republic is preferentially disposed within the Czech Republic*.

The import of waste to the Czech Republic for the purpose of its disposal is forbidden under usual circumstances.

The National Waste Management Plan refers under paragraph 3.5 (b) of the binding part to the need to "*attempt to minimise transboundary movements of waste intended for disposal*" and under paragraph (d) to "*permit import of wastes for the purpose of recovery only to installations that are operated in accord with the valid legal regulations and that have sufficient capacity*".

3.3.2. Implications for Planning

The restrictions on the import and export of residual MSW for the purpose of disposal require domestic capacities for stabilisation of residual MSW in the Czech Republic. On the other hand it cannot be calculated with filling up domestic disposal capacities with foreign waste even if for this foreign waste higher prices may be achieved.

3.4. METHODOLOGY FOR CALCULATING THE BIODEGRADABLE CONTENT OF MSW

The Ministry of Environment has published a guideline how the quantity of biodegradable parts of MSW which are landfilled have to be calculated (see below for reference). The guideline shows how the figures are to be calculated on the level of each region.

The most important parts of the calculation are:

- *The following types of waste in group 20 of the Waste Catalogue (Decree of MoE No. 381/2001 Coll.) or shares of biodegradable waste included within them are to be considered as biodegradable waste:*

  20 01 01 Paper and cardboard
  20 01 08 Biodegradable waste from kitchens and restaurants
  20 01 10 Clothes
  20 01 11 Textile materials
  20 01 38 Wood not stated under No. 20 01 37
  20 02 01 Biodegradable waste (from gardens and parks)
  20 03 01 Mixed municipal waste
  20 03 02 Market waste
  20 03 07 Bulky waste

- *For the calculation of the target quantity of BRKO allowed to be landfilled in the region and for the recalculation to MSW see Table 3. The target quantity of BRKO (Table 3, column 4) is the comparative basis for the assessment of the development in the reduction in quantity of landfilled BRKO in the regions and CR.*

Table 3: Quantity of BRKO and MSW allowed to be landfilled in the region

Year	*Measured quantity of BRKO (kg/inhab. and year)*	*No. of inhabitants*	***Target quantity of BRKO (t/year)***	*Factor biodegrade -able*	***Target quantity of MSW (t/year)***
2010	*112*			*0,45*	
2013	*75*			*0,55*	
2020	*53*			*0,60*	

- *If better information concerning the quantity of MSW and waste composition (share of biodegradable parts) are available these figures can replace the calculation figures of the "metodika BRKO".*

More information:

Metodika výpočtu postupného snižování množství biologicky rozložitelných komunálních odpadů (BRKO) ukládaných na skládky
Ministry of Environment (publ.): Methodology of calculation for gradual reduction of landfilled quantity of biodegradable municipal waste (BRKO)

The methodology has been used for calculating the needed treatment capacities for the region of Hradec Králové.

The basis for the calculation was to find the minimum capacities of treatment methods for stabilising residual MSW needed to meet the targets of the Landfill Directive which are the reduction of landfilled quantities of biodegradable MSW (BRKO).

In Option 1 it has been calculated which quantities of residual MSW have to be incinerated at least to fulfil the requirements of the EC Landfill Directive concerning the reduction of landfilled biodegradable MSW. The parts of residual MSW which are not needed to be incinerated would be landfilled untreated.

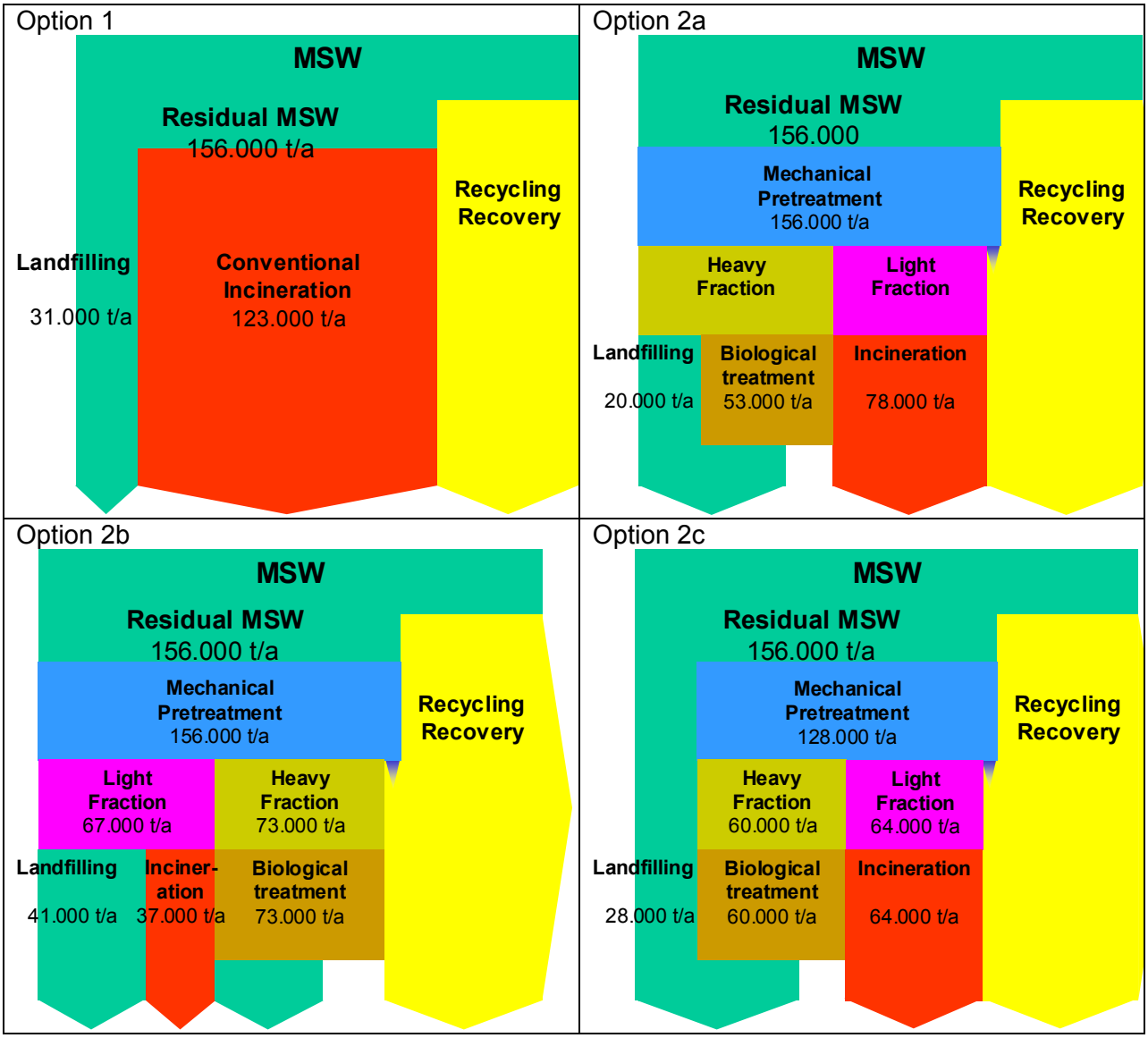
Option 2a has the priority in the incineration of the light fraction after mechanical splitting. Only if all light fraction is incinerated additional BRKO-reduction needs are achieved by biological degradation;

Option 2b has the priority in the biological degradation of biodegradable parts of the heavy fraction. This heavy fraction is one of the main two outputs of mechanical pre-treatment. The other main output is the light fraction. Only if all heavy fraction is treated by biological methods additional BRKO-reduction needs are achieved by incineration of light fraction.

Option 2c is a combination of biological and thermal treatment of MSW after mechanical splitting. It is taken as a basis that all outputs of a mechanical treatment would be treated further - the heavy fraction by biological methods, the light fraction by incinerating. No outputs of the mechanical treatment would be landfilled directly.

The following pictures show the results of the calculations for the four different options of MSW-treatment for meeting the targets of the year.

Figure 4 **Results of four different combinations of methods for meeting the targets of the year 2020 for the region of Hradec Králové following the metodika BRKO**



4. Approaches to reducing the quantity of landfilled biodegradable MSW

4.1. THE CONTRIBUTION OF SEPARATE COLLECTION AND RECOVERY

4.1.1. General Perspectives

As described above the EC as well as Czech legislation and the NWMP give the recycling and recovery priority to disposal. The NWMP requires a share of at least 50 % of MSW which should

be collected separately and recycled. This includes the recovery of biowaste by composting or anaerobic digestion.

Additionally the recycling and recovery mainly of paper/cardboard and biowaste is a very effective method for reducing the quantity of biodegradables in residual MSW.

The share of biodegradables in residual MSW is expected to be about 50 %. That means that each kilogram of paper or biowaste collected separately and recycled reduces the need of two kilograms of residual MSW-treatment.

In the following **calculation example** the effect including its *consequence on treatment capacities to be provided* is shown:

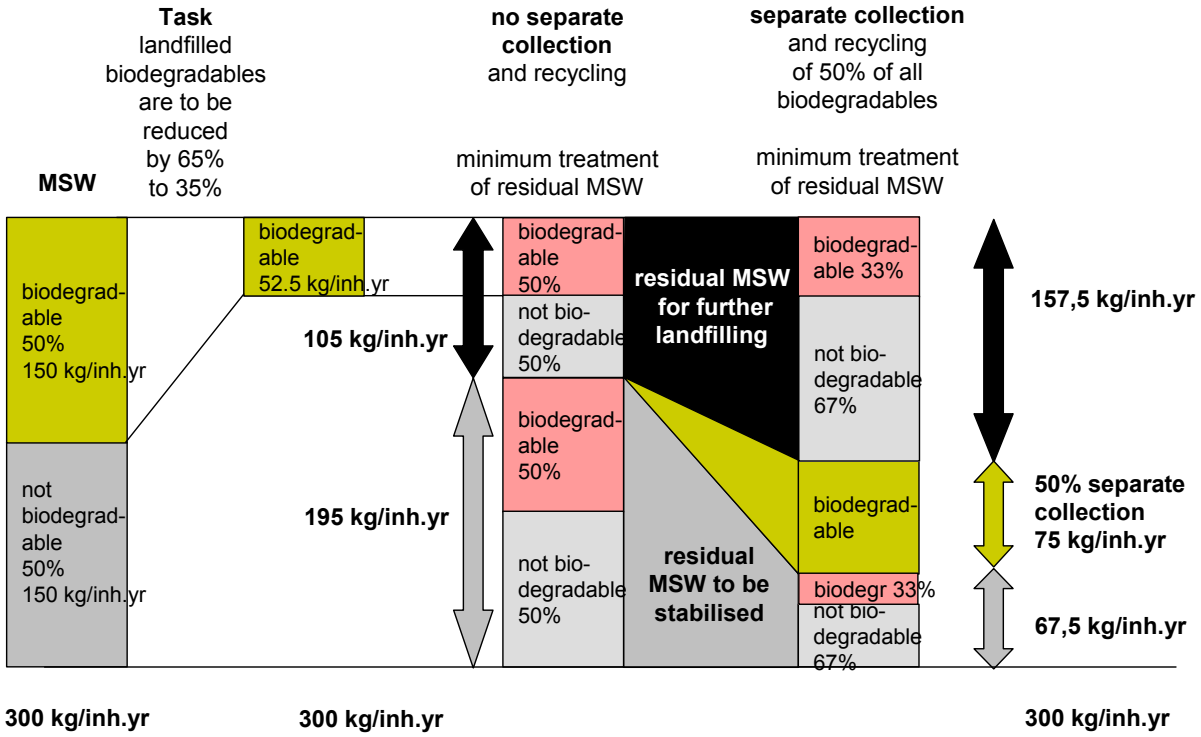
Table 4: Calculation example: Effect of separate collection on remaining quantities to be treated

	Starting position: No separate collection of biodegradable MSW		*Separate collection of 50 % of paper/cardboard and biowaste*	
Fraction	Share	Specific production	Share	Specific production
Biowaste	30 %	90 kg/inh.yr	20 %	45 kg/inh.yr
Paper/cardboard	20 %	60 kg/inh.yr	13 %	30 kg/inh.yr
biodegradable MSW (BRKO)	50 %	150 kg/inh.yr	33 %	75 kg/inh.yr
Other wastes	50 %	150 kg/inh.yr	67 %	150 kg/inh.yr
Residual MSW	100 %	**300 kg/inh.yr**	100 %	**225 kg/inh.yr**
Max. yield of biodegradable MSW (based on the 35 % target to be reached in 2020)		52.5 kg/inh.yr		52.5 kg/inh.yr
Reduction of biodegradable MSW (BRKO) needed		97.5 kg/inh.yr		22.5 kg/inh.yr
Total plant capacity needed in order to reduce biodegradable MSW to this target		97.5 kg/inh.yr ÷ 50% = 195 kg/inh.yr 100%		22.5 kg/inh.yr ÷ 33% = 67.5 kg/inh.yr 35%

As an overall effect of separate collection it can be noted that *required capacities for treating residual MSW can be reduced significantly* (see last line of table) **to 35%**, which is **a reduction of 65%.**

The effect is shown in the figure below:

Figure 5 Example: Effect of separate collection on remaining quantities to be treated



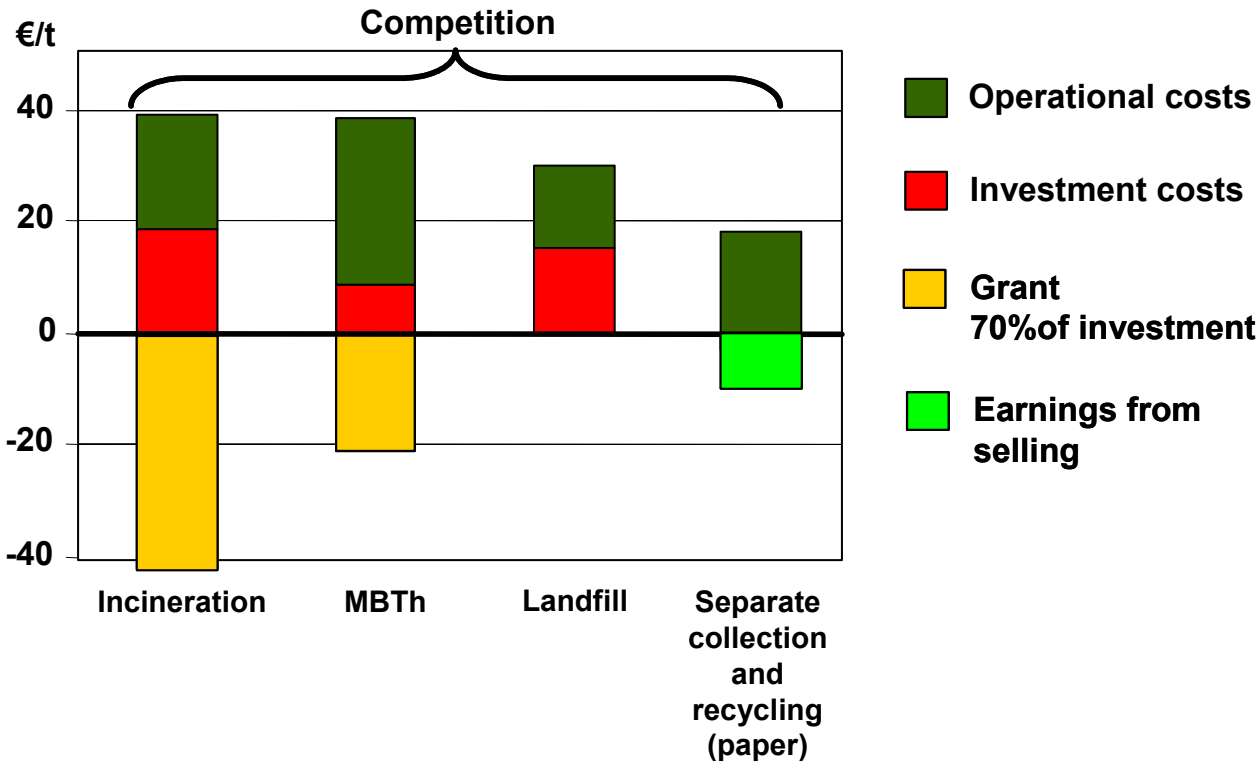
Note: In the presentation file on the CD the picture is animated with the animation the steps of thinking can be followed.

In addition to the effects in the physical waste streams important economic aspects are to be considered:

The reduction of needed treatment of residual MSW saves money. In the case of the example shown in the table and in the figure above the treated quantity can be reduced by 65%. Calculating with landfilling costs of Kc/t 1 300 and stabilisation costs of Kc/t 2 000 the costs in case of the left column would be 0.195 t/inh.yr times Kc/t 2 000 which gives Kc/inh.yr 526.5. In case of the right column the stabilisation of residual MSW would cost 0.0675 t/inh.yr multiplied with specific treatment costs of Kc/t 2 000 which gives costs of Kc/inh.yr 135 and 157.5 kg/inh.yr to be landfilled with costs of Kc/t 1 300. The difference of Kc/inh.yr 187.5 (526.5 minus 339) can be used for financing the separate collection of 75 kg/inh.yr. That relates to available specific costs of Kc/t 2 500 (Kc/inh.yr 187.5 divided by 75 kg/inh.yr) which is much more than the specific costs for treatment of residual MSW.

It can be seen that the separate collection of biodegradable MSW can cost more per mass-unit than treatment of residual MSW and still helps saving money at the same time.

Figure 6 Example cost comparison of alternative waste management systems



4.1.2. Best Practice Examples

Even the 50 % recycling target looks difficult to be achieved. Out of two countries adjacent to the Czech Republic four examples - two countries, two cities - are shown with a strong economy and a well developed private consumption, i.e. a relatively high throughput of goods:

- *Austria* and *the Free State of Bavaria*,
  both in size comparable with the Czech Republic (8 rsp. ≈ 17 Mio. population)

- *Vienna,*
  comparable with Prague in structure as well as size (1,7 vs. 1,2 Mio. inhabitants)

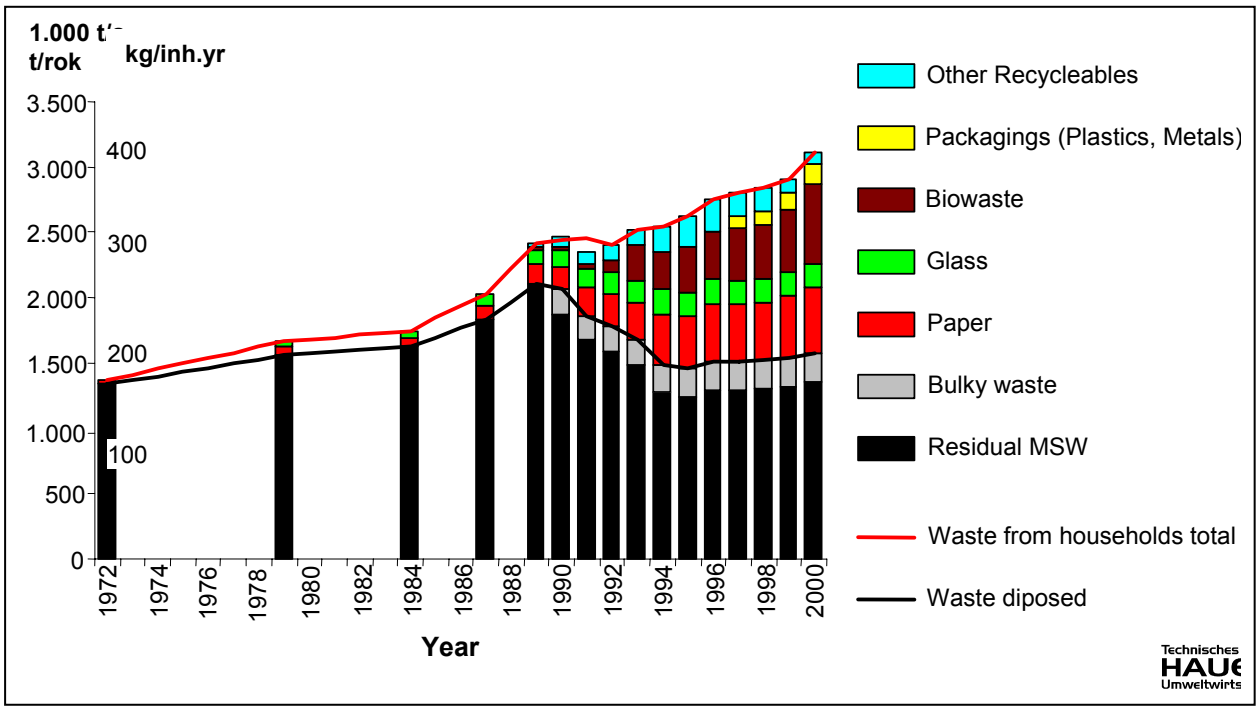
- *Innsbruck* (130.000 inhabitants),
  comparable in size with some regional capitals as Plzeň, Česke Budějovice, Hradec Králové, Ostrava, Pardubice etc.

All examples (in their customised thus quite different styles of presentation) show a considerable reduction of the quantity of residual MSW to be finally disposed of over the past 15 years.

In Austria the quantity of residual MSW rose with high growth rates up to the year 1999/2000. From then networks of integrated waste management systems have been started. The quantity of residual MSW (including bulky waste) decreased from an all time high of more than two million tons per year to about 1.5 million tons per year (equals about 190 kg/inh.yr). Currently the share of disposed residual MSW is about 50 % of the total quantity of MSW. More than 500.000 t/a (63 kg/inh.yr) of biowaste are collected separately and composted.

It is to be stressed that in Austria the share of separate collected and recycled MSW is higher in rural areas and is lower in large towns. Depending on the catchment area of municipalities the per capita quantity of residual MSW differs from less than 100 kg/inh.yr in rural areas to more than 320 kg/inh.yr in the town of Vienna.

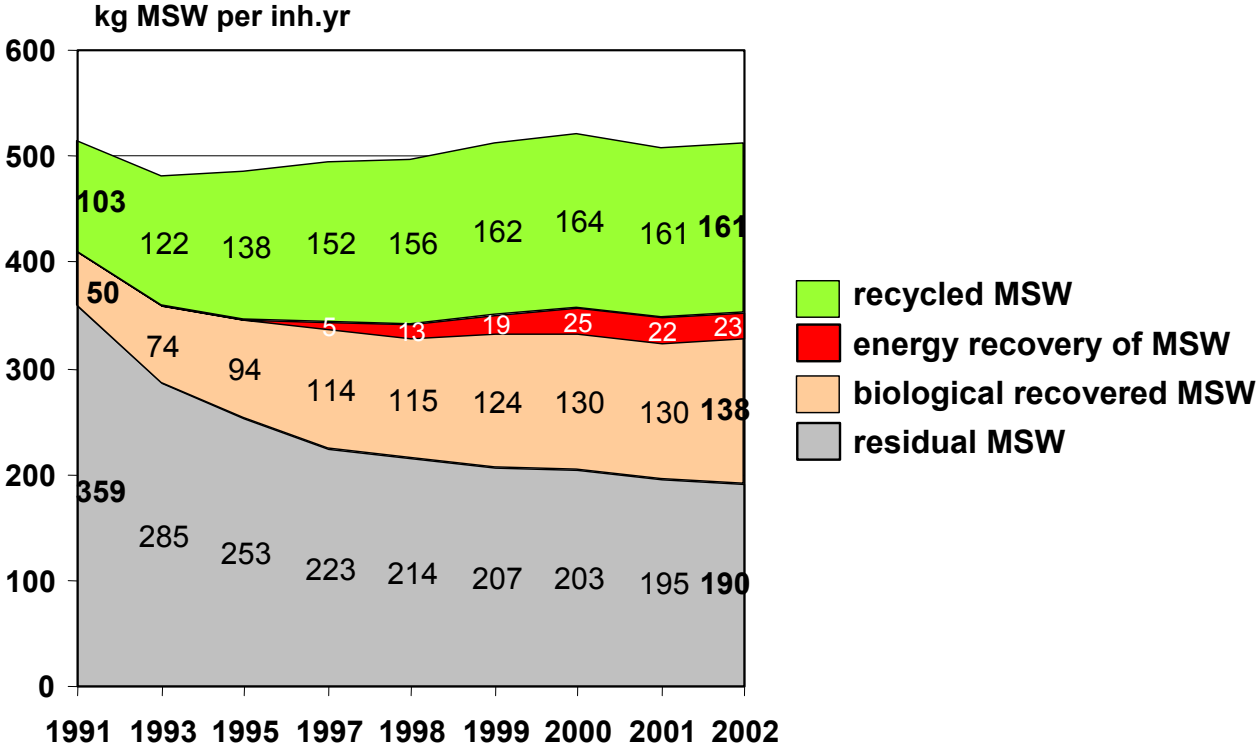
Figure 7 Development of Quantities of Recyclables and residual MSW in Austria, 1972 to 2000



In Bavaria the quantity of residual MSW has been reduced by 47 % from 360 kg/inh.yr to about 190 kg/inh.yr. The total quantity of MSW remained nearly constant with about 500 kg/inh.yr [2]. The share of separately collected and recycled waste is about 60 %. The share of residual MSW which will be disposed mainly in mass burn incineration facilities decreased to about 40 % of total MSW-quantity within 10 years.

[2] Compared with the other examples practically no increase in total waste production can be observed. To a large extent this is due to the fact that *wastes from commercial sources* have moved from MSW collected by municipalities to private organised waste collection which is not included in the statistics of the municipalities

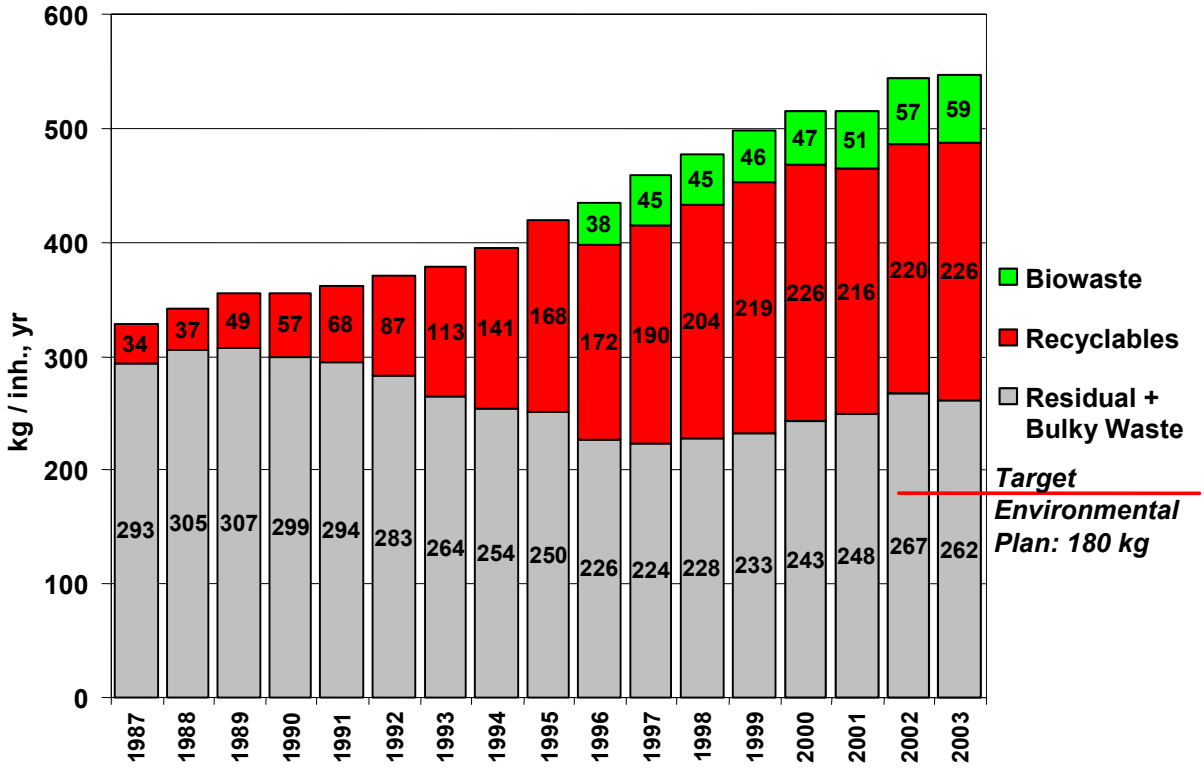
Figure 8 Development of Quantities of Recyclables and residual MSW in Bavaria, 1991 to 2002 [3]



The profile of Innsbruck (Figure 9) - which at the one hand is quite typical for a medium sized city, and at the other hand in comparison to other Austrian cities started relatively late with separate collection schemes, eg. for biowaste - shows that an overall waste growth of 4 % p.a. (= doubling in 18 years !) could be “controlled” by means of separate collection on the disposal side (grey columns).

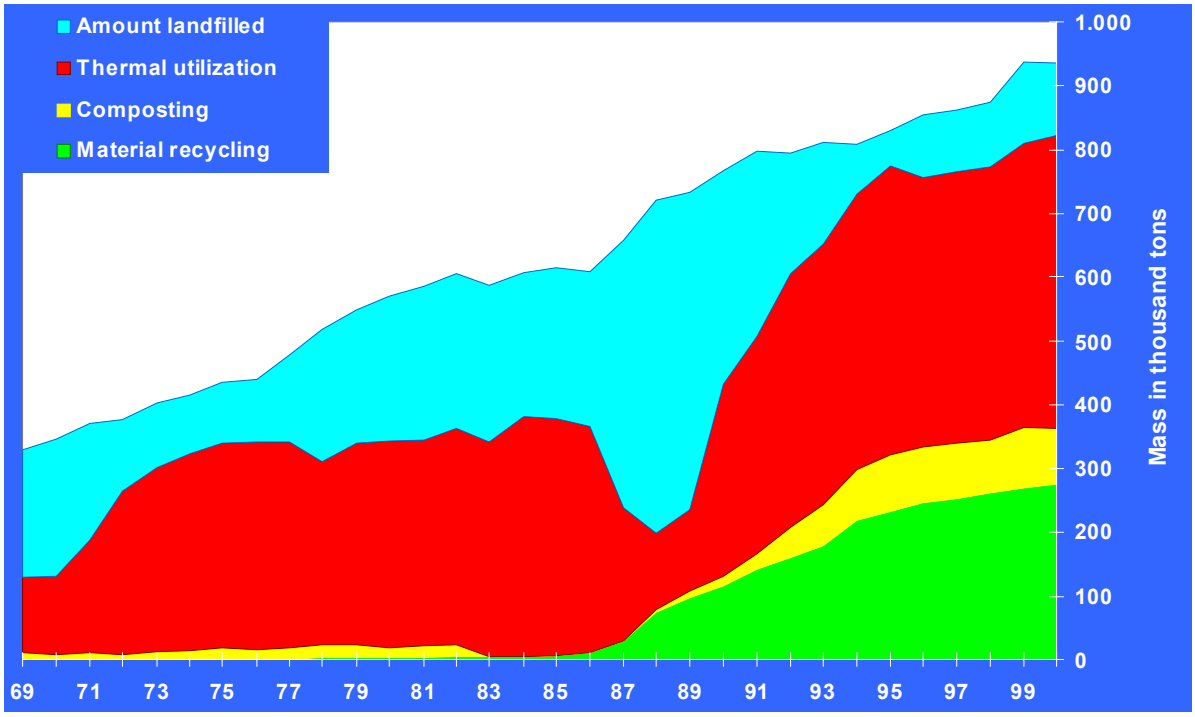
[3] Source: Bayrisches Landesamt für Umweltschutz (publ.): Abfallwirtschaft - Hausmüll in Bayern - Bilanzen 2002, p. 69

Figure 9 "Waste record" of Innsbruck / Austria (130.000 inhabitants) [4]



Also Vienna diverts about 40 % (green and yellow curve) of its MSW (current figures approach the 50 % line).

Figure 10 Vienna´s recent "Waste history" [5]

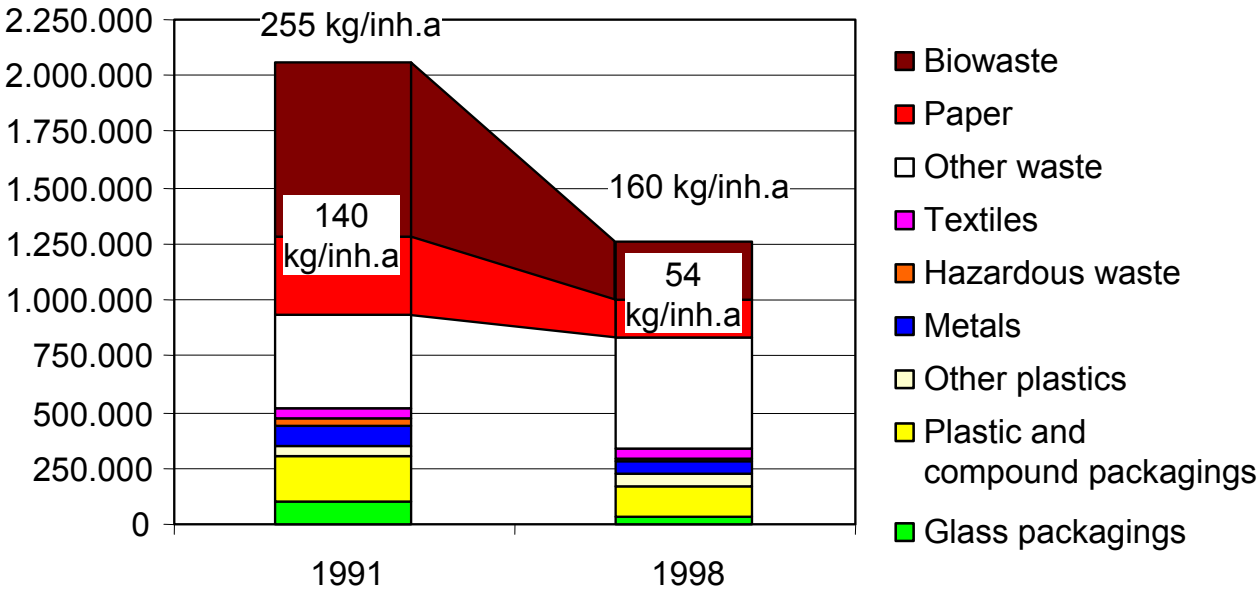


[4] Source: TBU, Environmental Plan Innsbruck, 2002
[5] The strong reduction of "red" = thermally treated amounts between 1986 and 1989 is due to the breakdown of one (of two) incineration plants

The conclusion of the given examples is that a *50 %-share of MSW to be recycled/recovered is an achievable and realistic average target* although supreme efforts are needed by all parties concerned.

Figure 11 shows the effect of separate collection in the composition of residual MSW and in the change in biodegradable parts of residual MSW. By means of separate collection the quantity of biodegradable residual MSW decreased from 140 kg/inh.yr in 1991 to 54 kg/inh.yr in the year 1998. That is one third of the situation seven years before. The total quantity of residual MSW decreased in this time by nearly 40 %.

Figure 11 Development of the Composition of residual MSW by means of separate collection, Austria, 1991 and 1998 [6]

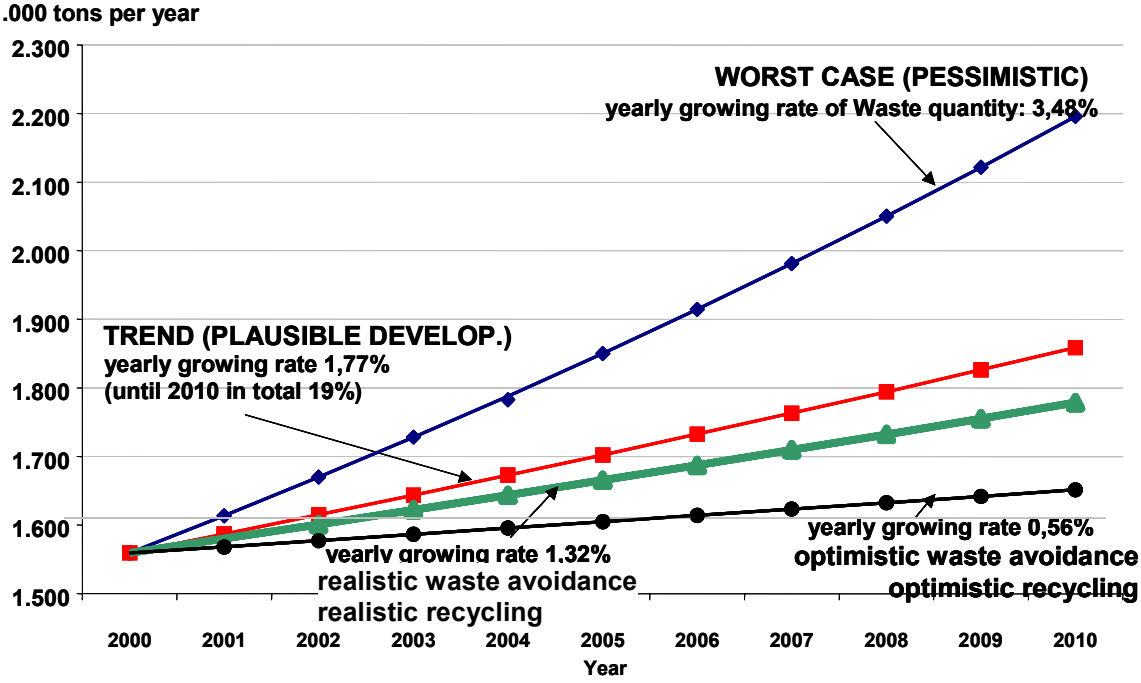


4.2. FORECASTING OF WASTE ARISINGS

When developing an overall waste scenario (projecting historic data into the future), the red line (sum of all waste streams) in Figure 12 would represent a pessimistic and the black line (amounts to be disposed of) an optimistic scenario.

[6] Sources: 1991: Hauer, W. et al: Abschätzung der als Abfall entsorgten Verpackungsmengen, Österreich 1991, Wien 1992
1998: TB Hauer: Kontrolle der Restmengenziele von Abfällen an sonstigen Verpackungen für das Kalenderjahr 1998, Korneuburg 1999

Figure 12 Example for "Variants of the Development of Waste Quantities in the City of Vienna"[7] - including commercial and institutional waste



For a more refined projection current amounts have to be mathematically combined with factors influencing waste development. In such calculation (usually done in an ordinary spreadsheet) timewise development of municipal waste is made dependent on

Parameter	*Usually applied on…*
➢ *Population growth* (respectively population *development*, as in certain areas also a decrease might be observed)	*Regional data level* i.e. certain municipalities out of the same area get multiplied with the same factor, eg. population growth 2004 - 2010 for *Moravia* region estimated by the National Dept. for Statistics by *x*% p.a. ⇨ MSW basis data (amount in 2004) for *Brno* x (1 + *x*) = amount in 2005, amount in 2005 x (1 + *x*) = amount in 2006 … other factors (from below) get multiplied accordingly
➢ *Economic development* (expressed usually as development of GDP): Waste arisings are connected to a certain extent with economic development [8].	*Regional or national data level* It is recommended to apply waste increase due to economic development *only for the ´consumer´ waste components (*glass, paper & cardboard, metals, plastics) - note that this parameter and the following one (Intensity of source separated collection) require the integration of *composition data*[9] into the model

[7] Strategische Umweltprüfung zum Wiener Abfallwirtschaftsplan Abfallmengen, Wien 2000
[8] usually not one by one, 50 % (2 % GDP growth results in 1 % waste increase) seems to be a reasonable guess in case no comprehensive and reliable datasets are available
[9] In the first stage a *plain assumption out of experience*, later on to be refined by real data gathered in *sorting analysis*

Parameter	*Usually applied on…*
➢ *Intensity of source separated collection* (by fraction, in %).	*Data at the level of large municipalities / municipalities with extended competence / regions*
➢ *Collection grade* Possibly in some rural areas not all dwellings are connected to regular waste collection systems	*Data at the level of large municipalities / municipalities with extended competence / regions*

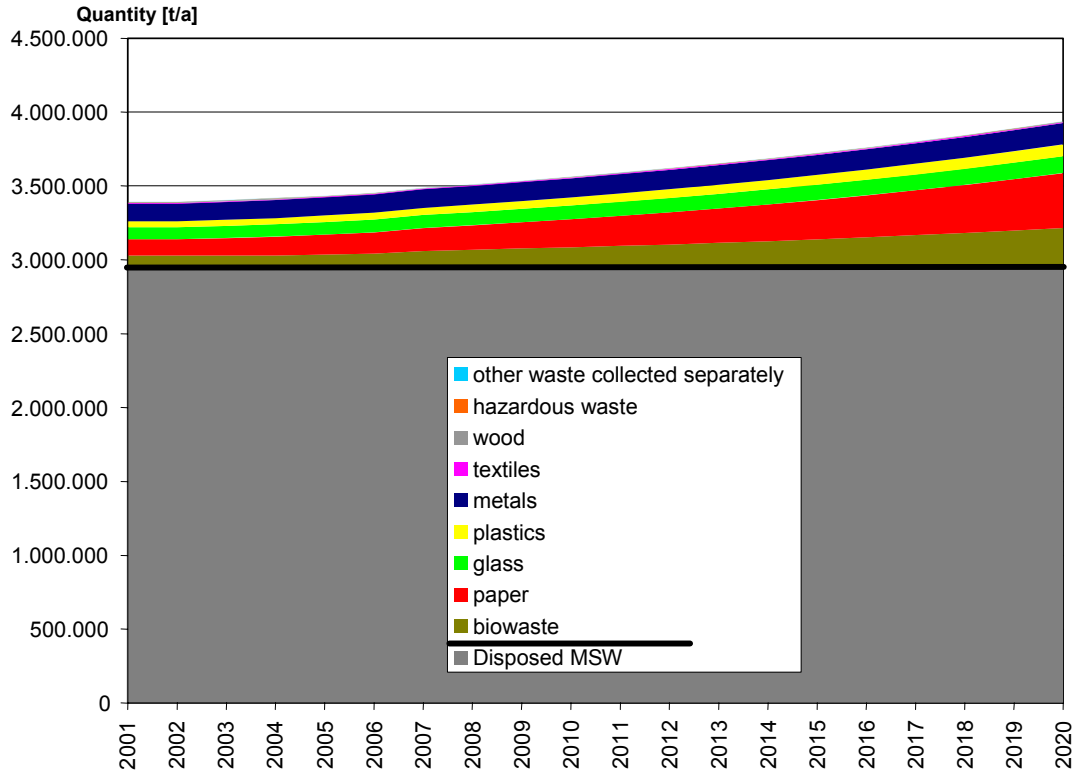
By variation of these parameters a range of development scenarios in terms of socio-economic variables to be expected and waste management activities to be proposed can be modelled. Scenarios can be evaluated (Table 5 gives an example on parameter variation), and forecasts for a number of municipalities as well as a whole region can be given – thus the meeting of targets eg. for biodegradable waste set by the Landfill Directive can be checked.

Table 5: Example for defining parameters for various *waste development scenarios*

Scenario	Population growth	Economic development (as GDP)	Development of source separated collection
0	0,0 % p.a.	+ 1,0 % p.a.	No further development
1	0,14 % p.a. [3]	+ 2,5 % p.a.	No further development
2	0,14 % p.a.	+ 2,5 % p.a.	“Modest”, i.e. a steady increase of separate collection (target for recyclables 40 %, organics 30 %, to be reached in 2010
3	0,14 % p.a.	+ 2,5 % p.a.	“Fast”, i.e. a steady increase of separate collection (same targets as in Scenario 2), to be reached in 2006

As an example a forecast (two scenarios) for the Czech Republic is shown. The forecast has been used by the TWINNING-team to calculate future waste quantities and needed capacities for the disposal of residual MSW. The growing rate of MSW-quantity was expected to be 0.7 % per year in average in the period from 2003 until the year 2020. That gives a total growing rate of 14 % for the calculated 19-years-period.

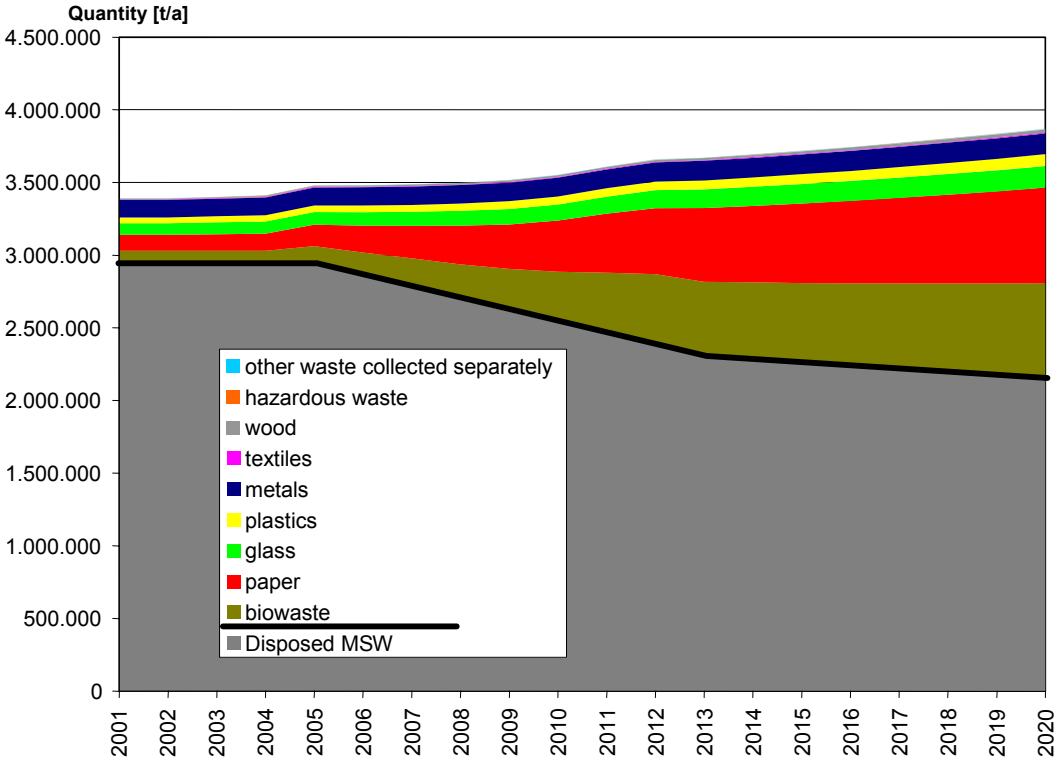
Figure 13 "Waste forecast" for the Czech Republic - middle scenario [10]



In an "optimistic" scenario it is assumed that the quantity of residual MSW can be reduced by 3 % per year until the year 2013 and from 1% per year thereafter (until 2020).

[10] The forecast for the Czech Republic shown has been used as a basis for calculating the stabilisation capacities for biodegradable MSW, see chapter 6 *Capacities and Investment Needs for MSW Disposal* and the *Guidance setting criteria for Residual Waste Management Projects for the Cohesion Fund* (not yet approved).

Figure 14 "Waste forecast" for the Czech Republic - "optimistic" scenario [11]



It is recommended to make forecasts at least for two periods which are about five years in future and about ten years in future.

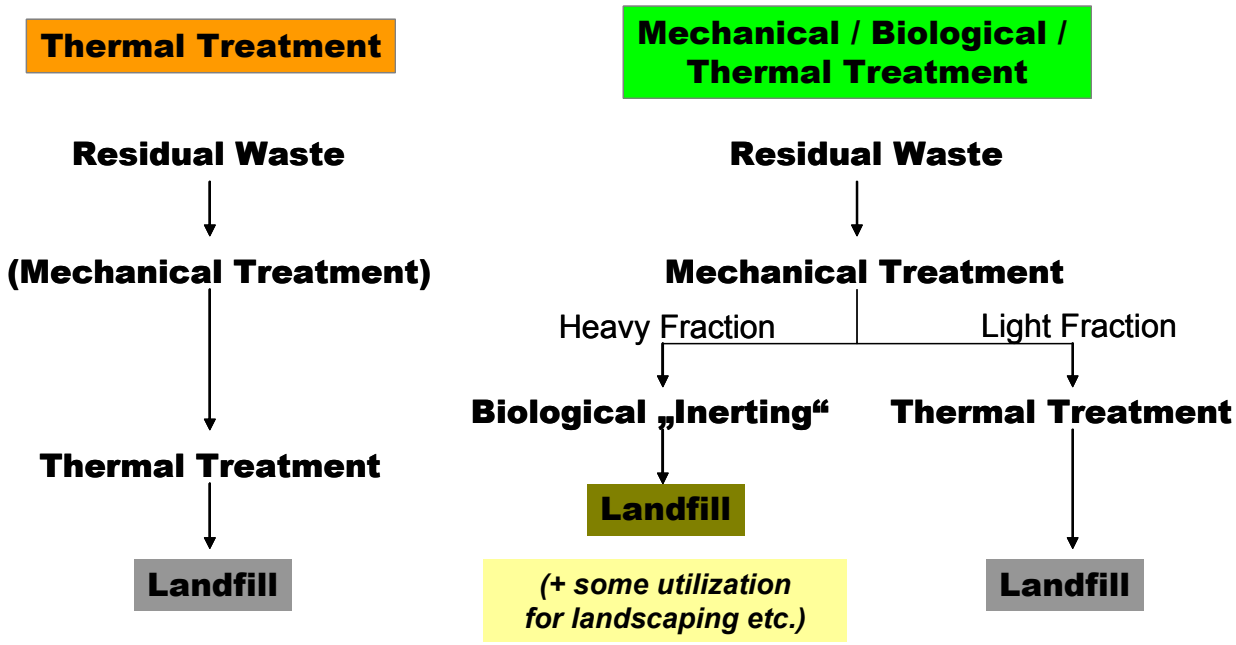
5. Disposal of residual MSW – basic technical options

Although waste minimisation and waste recovery are very important steps in meeting the requirements (see above), capacities for reducing the content of biodegradable parts of residual MSW have to be built. The reduction of the quantity of biodegradable parts of landfilled residual MSW can be done by two main technologies which are

- Incineration / Thermal Treatment
- Biological degradation

[11] The forecast for the Czech Republic shown has been used as a basis for calculating the stabilisation capacities for biodegradable MSW, see chapter 6 *Capacities and Investment Needs for MSW Disposal* and the *Guidance setting criteria for Residual Waste Management Projects for the Cohesion Fund* (not yet approved).

Figure 15 Basic Technical Alternatives for treatment of residual MSW prior to landfill



Incineration with energy recovery of at least the high calorific parts of MSW is an integral part of both treatment (stabilisation) technologies.

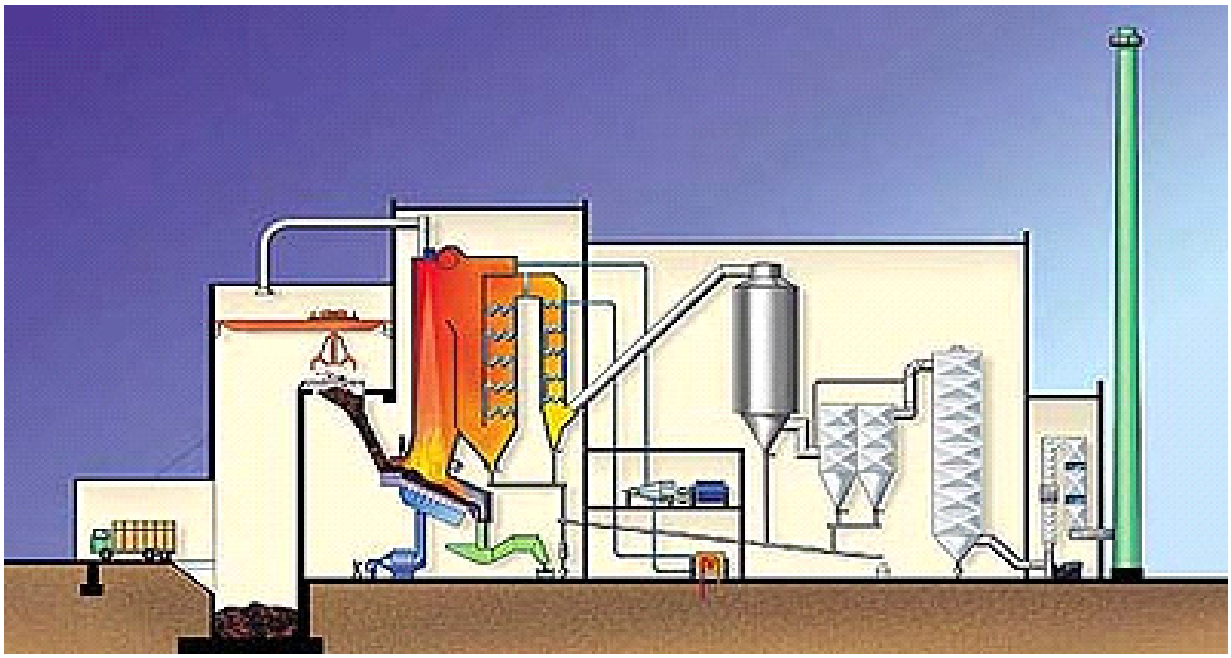
5.1. THERMAL TREATMENT

The thermal treatment will be done normally in so called mass burn incinerators. In such facilities the MSW is incinerated as delivered from the collection. The waste is incinerated on a grid. The not burnable parts are taken off as slag from the bottom. The heat generated will utilised in the vessel. After cooling the flue gas and utilizing the energy the flue gas will be cleaned in different parts of a flue gas cleaning system. After passing that cleaning unit the flue gas leaves the chimney to the environment.

Solid residues are slag and ash. Slag is a material which can be landfilled usually at landfills suitable for MSW. Ashes are residues from the flue gas cleaning unit. These wastes are highly contaminated with heavy metals and have to be handled as hazardous waste.

The following picture shows a typical construction of a mass burn incineration plant for MSW.

Figure 16 Typical construction of a mass burn incineration plant



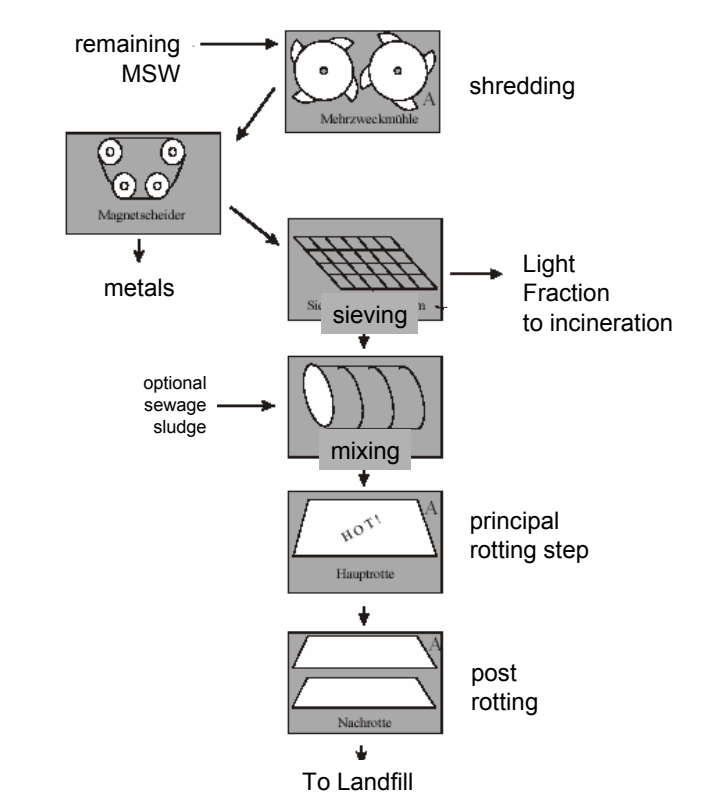
5.2. MECHANICAL / BIOLOGICAL / THERMAL TREATMENT

A combination of treatment methods is the so called MBT Mechanical-Biological-Thermal treatment. The idea of the combination of treatment methods is to combine the advantages of waste incineration - which is the feasibility of energy recovery - with a biological degradation of that parts of the waste which have a low calorific value, a high water content or which are inert.

In such a combination of methods the three different treatment steps can be done at different locations. So it is possible to situate the mechanical treatment very close to a town where the waste comes from. The biologic treatment can take place at a landfill - where the waste will be landfilled after the treatment. The incineration of the parts of the waste with a high calorific value can take place at another location where a suitable incineration plant is situated.

The three different treatment plants can be combined relatively independent to a whole waste management system like bricks. This possible combination of different parts and locations makes the system flexible to changing waste quantities and waste composition.

Figure 17 Typical process of a mechanical-biological treatment of MSW



The picture below shows an example of a rotting box where the principal rotting step takes place.

Figure 18 Example of a rotting box for the principal rotting of heavy fraction from MSW

The incineration of the light fraction can take place in different ways.

- One possibility is to incinerate the light fraction in a mass burn incineration facility. This is a common way for disposal of such wastes. It is done for instance in Austria where (parts of) the light fraction as output of a mechanical treatment of remaining MSW (Wiener Neustadt, Salzburg) is incinerated in a mass burn incinerator located in Dürnrohr, Lower Austria.

- A second possibility is the incineration of light fraction in a fluidised bed incineration unit. Such facilities need a well defined size of the waste particles. Even this size can be guaranteed after mechanical treatment. The advantage of fluidised be incineration units is the lower need of excess air. This reduces the flue gas quantity and reduces the transport of emissions to the air. Such facilities which are operated with light fraction from MSW are under operation for instance in Vienna, Lenzing (Upper Austria), Niklasdorf (Styria).

- A third possibility is the further treatment of the light fraction to produce secondary fuel or so named RDF (refuse derived fuel). Such secondary fuel is normally produced to be utilised in existing combustion plants as fuel partly replacing primary fuel. This process is named co-incineration. For such a use the secondary fuel needs well specified characteristics (like size, calorific value, ignition characteristics, …). The production of such RDF has to be done in strong cooperation with the facility which uses this secondary fuel. An example for such a facility is located in Retznei (Styria) where secondary fuel is produced for utilisation in cement kilns.

5.3. TECHNICAL STANDARDS

The standard of treatment plants to be kept is defined in EC-regulations and with descriptions of the Best Available Technique (BAT). The standard to be kept by incineration plants is well defined in the EC Incineration Directive and in a draft BAT Reference Docment from the European IPPC Bureau[12]. The standard of MBT plants and the characteristics of the landfilled output materials of MBT-plants are by contrast not that well defined[13].

5.3.1. Technical Standard of MBT-plants

Neither EC nor Czech legislation sets detailed technical requirements for MBT plants. Nevertheless an important purpose of MBT plants is to stabilise waste before landfilling. Stabilisation means a large reduction of the biological activity of the waste.

A Draft Reference Document on Best Available Techniques of the European IPPC Bureau of the European Commission[14] describes general requirements. The IPPC regulations require best available techniques for MBT plants with a capacity of more than 50 tonnes per day - which is about 17,500 tons per year.

[12] European Commission, Directorate General, Joint Research Centre (publ.): Integrated Pollution Prevention and Control Draft Reference Document on the Best Available Techniques for Waste Incineration, Draft March 2004
[13] compare: European Commission, Directorate General, Joint Research Centre (publ.): Integrated Pollution Prevention and Control Draft Reference Document on Best Available Techniques for the Waste Treatment Industries, Draft January 2004
[14] European Commission, DG Joint Research Center, European IPPC Bureau: Draft Reference Document on Best Available Techniques for the Waste Treatments Industries, draft January 2004, http://eippcb.jr.es

Considering the basic objective of stabilising biodegradable MSW to achieve compliance with the Landfill Directive, MBT projects should meet minimum requirements concerning stabilisation figures. Such figures are for instance described in a working document concerning "Biological Treatment of Biowaste" :[15]

"If residual municipal waste undergoes a mechanical/biological treatment prior to landfilling, the achievement of either a Respiration Activity after four days (AT4) below 10 mg O2/g dm or a Dynamic Respiration Index below 1,000 mg O2/kg VS/h shall deem that the treated residual municipal waste is not any more biodegradable waste in the meaning of Article 2 (m) of Directive 1999/31/EC."

Concerning waste air it should be noted that, due to the emissions to be awaited by the composting process of residual MSW, the waste air should be collected and treated in a scrubber unit extracting ammonia followed by a biofilter.

5.3.2. Technical Standard of Incineration Plants

Thermal treatment plants can be
- mass burn incinerators
  or
- specialised incinerators for high calorific wastes
  or
- facilities co-incinerating processed parts of residual MSW
  or

other types of thermal treatment.

The Incineration Directive gives specific requirements for waste. Additionally BAT (best available techniques) have to be applied. The requirements of BAT are defined in a draft Reference Document on Best Available Techniques for Waste Incineration of the European IPPC Bureau of the European Commission.[16]

For preparing waste to be used as fuel the best available techniques are described in the draft document "Best Available Techniques for the Waste Treatment Industries" (see footnote 14).

[15] The verb "stabilisation" is defined in this way in the European Commission's Working Document "Biological Treatment of Biowaste", 2nd draft, 2001. In comparison to the limit of this draft for the respiration activity AT_4 of 10 mg O_2/g dry matter the Austrian Landfill Regulation requires a respiration activity AT_4 of less than 7 mg O_2/g dry matter.

[16] European Commission, DG Joint Research Center, European IPPC Bureau: Draft Reference Document on Best Available Techniques for Waste Incineration, draft March 2004, http://eippcb.jr.es

6. Capacities and Investment Needs for MSW Disposal

6.1. NATIONAL LEVEL

Currently three incineration plants for MSW are under operation in the Czech Republic. These plants will be upgraded following the EC Incineration Directive in the next time. Then a capacity of 650.000 t/a will be available.

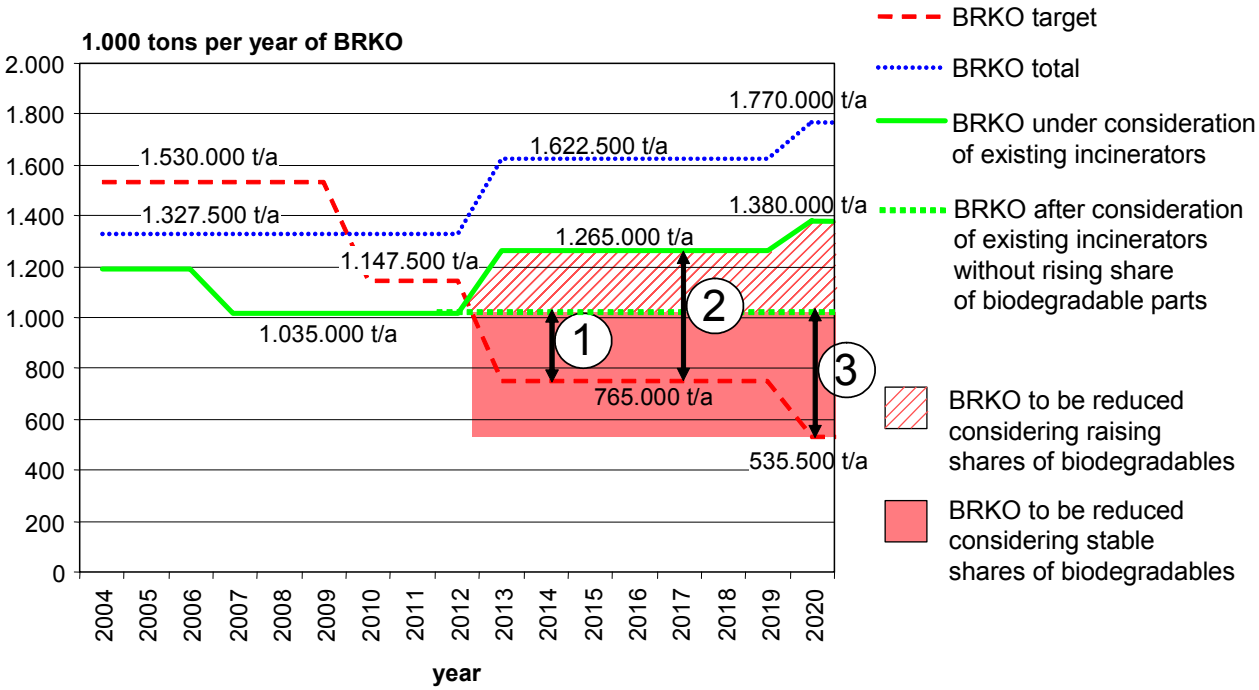
As a basis for the calculation of capacities needed it is assumed that risings of the waste quantity are captured by increasing quantities of separate collected and recovered parts of MSW. That means that the current quantity of residual MSW is calculated to be constant (see chapter 4.2 and scenario of Figure 13).

In the “optimistic” scenario (as described earlier) it is calculated that the quantity of residual MSW decreases with 3% per year until the year 2013 and further on with 1% per year. The total quantity of MSW is unchanged in comparison with the “middle” scenario. The difference is the quantity of separate collected and recycled / recovered MSW (see Figure 14).

6.1.1. Quantities of biodegradable residual MSW

The following picture shows the quantities of biodegradable residual MSW (BRKO). It shows the context between targets, current and future quantities and the reductions needed. From the reductions needed the quantities of MSW which has to be treated before landfilling are calculated (see the following section 6.1.2). The figure is explained in detail below.

Figure 19 Biodegradable Municipal Solid Waste in the Czech Republic: Targets, expected development and reductions needed – middle scenario



Note: BRKO = **b**iologicky **r**ozložitelný **k**omunální **o**dpad (biodegradable municipal solid waste)

- The broken line starting with 1 530 000 t/yr (red line) shows the national targets for landfilled biodegradable MSW (BRKO) given by the Landfill Directive. The baseline has been agreed with the European Commission in the accession process.
- The dotted line starting with 1.327,500 t/yr (blue line) shows the expected total quantity of biodegradable MSW following the calculation method proposed by the Ministry of Environment ("*metodika BRKO*"[17]) which anticipates an increase in the share of biodegradables in landfilled MSW from the current level of 45% to 60% from the year 2020. These figures are to be used only if no results of waste analyses are available. If such data are available they are to be used as the basis for the calculation.
- The full line (green line) considers the capacity of the three existing MSW incineration plants. If they operate with full capacity of 650 000 t/yr (and treating only residual MSW from the Czech Republic, no other wastes) the 2010 target can be met. The green line considers a treated quantity of 300.000 t/yr to the year 2006 and operation at full capacity of 650 000 t/yr from the year 2007.

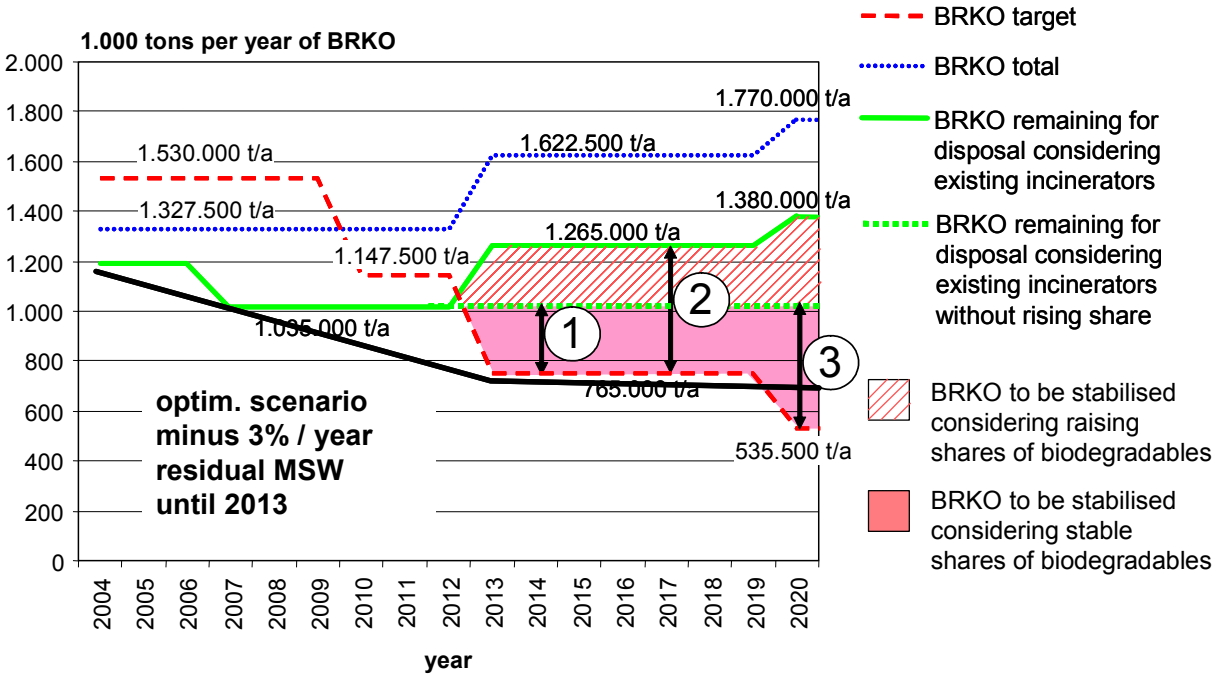
  Considering the raising shares of BRKO in residual MSW as prescribed in the *"metodika BRKO"* the incineration of 650.000 t/yr of residual MSW reduces the landfilled biodegradable MSW by 292.500 t/yr in the period 2007 to 2012 (650.000 t/yr * 45% = 292.500 t/yr) by 357.500 t/yr in the period 2012 to 2019 (650.000 t/yr * 55% = 357.500 t/yr) and by 390.000 t/yr from the year 2020 (650.000 t/yr * 60% = 390.000 t/yr)

  It is to be seen that the decreasing targets (broken red line) and the future quantities of landfilled biodegradable parts of MSW (full green line) cross each other with the year 2013. This means that from this year on the target is according to this scenario in not fulfilled (full green line).

  In the case of the optimistic scenario the targets of the year 2013 could be met without additional stabilisation capacity. The existing incineration capacity of 650.000 t/a would be enough until the year 2020.

[17] Ministry of Environment of the CR: Methodology of calculation for gradual reduction of landfilled quantity of biodegradable municipal waste (*Metodika výpočtu postupného snižování množství biologicky rozložitelných komunálních odpadů (BRKO) ukládaných na skládky*) (draft, June 2003). This methodology only has the status of a recommendation, not a requirement.

Figure 20 Biodegradable Municipal Solid Waste in the Czech Republic: Targets, expected development and reductions needed – optimistic scenario additionally shown



6.1.2. MSW Treatment Capacities Needed

From the difference of the targets and the in future existing quantities of BRKO it can be calculated which quantities of residual MSW have to be treated before landfilling - either by incineration or by mechanical-biological means.

First **it is to be stressed that the landfilled biodegradable MSW should be reduced substantially by means of separate collection and recycling of especially paper/cardboard and biowaste (garden and kitchen waste).** The targets of the National Waste Management Plan are reminded:

- to "*increase the material recovery of municipal waste to 50% by 2010*" (chapter 3.6)
- to "*the maximum degree, increase the material recovery of kinds of waste constituting BDMW separated from municipal waste, especially paper and cardboard*" (paragraph 3.8 c)
- "*prefer composting and anaerobic decomposition of biologically degradable wastes* (except paper/cardboard) *…, with use of the final product particularly in agriculture, in reclaiming and landscaping; wastes that cannot be used in this manner should be processed to fuel or used for energy production*" (paragraph 3.8 h)

Nevertheless from the year 2013 additional capacities for treatment of residual MSW are needed in the case of the middle scenario. Calculating a stable share of biodegradables in disposed MSW **additional capacities of at least 600.000 t/yr are needed** (depicted in Figures 19 and 21 with ①). This is a conservative calculation and the figure has to be seen as a minimum.[18] The calculations concerns the need of a BRKO-reduction of 270.000 t/yr divided by a share of BRKO in residual MSW of 45 % (1.035.000 t/yr - 765.000 t/yr = 270.000 t/yr; 270.000 t/yr ÷ 45% = 600.000 t/yr).

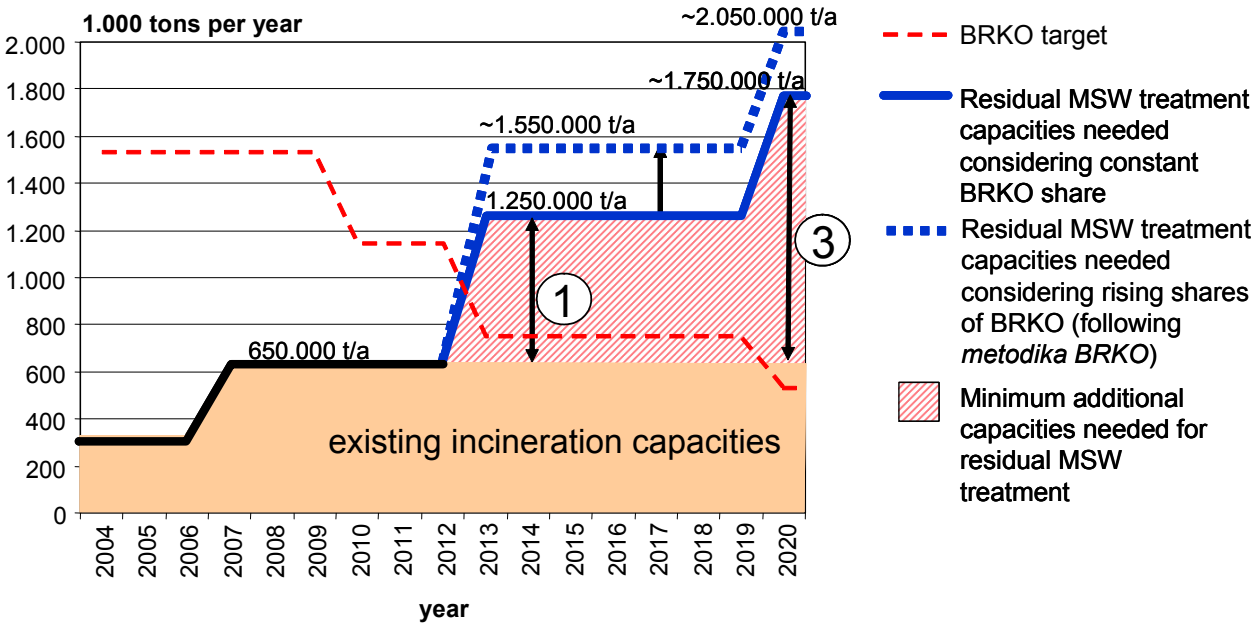
[18] In fact this calculation is not in line with the "*metodika BRKO*". The approach assumes that waste analyses will show constant - and not raising - shares of biodegradables in disopsed MSW.

Following the *metodika BRKO*- calculation method additional capacities of 900.000 t/yr are needed (depicted in Figures 19 and 21 with ②); calculated with 1.265.000 t/yr - 765.000 t/yr = 500.000 t/yr; 500.000 t/yr ÷ 55% = 909.091 t/yr.

From the year 2020 additional capacities of at least 1.100.000 t/yr are needed for treatment of residual MSW (depicted in Figures 19 and 21 with ③). Calculation: 1.035.000 t/yr - 535.500 t/yr = 499.500 t/yr; 499.500 t/yr ÷ 45% = 1.110.000 t/yr

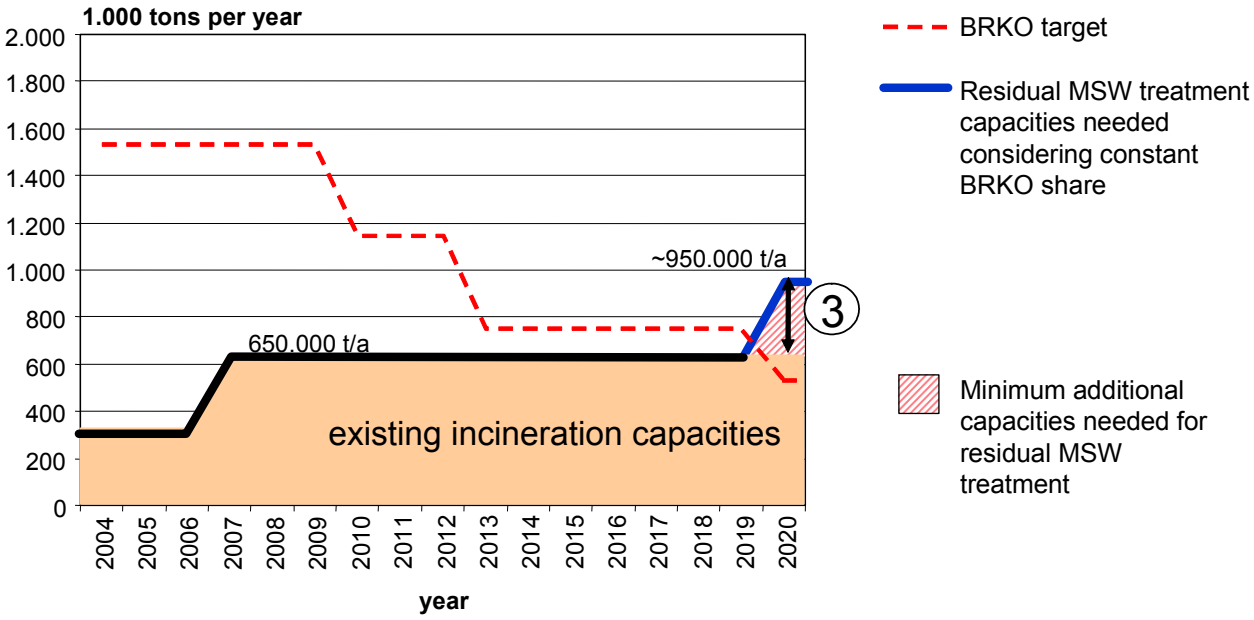
In the case of an increasing share of biodegradable MSW according to *metodika BRKO* additional capacities of about 1.4m t/yr would be needed. Calculation: 1.380.000 t/yr - 535.000 t/yr = 844.500 t/yr; 844.500 t/yr ÷ 60% = 1.407.500 t/yr

Figure 21 Capacities for MSW-treatment needed to meet the targets of the Landfill Directive – middle scenario



In case of the optimistic scenario no additional treatment capacities for residual MSW are needed. For meeting the targets of the year 2020 capacities of about 950.000 t/yr would be needed of which 650.000 t/yr are existing.

Figure 22 Capacities for MSW-treatment needed to meet the targets of the Landfill Directive - optimistic scenario



6.1.3. Investments needed

6.1.3.1 Middle Scenario

To install the additional capacities like described above investments in a range of Kc 7.8 billion to Kc 11.4 billion (depicted in Figures 19 and 21 with ①) respectively Kc 11.8 - 17.3 billion (depicted in Figures 19 and 21 with ②) have to be estimated needed until the year 2012. The range of the investment is dependent from the chosen technology.[19]

Until the year 2020 the investments needed are to be estimated with a range of Kc 14 billion to Kc 21 billion (depicted in Figures 19 and 21 with ③).

6.1.3.2 Optimistic Scenario

In case of the installation of efficient collection systems for biodegradable MSW, especially paper/cardboard and biowaste (optimistic scenario) the targets of the Landfill Directive could be met with the existing facilities until the year 2019. From the year 2020 additional 300.000 t/yr of stabilisation capacities would be needed which would need investments of Kc 4 - 6 billion (depicted in Figure 22 with ③).

[19] The calculation uses the following input data which are ranges from realised projects in EC member countries and which are in compliance with EC-legislation:
- specific investment costs for mass burn incinerator facilities per installed capacity: Kc/t 13,000 - 19,000
- specific investment costs for mechanical biological treatment plants per installed capacity: Kc/t 4,500 - 7,500
- share of high calorific output from mechanical biological treatment plants: 50% by mass
- energy content of high calorific output from mechanical biological treatment plants is recovered in incineration facilities with the same specific investment costs as mass burn incinerators

6.2. REGIONAL LEVEL

In order to apply the nationwide target at regional level the *metodika BRKO* has been developed by the MoE (see section 3.4). This methodology has to be used by the regions for calculating the regional targets. **Each region is responsible for meeting its regional target, though it is possible for the regions to cooperate in achieving their targets.**

In fulfilling this demand regions should be able either to fullfil their regional targets by themselves or to join other regions with the aim to meet their targets together.

The needed treatment capacities are dependent on the regional situation which includes for instance waste quantities, structure of the catchment area, existing infrastructure and waste treatment facilities, etc.

6.3. TIME SCHEDULE FOR RESIDUAL MSW - TREATMENT

Until the end of the year 2012 - that is within the next eight years - there is a need of additional treatment capacities for stabilising residual MSW of at least 100 000 to 200 000 t/yr. Under consideration of the usual needs of time from the first planning to the start of operation the planning of new facilities has to start very soon.

From the view of the year 2004 the planning of new facilities stabilising residual MSW has to be pushed strongly.

7. Regional Waste Management Planning

The chapter gives some evidences for planning processes in regional waste management. It is stressed that planning is thinking in alternatives. That means that the development of different options their assessment and selection is an essential part of each planning process.

The results of a planning process are individual for the special situation in the planning area. Therefore the description of the planning frame and the starting position is essential too.

7.1. PLANNING PROCESS

Planning is a process which starts normally with relatively few detailed information. Missing data have to be replaced in early planning steps by brief expectations and prognosis.

Starting from such brief information a number of options can be developed which may serve the requirements. Already at this early stage of project development a number of options can be excluded in because of being not able to fulfil the requirements or of being complete inadequate to the regional situation. It is important to include, in the beginning, a full range of options covering all aspects of the waste hierarchy, i.e. from avoidance of waste, through recycling and recovery to disposal. Disposal needs, in other words, should not be calculated without reference to options that may be available ‘higher up’ the waste hierarchy. This is particularly important given the high cost of disposal compared to other possible options.

A very important step in excluding diverse options is the documentation of the reasons why options are excluded from further development. Such documentation is needed later if public discussions take place.

At this point it should be remembered that all plans which may cause environmental impacts have to be accompanied by a Strategic Environmental Assessment (SEA)[20]. Such a SEA needs to be documented well and requires the implementation of representatives of the public in the process of decision finding.

The fact of missing detailed data can be respond with sensitivity analysis. Sensitivity analysis are done with the aim to check the effects of the change of different facts and data which are important for taking a decision. If a change of facts and data within the range of uncertainty do not change the decision or the ranking of different options the decision can be taken. It can be taken under the certainty of having selected (or excluded) the right option.

A sensitivity analysis allows further to find that facts or data which are of great importance of the result of a decision. In the further planning process the research in more detailed / better data and information should be concentrated to these “key” factors.

By dividing a planning process in several steps with sensitivity analysis in between the research for facts and data can be done much more concentrated and effective. It speeds up the planning process rapidly and avoids the collection of “data graveyards”.

The results of a planning process described above including the reasons can be presented and justified to decision-makers very well.

The profit of the region in developing regional plans fast and holding the decision process short is a stable basis for a dynamic and continuous regional development of private and public economy as well as public prosperity.

7.2. SUPPORT FOR THE FOUNDATION OF ASSOCIATIONS OF MUNICIPALITIES

In the CR the average size of municipalities is very small. Without considering larger towns the average size of municipalities is below 1,000 citizens. Municipalities with such a “size” usually are not able to implement a modern waste management on their own. To join an association of municipalities has a number of advantages which are for example:

- Increase of professional expertise by concentration
- Better position in negotiations with the private sector
- Pooled placing of orders
- Condition for providing advanced collection services (e.g. for hazardous waste, recyclables, ...)
- Uniform waste management system in a larger area
- Transfer of some administrative tasks (e.g. billing, dealing with complaints, control of contractors)
- Better information access (e.g. on recent technical and legal developments)
- Decrease of management cost, increase of efficiency
- (Better) access to national- and EC-funds

For further information see the results of a workshop held at the Ministry of Environment in September 2003. The following documents are available:

[20] Directive 2001/42/EC on the Assessment of Environmental impacts of certain plans and programmes

- Presentation
- Summary report
- SWOT analysis

8. Basics for assessment of options

8.1. INTRODUCTION

The rational assessment of options for how to achieve given objectives is a feature of planning in many areas of human endeavour, and waste management is no exception. Before proposing a particular solution, it is important to assess the range of available options. Only following such a comparison is it possible to choose the optimal solution.

This process is particularly important where the use of public money is being proposed, as in the case of projects seeking grant support. The European Commission's guide to the assessment of large projects ('Guide to Cost Benefit Analysis of Investment Projects') also emphasises this point. It is also expected that for future projects, the Ministry of Environment will require a clear comparison of options at the 'project intention' stage where approval is sought for the preparation of a Cohesion Fund application.

8.2. SYSTEM BOUNDARIES

The assessments of all options have to consider the same system boundaries. It has to be clear documented which parts of a waste management system are within the system boundaries and which are outside. All effects which are influenced by parts within the system boundaries are taken into consideration, all effects from parts outside the system boundaries not.

It is recommended to take the following definitions for assessing treatment options for residual MSW:

Inside the system boundaries (effects considered)

- Transport of waste from transfer stations to the facility (if any)
- Utilisation of energy as heat and/or electricity at the planned facility
- Disposal / recovery of output materials
- Employment in direct connection with the planned facility
- Effects of accidents within the facility - possibly for the risk assessment

Outside the system boundaries (effects not considered)

- Waste collection and transport to transfer stations
- Collection and treatment of other wastes than residual MSW
- Distribution of energy (heat and/or electricity)
- Production of by-products and operation materials
- Environmental effects of the construction phase

8.3. COST ASSESSMENT

8.3.1. Principles

One principle of the cost assessment is to use data which are good enough for taking a certain decision. With a sensitivity analysis the influence of different changes of input data to the final result can be evaluated. If the result is very sensitive to some input data, these data should be chosen carefully. Other input data which have low influence to the result should be taken from experience (out from comparable projects and/or from literature).

It has to be stressed clearly that cost calculation is a method which is used for a special purpose. The purposes in the current case are the comparison of different options for a given region, and to calculate financial sustainability and the approved support of EC-funds. The methodology for calculating the approved support is defined by the European Commission in the 'Guide to Cost Benefit Analysis of Investment Projects'.

The cost assessment for one area is usually done under specific circumstances. The results are not comparable with other regions and different general conditions.

Using the same *system boundaries* for all options is of utmost importance (for more details refer to chapter 8.2).

No subsidies have to be considered when evaluating and comparing options.
Options have to be assessed without subsidies first, and in a next step it has to be estimated how much subsidy is needed to make this option competitive with the current disposal method which has be overcome in order to cope with legal requirements (landfilling).

8.3.2. Typical costs

A clear distinction has to be made between

- Investment (capital) costs

  and

- Operating Costs

For *capital costs* as a general rule it can be stated that mechanical-biological systems as the technically less complex are less costly compared to incinerators for which the following real range of operational costs can be assumed: [21]

[21] Some calculations were done by the TWINNING-team. These calculations and can be seen in detail on the CD: there is one example for Hradec Králové and one for Pilsen.

Table 6: Typical cost ranges of MSW incinerators

	Facility / facilities	*Cost / gate fee*	*Remarks*
①	Medium sized (< 150.000 t/a) Bavarian incinerators (Schwandorf, Augsburg, Kempten…)	125 … 180 €/t	Top values: 250 €/t (South Bavaria). This group of plants is altogether characterised by much less attractive conditions for marketing the produced energy compared to potential sites in the CR evaluated within the present project (Plzeň, Opatovice).
②	Result of recent tenders (BOO, Austria, capacity 150.000 … 250.000 t/a)	120 … 130 €/t	Lower Austria: ~ 120 €/t (2002), Upper Austria 130 €/t (2003) – Carinthia even 141 €/t ! (however only 80.000 t/a)
③	Result of recent tenders (BOO, Germany, capacity ~ 300.000 t/a)	100 €/t	Dictum German waste treatment industry: "100 € in the price envelope works, but 95 € is ruinous"
④	Result of in-depth cost estimates performed for CR (capacity > 100.000 t/a)	75 … 85 €/t	Treatment costs 15 - 25 % lower compared to the 'German tender cost line' are due to (slightly) lower costs for civil works, sites which are already developed, lower disposal cost for residuals and good conditions for energy marketing (heat sale all year round)

Table 7: Example of capital cost calculation for a 30.000 ton per year MBT plant

MSW Treatment Center

Financing Tools to Implement Acquis in the Environment Sector
Waste Management

Data on investment:	amount	price per unit	
Civil Works			**31.900.000 Kč**
Access arrangements, site preparation	1	5.000.000 Kč	5.000.000 Kč
Building (30 x 40 x 8 m), insulated, with doors, ...	9.600 m3	2.500 Kč	24.000.000 Kč
Planning, gathering of approvals, documentation	based on total investment	10%	2.900.000 Kč
M & E-part			**46.305.000 Kč**
Shredder (multifunctional: bag opener MSW, volume reduction bulky waste...)	1	8.000.000 Kč	8.000.000 Kč
Separation unit	1	7.000.000 Kč	7.000.000 Kč
Magnet	2	1.000.000 Kč	2.000.000 Kč
Conveyors	3	1.000.000 Kč	3.000.000 Kč
Container press	1	2.000.000 Kč	2.000.000 Kč
Ventilation	1	1.500.000 Kč	1.500.000 Kč
Control system	1	1.500.000 Kč	1.500.000 Kč
Steel structure	1	2.000.000 Kč	2.000.000 Kč
Biologic treatment step (´medium´ lumpsum eg. for triangular windrows ..)	1	15.000.000 Kč	15.000.000 Kč
Contingencies	based on total investment	5%	2.100.000 Kč
Planning, gathering of approvals, documentation	based on total investment	5%	2.205.000 Kč
Mobile equipment			**2.770.000 Kč**
Feeding device (shovel loader, mobile crane...)	1	3.000.000 Kč	3.000.000 Kč
3 axle truck equipped with roll-on/roll off system	1	2.000.000 Kč	2.000.000 Kč
Container (open, ca. 33 m3)	4	65.000 Kč	260.000 Kč
Container (closed, for RDF transport)	6	85.000 Kč	510.000 Kč
Planning, gathering of approvals, documentation	based on total investment	0%	0 Kč
Total			**81.000.000 Kč**

Table 8: Basic structure of an operational cost calculation

	Item	
Cost	• Annuities	
	• Repair and Maintenance	
	• Consumables	Energy, chemicals…
	• Staff	
	• Disposal of residues (including transport)	Incineration slag, residues of flue gas cleaning, …
	• Ancillary	Administration, insurance, …
Minus		
Revenues	• Secondary raw materials	Ferrous scrap
	• Energy	Heat, electricity
= net cost	**Given per ton (Kc/t)**	

For cost calculation it is recommended to use the following *basic data*:

Table 9: Economic basic values recommended for operational cost calculations

Parameter	*comment*	*Value to be chosen*
Depreciation / Reinvestment period		
	for mobile equipment (as vehicles, container etc.)	7 years
	for machinery (fixed plant equipment)	10 – 15 years
	for civil works	25 years
Interest rate (for calculation of annuities)	Depending on current finance market conditions	…4 – 6 % …
Repair and maintenance cost, as a share of initial investment per year	for mobile equipment	5 %
	for machinery	3,5 %
	for civil works	1,5 %
Utilisation of Capacity	Not less than … should be assumed; and after start-up full capacity utilisation should be assumed (no holding out of capacities to be eventually filled up by external sources at a later stage)	90 %
Staff	Including all charges, taxes, fringe benefits etc; a typical average value for the CR at present seems to be	300.000 Kc/staff.yr

Table 10 Example for a calculation sheet for a mass burn incineration facility

Waste Incineration **165.000 t/y**

Calculation based on a classical mass burn incineration plant

3.136 Mio. Kc **total investment** **98 Mio. EUR**

19.006 Kc/t specific investment 594 EUR/t

								Costs & revenues (per year)	
1) Annuitized construction costs						depreciated in	interest rate	289.942.295 Kč	52%
Civil Works	thereof subsidized	0%	480.000.000 Kč	15%		25 years	5,0%	34.057.180 Kč	
Plant & Equipment	subsidized	0%	2.656.000.000 Kč	85%		15 years	5,0%	255.885.116 Kč	
2) Repair & Maintenance								100.160.000 Kč	18%
Civil Works			480.000.000 Kč	1,5%	from initial investment p. a.			7.200.000 Kč	
Plant & Equipment			2.656.000.000 Kč	3,5%	from initial investment p. a.			92.960.000 Kč	
3) Consumables		eg. chemicals		650 Kč	cost per t			107.250.000 Kč	19%
4) Staff			70 staff	300.000 Kč	per staff / year			21.000.000 Kč	4%
5) Disposal of residuals								36.795.000 Kč	7%
Slag and ashes			related to input	30%	600 Kč cost per t			29.700.000 Kč	
Flue gas cleaning residues			related to input	1%	4.300 Kč cost per t			7.095.000 Kč	
6) Total cost (lines 1 bis 6)								555.147.295 Kč	100%
7) Revenues (detailed as given below, or as a lumpsum)								190.575.000 Kč	34%
Total energy output			1.875 kWh/t		0,60 Kč per kWh			185.625.000 Kč	
Scrap metal			related to input	3%	1.000 Kč per t			4.950.000 Kč	
8) Balance: Net cost (line 6 minus line 7)								364.572.295 Kč	66%
9) Specific cost								2.210 Kc/t	

Table 11 Example for a calculation sheet for a MBT mechanical biological treatment plant

Regional MSW Treatment Centers

40.000 t/y mechanical treatment

18.800 t/y biological treatment

171 Mio. Kc **total investment** **5 Mio. EUR**

4.269 Kc/t specific investment 133 EUR/t

									Costs & revenues (per year)	
Pre-treatment										
I.1 Annuitized construction costs						depreciated in	interest rate	factor	15.478.016 Kč	33%
Civil Works	thereof subsidized	0%	55.000.000 Kč	32%		25 years	5,0%	0,071	3.902.385 Kč	
M & E-part	subsidized	0%	108.540.000 Kč	64%		15 years	5,0%	0,096	10.456.992 Kč	
Mobile equipment	subsidized	0%	7.230.000 Kč	4%		8 years	5,0%	0,155	1.118.639 Kč	
I.2 Repair & Maintenance									4.623.900 Kč	10%
Civil works			55.000.000 Kč	1,5%	from initial investment p. a.				825.000 Kč	
M & E-part			108.540.000 Kč	3,5%	from initial investment p. a.				3.798.900 Kč	
Mobile equipment			7.230.000 Kč	5,0%	from initial investment p. a.				361.500 Kč	
I.3 Energy & Consumables									4.000.000 Kč	9%
Electric energy			3,50 Kč per kWh		20 KWh per t				2.800.000 Kč	
Fuel			20,00 Kč per l		1,5 l/t				1.200.000 Kč	
Consumables					30 Kč per t				1.200.000 Kč	
I.4 Staff			5		300.000 Kč each p. a.				1.500.000 Kč	3%
I.5 Marketing of recyclables & disposal of residuals on site									20.640.000 Kč	45%
Scrap metal and other recyclables				3%	-1.000 Kč per t				-1.200.000 Kč	-3%
Other (eg. hazardous components)				1%	5.000 Kč per t				2.000.000 Kč	4%
Material to be landfilled				62%	800 Kč per t				19.840.000 Kč	43%
Quality B compost -> landfill recultivation				5%	0 Kč per t				0 Kč	0%
I Total cost of pre-treatment (lines 1 bis 5)									46.241.916 Kč	100%
I Specific cost of pre-treatment									1.156 Kc per t	0%

Table 12 shows the relevant data of a comparison of various treatment options - prepared by the TWINNING-Team for the region of Hradec Králové

Table 12: Results of a cost assessment (overview)

Option 1		Thermal	MBT	Transport	**Therm+MBT**	Landfilling	**Total**	
tons		165.000	0	111.150	**165.000**	135.000		
specific costs	Kc/t	2.210	1.032	111	**2.284**	800		
costs per year	Mio Kc/a	365	0	12	**377**	108	**485**	**Mio Kc/a**
							300.000	t/a
total average costs including operational costs and depreciation							**1.616**	**avg Kc/t**
investment	Mio Kc	3.136			3.136		3.136	Mio Kc
specific investment	Kc/t	19.006			19.006		10.453	avg Kc/t
Option 2a		Thermal	MBT	Transport	**Therm+MBT**	Landfilling	**Total**	
tons		150.000	300.000	150.000	**300.000**	0		
specific costs	Kc/t	2.220	1.156	83	**2.308**	0		
costs per year	Mio Kc/a	333	347	13	**692**	0	**692**	**Mio Kc/a**
							300.000	t/a
total average costs including operational costs and depreciation							**2.308**	**avg Kc/t**
investment	Mio Kc	3.338	1.281		4.618		4.618	Mio Kc
specific investment	Kc/t	22.250	4.269		15.394		15.394	avg Kc/t
Option 2b		Thermal	MBT	Transport	**Therm+MBT**	Landfilling	**Total**	
tons		0	260.000	0	**260.000**	40.000		
specific costs	Kc/t		1.156	0	**1.156**	800		
costs per year	Mio Kc/a	0	301	0	**301**	32	**333**	**Mio Kc/a**
							300.000	t/a
total average costs including operational costs and depreciation							**1.109**	**avg Kc/t**
investment	Mio Kc		1.110		1.110		1.110	Mio Kc
specific investment	Kc/t		4.269		4.269		3.700	avg Kc/t
Option 2c		Thermal	MBT	Transport	**Therm+MBT**	Landfilling	**Total**	
tons		80.000	165.000	120.000	**165.000**	130.000		
specific costs	Kc/t	2.220	1.032	120	**2.196**	800		
costs per year	Mio Kc/a	178	170	14	**362**	104	**466**	**Mio Kc/a**
							300.000	t/a
total average costs including operational costs and depreciation							**1.554**	**avg Kc/t**
investment	Mio Kc	1.780	704		2.484		2.484	Mio Kc
specific investment	Kc/t	22.250	4.269		15.057		8.281	avg Kc/t
Option 1+2c		Thermal	MBT	Transport	**Therm+MBT**	Landfilling	**Total**	
tons		120.000	80.000	40.000	**170.000**	140.000		
specific costs	Kc/t	2.283	1.032	40	**2.107**	800		
costs per year	Mio Kc/a	274	83	2	**358**	112	**470**	**Mio Kc/a**
							300.000	t/a
total average costs including operational costs and depreciation							**1.567**	**avg Kc/t**
investment	Mio Kc	2.500	342		2.842		2.842	Mio Kc
specific investment	Kc/t	20.833	4.269		16.715		9.472	avg Kc/t

Another example (in a slightly different form of presentation) can be taken from the summary of the Regional Waste Management Plan for the Plzeň region (note: not absolutely final – remaining changes were done in Czech version).

Figure 23 Comparison of total specific costs

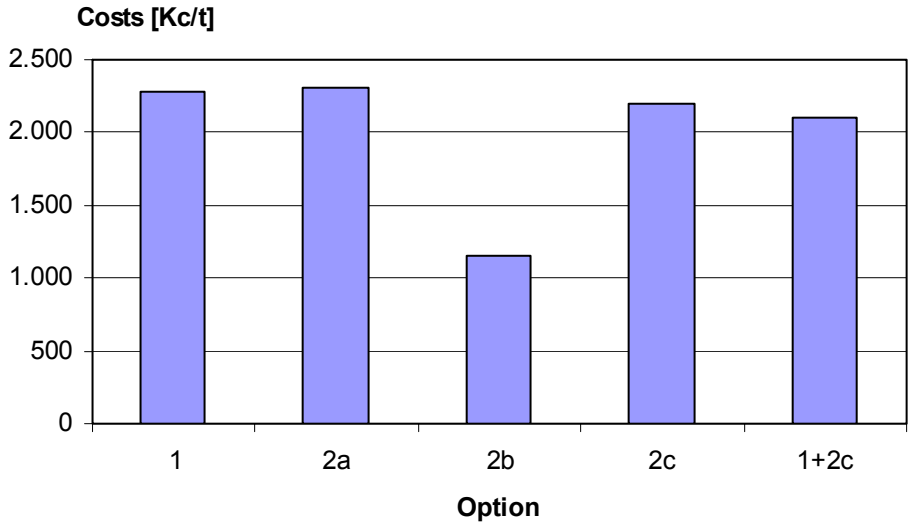
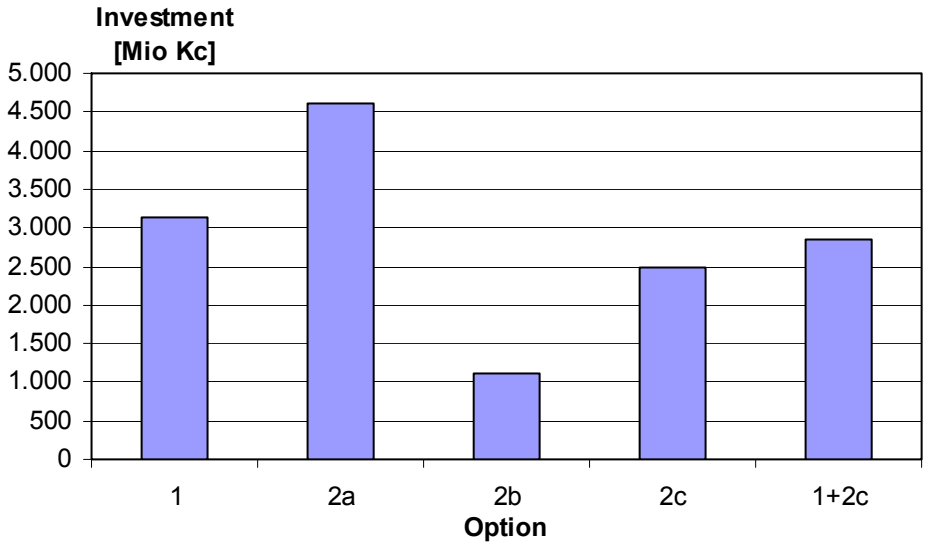


Figure 24 Comparison of investment costs



8.4. CALCULATION OF SUPPORT NEEDED TO BE COMPETITIVE WITH LANDFILLING

The current prices for landfilling MSW in the Czech Republic are very low. With these prices no more advanced treatment technologies are competitive. The challenge of new facilities is to become competitive with landfilling. Otherwise the facility cannot survive in a free market. Making facilities which represent the state of the art competitive is one main task of the EC funds OP Infrastructure and the Cohesion Fund.

The financial support is a subsidy to the investment. The applicant has to calculate and to make evident the need for a support and has to calculate the support rate. How this support rate is to calculate is determined by the EC. However the applicant has to calculate the economic sustainability of the project.

8.5. ENVIRONMENTAL ASSESSMENT

The assessment of the environmental impacts of different waste options is not straightforward. Nevertheless it is possible, and desirable, to undertake at least a simple assessment of easily-quantifiable environmental aspects. In work done by the Twinning team, for instance, the following effects were assessed (see figures):

- Waste transport (not including transport by collection vehicles but only longer-distance transport involving waste transfer from collection vehicles to another means of transport)
- Energy recovered
- Volumes of exhaust gas (assuming different combustion technologies)

Figure 25 Comparison of utilisable energy – example comparison of options

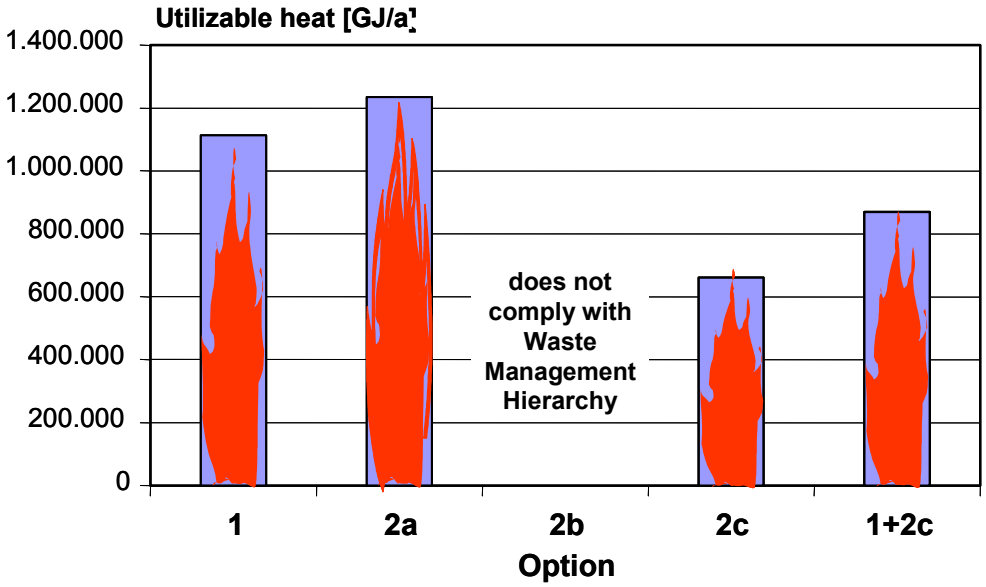
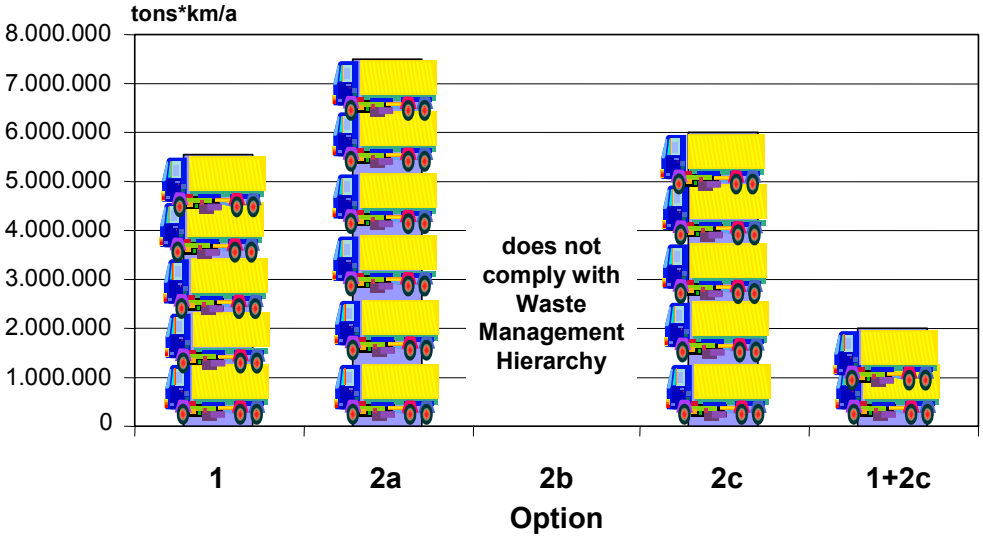


Figure 26 Transport intensity – example comparison of options



It is desirable to undertake a more sophisticated comparison of options from an environmental perspective where this is possible, for instance to estimate the external costs of different options associated with their actual or implied greenhouse gas emissions or savings. The monetary evaluation of externalities is a however a challenging area and the Twinning project did not attempt this.

8.6. MULTI CRITERIA ANALYSIS

As a matter of fact not all aspects of an option worth being assessed and evaluated can be evaluated in *monetary terms*, eg. parameters like

- *additional traffic loads / transport efforts*
  (as an indirect parameter for environmental loads)
- *emission of contaminations to soil, air, surface and ground water*
- *noise emissions*
- *energy release* (beyond ´ordinary´ economical appraisal, as a general issue of national economy)
- *employment issues* (N^{o} of jobs created)
- *emission of greenhouse gases like CO_2 or Methane*
- *exceeding set targets* (eg. for biodegradable waste components)

and the like.

For a multi criteria analysis different individual parameters (like listed above) have to be evaluated and a single result has to be found. Therefore the individual parameters have to be evaluate with individual values. The selection of parameters and the values to be assigned to each parameter has to be done carefully. The process has to be described well and to be done in a re-enactable way.

Figure 27 Example of results of a multi criteria analysis

	Option				
	1	2a	2b	2c	1+2c
Legal assessment	1	1	Not compliant	1	1
Economic assessment	4	5	1	3	2
Ecologic assessment	3	3	1	3	2
Utilizable energy	2	1	5	4	3
Emissions to the air	5	4	1	2	3
Transport	3	5	1	4	2
Risk assessment	No special disadvantages				
Total	3	4	Not compliant	2	1

9. Sensitivity Analysis and Risk Analysis

Sensitivity analysis are done to see the influence of changing basic calculation data to the result of the calculation.

Especially in early stages of project development a large number of figures are not known in detail. These data have to be estimated. The estimations usually are done with experience data from realised and compareable projects. Additionally to the uncertainties of figures for the present the future development has to be considered.

The task of a sensitivity analysis is to find the key factors which influence the result strongly and which could change the result of the advantage or disadvantage of a project. This can be either economic factors or other factors like environmental effects.

Sensitivity analysis help further to find out if input data are defined well enough. If the influence of a specific data to change the result is very low a rough estimation of this figure is enough. If specific data influence the result very strong - the result reacts very sensitive to these data - these data have to be determined carefully.

From the experience of calculating waste management projects the results are sensitive especially to the following input factors for which sensitivity analysis should be done in any case:

- Different waste quantities and capacities
- Different percentages of capacity used (rate of utilisation)
- Different payments/revenues for the outputs including energy
- Different disposal/recovery methods of outputs
- Different transport distances for input and output
- Different waste compositions like calorific value, biodegradable content
- Different existing infrastructure which may be used by the project
- Different interest rates for financing

A special type of sensitivity analysis is to check the influence of “optimistic” and “pessimistic” prognosis for future developments of single figures like price trend of inputs and outputs or trend of waste quantities. A sensitivity analysis allow to compare the results of such different forecasts.

Table 13 shows as an example the comparison of five different options of residual MSW treatment where the following information can be taken:

What can be seen in this table:

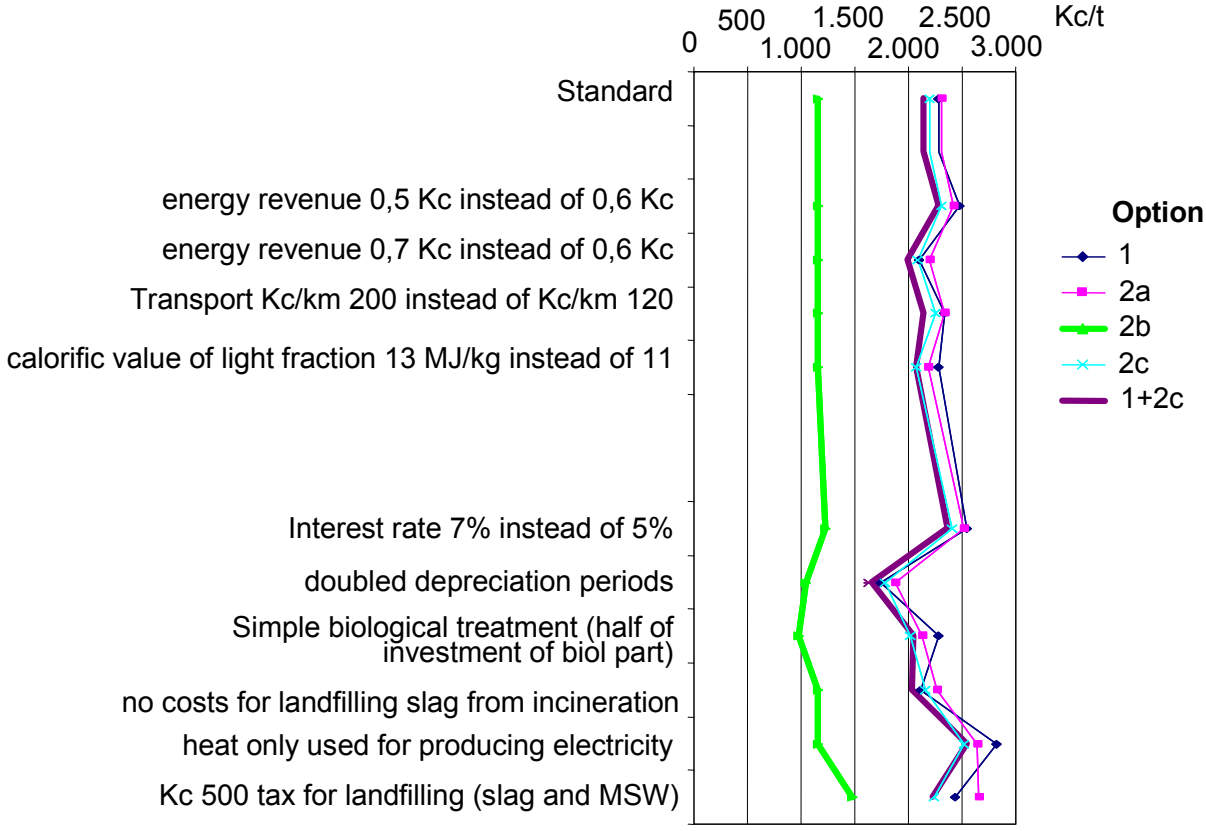
- Changes in input figures can change the result up to 60 % (see last two lines min/max)
- The most sensitive factors are
    - The use of heat
    - Additional tax for landfilling slag from MSW-incineration
- Option 2b is the option with the lowest costs in all cases

Table 13: Example for a sensitivity analysis

	Option				
	1	2a	2b	2c	1+2c
	Kc/t	Kc/t	Kc/t	Kc/t	Kc/t
Standard	2.284	2.308	1.156	2.196	2.107
energy revenue 0,5 Kc instead of 0,6 Kc	2.472	2.422	1.156	2.307	2.249
energy revenue 0,7 Kc instead of 0,6 Kc	2.097	2.193	1.156	2.084	1.965
Transport Kc/km 200 instead of Kc/km 120	2.334	2.335	1.156	2.254	2.113
calorific value of light fraction 13 instead of 11 MJ/kg	2.284	2.183	1.156	2.074	2.048
Interest rate 7% instead of 5%	2.544	2.520	1.215	2.403	2.336
doubled depreciation periods	1.734	1.877	1.038	1.774	1.631
Simple biological treatment (half of investment of biol part)	2.284	2.122	971	2.010	2.020
no costs for landfilling slag from incineration	2.104	2.263	1.156	2.152	2.001
heat only used for producing electricity	2.816	2.632	1.156	2.510	2.510
Kc 500 tax for landfilling (slag and MSW)	2.434	2.655	1.466	2.232	2.195
min	1.734	1.877	971	1.774	1.631
max	2.816	2.655	1.466	2.510	2.510

Another method for presenting the results of a sensitivity analysis is to draw the figures in a graph. In the graph the advantage of option 2b can be seen much more clearly than in the table above:

Figure 28 Example for a sensitivity analysis



In the most cases a sensitivity analysis gives essential information where possible risks of a project are. Especially factors which can change the profitability and/or sustainability of a project have to be checked carefully. The factors can be found by the method of the sensitivity analysis.

10. Requirements and Guidance for applications

10.1. COHESION FUND

10.1.1. Requirements and Guidance of the European Commission

Legislation

- Council Regulation (EC) No 1164/94 of 16 May 1994 establishing a Cohesion Fund
- Commission Decision No 96/455 of 25 June 1996 concerning information and publicity measures to be carried out by the Member States and the Commission concerning the activities of the Cohesion Fund under Council Regulation (EC) No 1164/94
- Council Regulation (EC) No 1264/1999 of 21 June 1999 amending Regulation (EC) No 1164/94 establishing a Cohesion Fund
- Council Regulation (EC) No 1265/1999 of 21 June 1999 amending Annex II to Regulation (EC) No 1164/94 establishing a Cohesion Fund
- Commission Regulation (EC) No 1386/2002 of 29 July 2002 laying down detailed rules for the implementation of Council Regulation (EC) No 1164/94 as regards the management and control systems for assistance granted from the Cohesion Fund and the procedure for making financial corrections
- Commission Regulation (EC) No 16/2003 of 6 January 2003 laying down special detailed rules for implementing Council Regulation (EC) No 1164/94 as regards eligibility of expenditure in the context of measures part-financed by the Cohesion Fund

Guidance

- Guide to the Cohesion Fund 2000-06
- Presentation on Cost Benefit Analysis by DG REGIO, April 2004
- Guide to Cost Benefit Analysis of Investment Projects
- Guidelines on Public Private Partnerships

10.1.2. Requirements and Guidance of the Czech Republic

- Ministry of Environment Directive 6/2004 on the submission of Cohesion Fund applications
- Ministry of Environment Directive 7/2004 on the provision and use of financial support from the State Environment Fund of the Czech Republic for investment projects implemented in the framework of the Cohesion Fund
- National Strategy of the EU Cohesion Fund – The Environment (2004-2006)
- Statute of the Cohesion Fund Working Group
- Guidance setting minimum criteria for residual municipal solid waste projects submitted for support from the Cohesion Fund (*prepared by Twinning project but not approved at time of publication of this Manual*)

10.2. OPERATIONAL PROGRAM INFRASTRUCTURE (OP-INFRA)

10.2.1. Requirements and Guidance of the European Commission

Legislation

- Council Regulation (EC) No 1260/1999 of 21 June 1999 laying down general provisions on the Structural Funds
- Regulation (EC) No 1783/1999 of the European Parliament and of the Council of 12 June 1999 on the European Regional Development Fund
- Commission Regulation (EC) No 1159/2000 of 30 May 2000 on information and publicity measures to be carried out by the Member States concerning assistance from the Structural Funds
- Commission Regulation (EC) No 1685/2000 of 28 July 2000 laying down detailed rules for the implementation of Council Regulation (EC) No 1260/1999 as regards eligibility of expenditure of operations co-financed by the Structural Funds
- Commission Regulation (EC) No 438/2001 of 2 March 2001 laying down detailed rules for the implementation of Council Regulation (EC) No 1260/1999 as regards the management and control systems for assistance granted under the Structural Funds
- Commission Regulation (EC) No 448/2001 of 2 March 2001 laying down detailed rules for the implementation of Council Regulation (EC) No 1260/1999 as regards the procedure for making financial corrections to assistance granted under the Structural Funds
- Council Regulation (EC) No 1447/2001 of 28 June 2001 amending Regulation (EC) No 1260/1999 laying down general provisions on the Structural Funds
- Commission Regulation (EC) No 2355/2002 of 27 December 2002 amending Commission Regulation (EC) No 438/2001 laying down detailed rules for the implementation of Council Regulation (EC) No 1260/1999 as regards the management and control systems for assistance granted under the Structural Funds
- Commission Regulation (EC) No 448/2004 of 10 March 2004 amending Regulation (EC) No 1685/2000 laying down detailed rules for the implementation of Council Regulation (EC) No 1260/1999 as regards the eligibility of expenditure of operations co-financed by the Structural Funds and withdrawing Regulation (EC) No 1145/2003

Guidance

The guidance on cost-benefit analysis presented above for the Cohesion Fund is also relevant for OP Infrastructure projects.

10.2.2. Requirements and Guidance of the Czech Republic

- Operational Programme Infrastructure (OP Infra) – *not guaranteed to be final version as officially approved*
- OP Infra Programme Complement
- MoE Directive 8/2004 on the provision of financial support from Operational Programme Infrastructure – Priority 3, including co-financing from the State Environmental Fund
- Information on how to apply to the State Environment Fund
- Guidance on the financial and economic analysis of projects (basic document, and spreadsheets to be used for different periods of analysis – 8, 15, 30 and 50 years)
- Presentation on waste management projects from State Environment Fund, October 2004

11. General Recommendations

- Public funds should be focused primarily in the area of municipal solid waste, where the largest investments will be needed and where the producer responsibility and polluter pays principles do not rule out public funding.

- The planning of these investments must be an integral part of the regional waste management planning process. One of the key aims of this process should be to determine and implement the right level of separate collection (and recycling/recovery) activity, since this can be much more cost-effective than treatment of residual MSW.

- Nevertheless it is unrealistic to expect that the Czech Republic will comply with the 2013 target for reduction of landfilled biodegradable MSW without also investing in facilities for the treatment of residual MSW. Planning for these facilities must start now (2004) if they are to be available in time to contribute to meeting the target.

- Before a commitment is made to a particular project, a comparison of options must be undertaken following a set of basic principles (as set out in Guidance to be issued by the Ministry of Environment).

- Projects dealing only with residual MSW are acceptable for Cohesion Fund support. Projects that also include complementary elements of separate collection (and recycling / recovery) are however preferred (all other things being equal). It is nevertheless recognised that 'integrated' projects containing both elements are likely to be more complex and so more difficult to prepare and implement successfully.

- Particular care must be taken when preparing projects for support from the Cohesion Fund to respect the polluter pays principle, especially if wastes other than municipal wastes are involved.

- Care must also be given when considering the role of the private sector in EC-funded projects. Cohesion Fund projects must respect the European Commission's approach to Public Private Partnerships and public procurement requirements. Projects for OP Infrastructure must respect (complex) State Aid rules, which may in practice limit the level of support that is possible to give to private applicants to less than 35% of eligible costs.

12. Other Literature

Ministry of Environment

- National Waste Management Plan
- Metodika BRKO

TWINNING-team

- Implementation plan for residual Municipal Solid Waste in the region of Hradec Králové
- Implementation plan for residual Municipal Solid Waste in the region of Pardubice
- Summary Report of Workshop on Waste Management at the MoE, 10 September 2003
    - Presentation
    - Summary report
    - SWOT analysis
- Guidance setting minimum criteria for residual municipal solid waste projects submitted for support from the Cohesion Fund
- Calculation sheet: *Calculation of landfilled biodegradable MSW*
- Calculation sheet: *Cost assessment of different disposal methods of residual MSW in the region of Hradec Králové*
- Calculation sheet: Example on cost comparison of MSW treatment options in the region of Plzeň
- Bohemiaplan Plzeň: Regional Waste Management Plan Plzeň region (note: not final version, which exists only in Czech)
- Presentation of Manual, 5 and 6 October 2004

European Commission

- European Commission, Directorate General, Joint Research Centre (publ.): Integrated Pollution Prevention and Control Draft Reference Document on the Best Available Techniques for Waste Incineration, Draft March 2004
- European Commission, Directorate General, Joint Research Centre (publ.): Integrated Pollution Prevention and Control Draft Reference Document on Best Available Techniques for the Waste Treatment Industries, Draft January 2004

13. Annex – EC Legislation Relating to Waste Management

Summary of the Main Existing EU Legislation Relating to Waste Management

Directive	Main Requirements
Council Directive 75/442/EEC on Waste (The Framework Directive)	This Directive establishes a framework for the management of waste and a waste management hierarchy (prevention or reduction of waste production and its harmfulness, the recovery of waste, including recycling, re-use or reclamation, or the use of waste as a source of energy, final disposal), and requires Member States *inter alia* to: • Establish an integrated and adequate network of disposal installations • Prepare and implement waste management plans • Apply the 'polluter pays principle' • Ensure that waste is recovered, or disposed of, without endangering human health and the environment • Prohibit the abandonment, dumping or uncontrolled disposal of waste.
Council Directive 91/689/EEC on Hazardous Waste	The main aim is to promote the environmentally-sound management of hazardous waste. It establishes a list of hazardous waste and requires Member States *inter alia* to: • Draw up plans for the management of hazardous waste and make them public • Establish proper databases at any site where hazardous waste is produced, transferred or tipped • Ensure that producers of hazardous waste are subject to appropriate periodic inspections • Ensure that, in the course of collection, transportation and temporary storage, waste is properly packaged and labelled.

Summary of the Main Existing EU Legislation Relating to Waste Management

Directive	Main Requirements
Council Directive 94/62/EC on Packaging and Packaging Waste	The main aim is to harmonise measures on the management of packaging and packaging waste, in order to prevent or minimise any environmental impacts of this waste and to avoid distortions of competition within the internal market. It lays down minimum standards for packaging materials and targets for the recovery and recycling of packaging waste and requires Member States *inter alia* to: • Include a chapter on the management of packaging and packaging waste in waste management plans • Set up systems for the return and collection of used packaging and packaging waste and their reuse or recovery • Establish databases on packaging and packaging waste • Take measures to prevent the production of packaging waste and to attain specified targets for recovering and recycling packaging waste, including measures to ensure that 50 - 65% of packaging waste is recovered and 25 - 45% of packaging material contained in packaging waste is recycled • Organise an information campaign for the general public and economic operators • Take measures to ensure that users of packaging, particularly consumers, obtain information on how they could contribute to re-use, recovery and recycling of this waste.
Council Directive 96/59/EC on the Disposal of Polychlorinated Biphenyls and Polychlorinated Terphenyls (PCBs/PCTs)	The purpose of the Directive is to harmonise laws on the controlled disposal of PCB/PCTs and on the decontamination or disposal of equipment containing PCBs (PCBs means PCBs, PCTs and similar substances) with a view to eliminating them completely. It requires Member States *inter alia* to: • Compile and regularly update inventories of equipment containing PCBs • Draw up plans for the decontamination and/or disposal of PCBs and of equipment containing PCBs • Develop installations for the disposal, decontamination and safe storage of PCBs • Ensure that PCBs and equipment containing PCBs are decontaminated or disposed of within specified deadlines (by 2010).

Summary of the Main Existing EU Legislation Relating to Waste Management

Directive	Main Requirements
Council Directive 91/157/EEC on Batteries and Accumulators Containing Certain Dangerous Substances	This Directive aims to approximate laws on the recovery and controlled disposal of spent batteries and accumulators. It requires the reduction of their heavy metal content. It also requires Member States *inter alia* to: • Draw up programmes to achieve specific objectives, including the reduction of the heavy metal content of batteries and accumulators • Ensure the efficient organisation of separate collection systems with a view to recovery or disposal, and where appropriate consider the use of deposit systems • Prohibit the marketing of alkaline manganese batteries containing specified levels of mercury • Consult with concerned parties on proposals for a separate collection and deposit system as well as for economic instruments in order to promote recycling • Provide consumers with specific information about batteries and accumulators, including information about the dangers of their uncontrolled disposal.

Summary of the Main Existing EU Legislation Relating to Waste Management

Directive	Main Requirements
Council Directive 75/439/EEC on the Disposal of Waste Oils	The purpose of the Directive is to create a harmonised system for the collection, treatment, storage and disposal of waste oils, without harming the environment. This Directive requires Member States *inter alia* to: • Ensure that waste are collected and disposed of without causing avoidable damage to human health and the environment • In managing waste oils, give priority to processing by regeneration, then to combustion, and finally to safe destruction or final disposal • Prohibit the discharge of waste oils into waters or onto soils and emissions to air in excess of permitted levels • Require any undertaking that disposes of waste oils to be subject to prior authorisation • Take measures to ensure that the operation of plants where waste oils are used as fuel will not cause significant levels of air pollution, and that waste oils used as fuel do not constitute toxic and dangerous waste or contain PCB/PCT concentrations of more than 50 ppm • Prohibit mixing of waste oils with PCB/PCTs when collecting or storing waste oils.
Council Directive 86/278/EEC on the Protection of the Environment, and in particular of the Soil, when Sewage Sludge is used in Agriculture	The main aims are to regulate the use of sewage sludge in agriculture in order to prevent harmful effects on soil, vegetation, animals and humans. The Directive requires the application of maximum limit values for certain heavy metals both in sludge and in the soil. It requires Member States *inter alia* to: • Ensure that the use of sludge in agriculture complies with limit values for the concentrations of heavy metals in soil • Prohibit the use of sewage sludge on specified categories of land within defined periods or where the concentrations of heavy metals in the soil exceeds specific limit values • Ensure that the necessary information is available to the competent authorities • Analyse sewage sludge and soil to ensure that the proper limits are adhered to.

Summary of the Main Existing EU Legislation Relating to Waste Management

Directive	Main Requirements
Council Directives (78/176/EEC, 82/883/EEC, 92/112/EEC) on Waste from the Titanium Dioxide Industry	The purpose of the 78/176/EEC Directive is to prevent and reduce pollution caused by waste from the titanium dioxide industry. The two other associated directives elaborate on certain requirements of this directive. Member States are required *inter alia* to: • Draw up programmes to fulfil the requirements of the legislation • Ensure that waste is disposed of without endangering human health or harming the environment • Encourage the prevention, recycling and re-use of waste • Monitor waste disposed of and the effects of disposal of waste on the environment • Ensure that the construction of new industries is subject to prior environmental impact surveys • Take steps to remedy specific situations and, if necessary, require the suspension of operations.
Council Directive 2000/53/EC on End-of-Life Vehicles	The purpose of this Directive is to harmonise laws on the recovery and controlled disposal of end-of life vehicles and their components. Member States are required *inter alia* to: • Establish a system for the collection of all end-of-life vehicles • Take measures to ensure that producers of vehicles collect and process a substantial part of those vehicles • Achieve targets for the recovery of at least 85% of the weight of discarded vehicles and the reuse or recycling of at least 80% (by 2006) and at least 95% and 85% respectively by 2015 (lower targets may be set for vehicles manufactured before 1980) • Reduce the utilisation of dangerous materials in vehicle manufacture • Support applications of recycled materials and facilitate dismantling and recycling through proper measures in designing vehicles • Ensure that the storage and dismantling of end-of-life vehicles will not harm human health and the environment, and enable the re-use and recycling of spare parts • Provide consumers with specific information about the processing of discarded vehicles, including information about the dangers of their uncontrolled disposal.

Summary of the Main Existing EU Legislation Relating to Waste Management

Directive	Main Requirements
Council Directive 99/31/EC on the Landfill of Waste	The main aim is to provide for measures, procedures and guidance to reduce the negative effects on the environment, and the risks to human health, from landfilling of waste. Member States are required *inter alia* to: • Prepare and implement a national strategy for reducing the amount of biodegradable municipal waste going to landfill in order to meet specified targets • Prohibit co-disposal of hazardous and non-hazardous waste • Prohibit landfilling of tyres, liquid waste, infectious clinical waste and certain types of hazardous waste • Apply stringent provisions on the control, monitoring, reporting and closure of landfill sites • Require operators to prepare conditioning plans for landfill sites and decide whether existing sites may continue to operate • Classify landfill sites according to the type of waste to be disposed of at the site • Ensure that landfill sites are located, constructed and operated in accordance with specified standards.
Council Directive 2000/76/EC on the Incineration of Waste	This Directive will replace the existing Directives on municipal waste incineration (89/369/EEC and 89/429/EEC) and hazardous waste incineration (94/67/EC). It will apply to new plants two years after adoption (i.e. from the autumn of 2002) and to existing plants five years after adoption (i.e. from the autumn of 2005). It includes standards for the co-incineration of waste (both hazardous and non-hazardous) in cement kilns and other combustion processes (these have been allowed slightly later deadlines for compliance). Member States are required *inter alia* to: • Ensure that authorisations contain the general conditions that energy is recovered and residues are minimised and (where appropriate) recycled • Require operators to take all necessary precautions to prevent negative effects on the environment during the reception of waste, and to classify wastes before acceptance • Require operators to meet the (more stringent) operating conditions and emission limits for air emissions and wastewater discharges specified in the Directive.

Summary of the Main Existing EU Legislation Relating to Waste Management

Directive	Main Requirements
Directive 2002/96/EC on waste electrical and electronic equipment (WEEE)	The purpose of the Directive is, as a first priority, the prevention of waste electrical and electronic equipment (WEEE), and in addition, the reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste. Member States are required *inter alia* to: • take appropriate measures so that producers do not prevent, through specific design features or manufacturing processes, WEEE from being reused, unless such specific design features or manufacturing processes present overriding advantages, • adopt appropriate measures in order to minimise the disposal of WEEE as unsorted municipal waste and to achieve a high level of separate collection of WEEE. • ensure that producers or third parties acting on their behalf, in accordance with Community legislation, set up systems to provide for the treatment of WEEE using best available treatment, recovery and recycling techniques. • Ensure that producers meet minimum rates for recovery and reuse/recycling of different types of WEEE • shall ensure that, by 13 August 2005, producers provide at least for the financing of the collection, treatment, recovery and environmentally sound disposal of WEEE from private households This Directive will replace the existing Directive on Batteries and Accumulators. These products are regulated together with other waste electrical and electronic equipment.

Summary of the Main Existing EU Legislation Relating to Waste Management

Directive	Main Requirements
Council Regulation (EEC) No 259/93 on the supervision and control of shipments of waste within, into and out of the European Community	The Regulation establishes a system for controlling the movement of waste, to implement the Basle Convention, the OECD Council Decisions on trans-frontier movements of waste, and the fourth ACP-EEC Convention (Lomé IV). It sets up separate regimes governing shipments within the EU, imports to and exports from the EU, and transit shipments through the EU. Different requirements are laid down depending on the destination of the waste shipment, on whether the waste is destined for recovery or disposal, and, in the case of shipments for recovery, whether it is listed in the Annexes on the Green, Amber or Red list. Member States are required *inter alia* to: • Establish a system for the supervision and control of shipments of waste within the national jurisdiction • Ensure that any bilateral agreements and arrangements for the import of waste are concluded in accordance with specified conditions • Enforce directly applicable provisions of the Regulation such as the prohibition of the export and import of waste • Prohibit and punish illegal traffic in waste • Ensure that shipments of waste are subject to the provision of a financial guarantee or equivalent insurance • Ensure that producers of waste take responsibility for its safe disposal or recovery • Ensure that waste is shipped in accordance with specified requirements, which may include inspections and spot checks • Designate customs offices of entry into, and departure from, the Community • Ensure that consignment notes conform to specified requirements • Ensure that the competent authorities, the notifier and the consignee keep documents sent to or by the competent authorities for at least three years • Ensure that authorities, shippers and producers of waste understand and comply with their obligations in respect of shipments of waste • Report to the Commission on specified aspects of implementation.