



Kick-Off Meeting of the Technical Working Group for the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Waste management Sector

Minutes of the meeting

Leuven, 30 September - 1 October 2015

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I. INTRODUCTION

The European Commission's Joint Research Centre (JRC) is developing a **Sectoral Reference Document (SRD)** on best environmental management practice in the waste management sector. This document will describe best environmental practices that local authorities and waste management companies can implement in order to minimise their environmental impacts.

The elaboration of this document is part of the European Commission's work to implement the EU Eco-Management and Audit Scheme (EMAS) Regulation¹. EMAS is a voluntary framework for companies and other organisations to evaluate, report and improve their environmental performance. Within this framework, the EU decided in 2009 to develop Sectoral Reference Documents (SRDs) on Best Environmental Management Practice for different sectors. These are documents that EMAS registered organisations must take into account when assessing their environmental performance, but can also be used by others looking for guidance on how to improve their environmental performance. The waste management sector is one of the priority sectors for which these documents are developed. Further information on this background is available in the JRC report "Development of the EMAS Sectoral Reference Documents on Best Environmental Management Practice"² and on the following website: <http://susproc.jrc.ec.europa.eu/activities/emas>.

For the development of the waste management SRD, the JRC established a European technical working group (TWG), comprising experts in different aspects of environmental sustainability within the sector. The TWG assists the European Commission in identifying the best practices to be described and then validate the findings. The kick-off meeting of the TWG was held in Leuven (Belgium) on 30th September - 1st October 2015. The goal of the workshop was to establish the information exchange between the members of the TWG and to begin steering the development of the document, discussing its scope and the preliminary best environmental management practices identified.

The German consultancy BZL Kommunikation und Projektsteuerung GmbH, together with its subcontractor E3 Environmental Consultants Ltd, prepared a background document to be used as a basis for the development of the sectoral reference document and a draft version of this background report was sent to the TWG members prior to the workshop.

II. OPENING OF THE WORKSHOP

The JRC opened the session and welcomed the participants. After a brief explanation of the meeting procedure, an introduction to the workshop and overall exercise was given.

- The meeting agenda was presented (see Annex A) and agreed by the participants.
- The TWG members introduced themselves and summarised their experience in the waste management sector and related environmental issues (the list of participants is attached in Annex B).

¹ Regulation (EC) 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC, OJ L 242/1, 22.12.2009

² <http://susproc.jrc.ec.europa.eu/activities/emas/documents/DevelopmentSRD.pdf>

- Participants were informed that the meeting would be recorded. There were no objections to this.
- It was agreed to use first names to refer to the different TWG members and the same convention is adopted in these meeting minutes.
- The JRC emphasised that at the stage of the kick-off meeting it would not be necessary to agree on every point, as the document will continue to be developed over the following year or so.

III. PURPOSE AND GOALS OF THE MEETING

The JRC introduced the framework of the EMAS Regulation, the methodology for developing the SRDs and the purposes and goals of the meeting.

- After introducing the basics of an Environmental Management System (EMS), the JRC explained that EMAS is a voluntary environmental management tool available to any kind of organisation to evaluate, report and improve its environmental performance.
- The process for developing EMAS Sectoral Reference Documents (SRDs) on best environmental management practices (BEMPs) was described. The BEMPs should provide practical guidance and propose appropriate environmental performance indicators and benchmarks of excellence already demonstrated by best environmental performers. It was also explained that the documents go beyond EMAS, offering support and being a source of information for all organisations that wish to improve their environmental performance.
- The aim and content of each document that will be developed (Background Report, Best Practice Report and the SRD) was introduced. The idea is that the SRD should promote BEMPs, but there are no obligations to organisation to implement specific BEMPs. The draft Background Report that was shared prior to the meeting is not a finished document, but open for discussion.
- The JRC presented the goal of the TWG kick-off meeting, which is to discuss and agree on the scope of the document and the potential best environmental management practices. The BEMPs should target organisations within the waste management sector. The JRC stressed how essential it was that the TWG members contribute as much as possible to the development of the SRD to ensure its quality and usefulness for the targeted companies and other organisations.
- Over the coming months, feedback and inputs from the TWG will be collected and an updated Background Report will be prepared. A final meeting of the TWG (planned for late 2016) will validate the BEMPs and agree on environmental performance indicators and benchmarks of excellence.

IV. INTRODUCTION OF THE SECTORAL REFERENCE DOCUMENTS ON BEST ENVIRONMENTAL MANAGEMENT PRACTICE (BEMP) AND LESSONS LEARNT

The JRC gave an overview of how the previous Sectoral Reference Documents (SRDs) for other sectors had been developed, as well as their structure. The approach and general structure will be the same for the document covering the waste management sector.

The presentation focused on the meaning of specific terms used in the context of the SRDs (best environmental management practices, environmental performance

indicator, benchmarks of excellence), along with examples from the SRD for the retail trade sector.

- **Best Environmental Management Practices (BEMPs)** are techniques, measures and actions that allow organisations to minimise their direct and indirect environmental impacts. They go well beyond common practices, should be fully implemented by best performers and are widely applicable. The TWG is responsible for determining whether the practices identified so far refer to actual BEMPs, or to common, obsolete or emerging techniques.
- **Environmental performance indicators**, which can be quantitative or qualitative, are required to allow organisations to measure their performance. The focus is on indicators that are already in use and environmentally meaningful, but which can be a proxy. The approach used to identify BEMPs, by analysing the practices implemented by 'frontrunners' (i.e. companies that go beyond the minimum in terms of environmental performance), was also presented.
- **Benchmarks of excellence** refer to a level of performance that is very ambitious (e.g. top 10 or 20% best performing companies in the sector for the specific aspect addressed by the benchmark) but already achieved by frontrunners. Benchmarks of excellence are a measure of what is possible, under stated circumstances (which is not necessarily a target, but rather a source of inspiration).

The outputs of the process of defining BEMPs were outlined:

- The background document (**Best Practice Report**) is intended to be a detailed technical guide that contains full details of the BEMPs that were developed in collaboration with the TWG.
- The final **SRD (Sectoral Reference Document)** is a short synopsis of the best practices, indicators and benchmarks. This is the official document that EMAS registered organisations can refer to.

Both these documents are available for some of the other sectors on the following website: <http://susproc.jrc.ec.europa.eu/activities/emas>.

The session ended with JRC presenting the **lessons learnt** from the development of BEMPs and SRDs in other sectors:

- The key role of the TWG is to validate findings and draw conclusions on environmental performance indicators and benchmarks of excellence.
- The composition of the TWG may change from kick-off to final meeting, and experts which have not assisted to the kick-off meeting can join the work on the SRD.
- Experts can send comments in an informal way, e.g. by just sending an email (no need for formal templates).

V. SCOPE OF THE SECTORAL REFERENCE DOCUMENT FOR THE WASTE MANAGEMENT SECTOR

The proposal for the scope of the sectoral reference document for the waste management sector was presented and it included (see also Annex C):

- In terms of target group: all waste management companies and public administration (mostly at local level) in charge of waste management.
- Waste streams and activities with significant environmental burdens not well covered by existing regulations (e.g. BREFs, landfill directive, end of waste criteria), including three core waste streams:

- Construction waste - large volume;
- Municipal solid waste (MSW) and waste with similar characteristics – high impact and high visibility;
- Medical waste – not fully addressed in other schemes and regulations;

and the following waste management phases (focus on the higher part of the waste hierarchy pyramid):

- establishing a waste management strategy;
- waste prevention;
- waste collection;
- waste re-use;
- waste treatment facilities not covered in the waste treatment BREF such as facilities performing treatments outside the scope of the IED (e.g. sorting facilities with the aim to recycle plastics).

It was clarified that waste treatment processes which are in the scope of the waste treatment BREF as well as material recycling, energy recovery and waste disposal would be considered out of scope in the sense that the SRD would not identify BEMPs in these areas but rather refer to the BREF where relevant.

There was a general agreement among participants on the proposed scope. It was also welcomed the idea of including extended producer responsibility schemes as an element where to investigate best practices.

However, some changes were recommended:

- Enlarge the scope of MSW – it was recommended to include waste similar to MSW (e.g. waste from services);
- Check terminology used in the text (e.g. use the term 'healthcare waste' instead of 'medical waste').

Moreover, it was recommended to review the text of the draft report especially in relation to:

- coherence with the definitions provided in the Waste Framework Directive about 'preparation for re-use' and 're-use';
- reference to other SRDs for other waste streams (e.g. industrial waste) not covered in the document for the waste management sector.

VI. OVERVIEW AND ENVIRONMENTAL ASPECTS OF THE WASTE MANAGEMENT SECTOR

The presentation of this session focused on a general overview of the waste management sector and its main environmental aspects and pressures. Participants agreed in general with the findings outlined, however they recommended introducing a warning for the reader about the Eurostat statistics and LCA results presented, which cannot be considered very reliable because of the variety of elements considered/excluded and definitions used.

During the discussion of this session, it was highlighted that the draft report should be reviewed and it should consistently use the terms environmental aspects, pressures and impacts, according to the EMAS regulation (**Maria Passalacqua** can recommend changes). Furthermore, risk management (concept introduced in the revised ISO 14001:2015) could also be integrated in the table 1.10.

Finally, it was mentioned that methods and data for biogenic CO₂ emissions accounting for waste management are available and **Dominic** can send references on this subject.

VII. MUNICIPAL SOLID WASTE – ESTABLISHING AN INTEGRATED WASTE MANAGEMENT STRATEGY

Cost benchmarking (BEMP 3.5.1)

There was a general agreement among participants on the concept of this BEMP. During the discussion it was highlighted that cost benchmarking can be carried out not only by external/third companies but also internally by the municipality or the waste management company. Moreover, it can be difficult to calculate cost by waste stream and this element should be added in the applicability of the BEMP.

Other suggestions for developing further this BEMP included: introducing economic benefits (not only costs) in the equation; looking at publicly available cost data from Wales (UK).

Several participants anticipated their intention to submit useful material and information:

Jean Benoit – on ADEME cost benchmarking tool;

Stefan - on a group of German towns carrying out benchmarking every 2 years;

Berthold - on the cost benchmarking system in Styria (Austria) and on the economic benefit from employment in re-use activities;

Carlos - on cost for waste management in his municipality in Portugal (while changing to door to door system).

Waste monitoring (BEMP 3.5.2)

There was a general agreement among participants on the concept of this BEMP. Discussions focused on the fact that weighing separately collected waste is not enough: in order to be a best practice, waste separately collected should be analysed and the capture rate (%) for different materials based on the total quantity of waste fraction generated (requiring composition analyses of the different fractions collected) is a better metric. The BEMP should also investigate the aspect of how to carry out a composition analysis. Additionally, information on the local context (population density, presence of tourist, climate etc.) should also be included. Other important elements in waste monitoring are the coverage rate (not always 100% and this could be an environmental performance indicator), frequency of monitoring and the timely availability of data (often this is available only 1-2 years after the end of the monitored period).

Finally, during the discussion it was also mentioned that for waste monitoring all incoming and out-going waste flows within the system, not only collected quantities (e.g. residual waste from sorting plants, origins and destinations) should be taken into account.

Several participants anticipated their intention to submit useful material and information:

Alain - methodological info based on hazardous waste monitoring;

Francesco - waste monitoring data from a door to door collection Life project in Italy;

Berthold - data on waste monitoring in Graz;

Christophe - info on Helen Mc Arthur foundation methodology;

Simone - info on a database on regional waste flows;

Eva - info on waste-web reporting tool (Sweden) and on a method for compositional analyses for mixed waste and organic waste;

Celeste - data on waste monitoring before and after implementing door to door;

Jan Marc - info on informal recycling.

Pay-as-you-throw (BEMP 3.5.3)

There was a general agreement among participants on the concept of this BEMP. It was recommended to add in the text of the BEMP incentive systems (e.g. bonus for home composting) aiming at driving behaviour and reach targets. Moreover, PAYT volume based system should also be included since they are simple and cheap but may lead to similar results compared to more complex weight based systems.

During the discussion it was also mentioned that the BEMP should also reflect on the need of enforcement measures to avoid illegal dumping or more impure fractions when introducing PAYT systems.

Another question raised was whether there are examples of "know-what-you-throw" rather than "pay-as-you-throw" (i.e. measure+inform without billing accordingly) and whether these are also effective.

Several participants anticipated their intention to submit useful material and information:

Berthold, Raphael, Aurélie - on successful PAYT systems;

Macjei - on limitation of PAYT pilots in Poland;

Orsola –on the system adopted in Trentino (pay for use).

Awareness raising (BEMP 3.5.4)

There was a general agreement among participants on the concept of this BEMP. It was recommended to broaden the scope to include also measures of 'behavioural change'. Additionally, it was mentioned that the BEMP should cover open days at waste facilities, environmental education plans (e.g. for small batteries) and campaigns for citizens not speaking the local language. Some participants also recommended that the text could include the use of 'waste advisors' and their training (e.g. in Graz), however this element could be further developed in a specific BEMP.

In terms of environmental performance indicators for this BEMP, the frequency and impact (quantity) of waste sorting mistakes and the amount of residual waste (rather than percentages of separately collected waste) were suggested, along with the number of people involved and people reached in awareness campaigns.

Participants also stressed the importance for awareness campaigns to go beyond the waste sorting/waste management dimension, and tackle practical ways for waste prevention (e.g. refillable containers for detergents).

Several participants anticipated their intention to submit useful material and information:

Maciej - info on indicators for awareness campaigns implemented by EMAS registered waste management companies;

Aida - info on successful example of awareness campaigns in Chania about small batteries (www.afis.gr), what to put in which bin and providing maps of recycling centres;

Ana - info on LIPOR activities on awareness raising (open days at waste management facilities, environmental education plans, etc.);

Berthold – info on 'waste advisors' scheme in Graz (Austria).

Interaction with deposit refund schemes (BEMP 3.5.5)

Participants agreed that this BEMP needs to be substantially redrafted; the current version of the BEMP, in fact, can be hardly applied at local level, since the implementation of deposit refund schemes require large schemes, typically at national level, to reduce the border effects (i.e. people buying where it is cheaper because there is no deposit refund scheme). Some participants recommended to consider broadening the BEMP towards "resource and re-use centres" where municipalities pay for recyclables brought there (without initial deposit).

There are however some examples of local/regional implementations of deposit refund schemes as well as schemes promoted by waste management companies and the BEMP could also be redrafted based on those experiences (e.g. during festivals/events, or for specific products – e.g. wine bottles).

Several participants anticipated their intention to submit useful material and information:

Christophe - info on waste management companies and retailers collaborating on deposit refund schemes in France;

Berthold - info from the example of deposit refund scheme in the region of Styria in Austria (about wine bottles);

Dominic - info on the example from the Netherlands where a price is paid for bringing back recyclables without an initial deposit.

Possible additional BEMPs for this chapter

Participants mentioned a number of areas to be investigated in order to identify further potential best practices:

- Participatory governance for waste management – civil society can be directly involved by participation in a committee with the task of checking and providing feedback on waste management (example from Sierra Leone);
- How to deal with trans-border spill over effect due to different local waste policies;
- Introduce 'waste advisors' in the territory of the local public administration and invest in their training – this element could be either included in the BEMP on awareness raising (3.5.4) or further developed in a specific new BEMP.
- Collection on request of bulky items – but this may be common practice in many places rather than BEMP.
- Dynamic strategy for improvement – local public administrations and waste management companies need to have a vision for the future and implement

measures in order to move up on the waste hierarchy (e.g. do not over-invest in residual waste treatment facilities).

- Green procurement for waste management – the document should cross-reference to the public administration sectoral reference document, where green procurement (in general and not only for waste management) is addressed. **Dominic** offered to send thoughts on specific aspects on green procurement for waste management.
- Plans for local environmental waste emergency (e.g. local strikes, extreme weather conditions) – plans to deal with local environmental emergency would allow reducing the environmental impact caused during these extreme circumstances.

VIII. MUNICIPAL SOLID WASTE – ENABLING TECHNIQUES ON STRATEGIES FOR MSW

Performance-based waste management contracting (Section 3.6.1)

Participants supported the idea of describing performance-based waste management contracting in the document. Depending on the information collected, this could be presented as a BEMP or as an enabling technique (as currently proposed by the contractors).

The main limitation to the development of this BEMP seems to be about accessibility to information, because contracts are generally confidential and it is difficult to find out about those actually implementing waste performance contracting and the specific solutions they implemented. However, the concept of the BEMP could encompass not only putting the right incentives in place, but also avoiding the wrong incentives.

Some participants anticipated their intention to submit useful material and information:

- **Dominic** offered to send some examples from Eunomia's study on performance-based waste management contracting;
- **Christian** to provide the contact from the Austrian administration which created a set of minimum criteria for waste management contracting.

IX. MUNICIPAL SOLID WASTE - WASTE PREVENTION

Local waste prevention programmes (BEMP 3.7.1)

There was a general agreement among participants on the concept of this BEMP. The discussion focused on a number of local waste prevention programmes which could be integrated, as examples, in the text. Some participants highlighted that local waste prevention programmes are based on the involvement of all the relevant stakeholders and this aspect should be reinforced in the text of the BEMP. Additionally, waste prevention measures need to carefully ensure that reductions in recorded waste volume do not arise because of inappropriate waste disposal and this could also be considered a cross-media effect.

During the discussion it was also recommended to review the environmental performance indicators, introducing a normalising factor which could take into account economic situation (e.g. reduction in waste generation because of reductions in economic activity), as well as the need to distinguish indicators for the different waste streams considered. The number of prevention projects supported by municipalities

could be an alternative relevant indicator for this BEMP and the ACR+ document "Quantitative benchmarks for waste prevention" could be a useful source of information.

Several participants anticipated their intention to submit useful material and information:

Ingrid - info on training programmes for best use of home composting;

Ana - info on LIPOR local waste prevention programmes (e.g. Dose Certa, Air Lab, home composting);

Berthold - info on the local waste prevention plan in Graz;

Orsola - info on WasteLess project in Chianti and No-waste project (city of Reggio Emilia);

Marie - two studies on waste prevention indicators (by Nordic Council of Ministers and 2009 study by European Commission).

X. MUNICIPAL SOLID WASTE - RE-USE

Re-use schemes (BEMP 3.8.1)

There was a general agreement among participants on the concept of this BEMP. Participants recommended including more examples of re-use schemes for a broader range of materials collected and they also highlighted the need to stress in the text the importance of careful collection for preserving the items to be re-used. The text of the BEMP should emphasize the importance of re-use and repair networks in which all the relevant stakeholders are involved for effective re-use schemes. Additionally, it was brought to the attention the issue of re-using items such as electrical and electronic equipment which, once repaired, would not have a formal guarantee as well as the issue that, based on lifecycle consideration, in some cases it would be better to buy a new and more energy performing item rather than re-using an old one.

Specific comments were also addressed to the proposed environmental performance indicators; they in fact could include the amount of waste effectively re-used compared to the amount put on the market; other alternatives could include the number of employees and the turnover associated with the re-use schemes and the effective development of partnerships and networks for waste re-use on the territory of the local public administration.

A final consideration on this BEMP was about the fact that re-use schemes, apart from environmental benefits, can also involve social inclusion projects, where low-class/disadvantaged people are employed in repairing and selling the used items (e.g. in Gothenburg) and this could definitely be mentioned in the text.

Several participants anticipated their intention to submit useful material and information:

Berthold - info about waste re-use examples in Flanders and Austria;

Maria - info on second-hand market and local initiative in Barcelona on how to repair items and details on waste collection points accessible (for residents) in order to collect re-usable materials;

Marie - info on examples of waste re-use from a circular economy project;

Iñigo - info on an example of waste re-use in the Basque area (Koopera.org).

XI. MUNICIPAL SOLID WASTE - COLLECTION

Waste collection strategy (BEMP 3.10.5)

There was a general agreement among participants on the concept of this BEMP. Some participants expressed the need of including considerations for hazardous waste in the waste collection strategy of the local public administrations and of clarifying and homogenising in the text of this chapter (and all along the document) the definitions of biowaste, kitchen waste and organic waste.

It was mentioned also that a further element of best practice in the waste collection strategy is to facilitate and encourage waste separation by citizen and preparation for re-use.

Participants suggested considering the capture rate as environmental indicator on top of the recycling rate. Additionally, participants mentioned that the recycling rate should be based on waste output from recycling centres and not their input to better acknowledge for the different quality levels of the waste fractions that are separately collected. The amount of waste selectively collected should not be account for as recycling rate but rather as the selective collection rate.

Several participants anticipated their intention to submit useful material and information:

Orsola - info on (i) Wasteless Chianti project and improvement in recycling rates in waste collection (ii) separate collection of nappies;

Marco - contacts in Milan waste management company in order to investigate their collection strategy achieving very good separately collected organic waste;

Susana - info on a report on the results achieved by selective door-to-door collection of biowaste from hotels and restaurants in Portugal;

Marie - will provide information on relevant case studies on separate collection;

Aida - information about door-to-door separate collection in city centres;

Eva - info on 8-fraction kerbside collection system in Sweden;

Jean-Benoit - info on city centre separation points and indicators used in French cities that address also the quality of the waste collected.

Infrastructure to recycle or recover waste streams and to dispose of hazardous compounds (BEMP 3.10.6)

There was a general agreement among participants on the concept of this BEMP provided that the BEMP goes beyond common practice and describe how to establish and organise these 'recycling centres' in order to achieve the best results. Participants suggested that the text of the BEMP could be improved by explaining the need of clear indications and experienced and trained staff present during opening hours in the recycling centres.

In terms of wording, many participants mentioned that 'recycling centres' may be misunderstood and is not self-explanatory. They suggested adding examples in different languages of the wording used for 'recycling centres' in different EU countries.

The discussion also dealt with the need to describe also mobile 'recycling centres' (especially for hazardous wastes) and, among the environmental indicators, the geographic spread of centres (especially for low-dense populated areas) should also be included. Additionally, it was highlighted that recycling centres could be strictly linked to the PAYT strategy and some important operational information about

appropriate staffing levels could be found, and eventually integrated in the text of the BEMP, in a UK study named "National assessment of civic amenity sites".

Several participants anticipated their intention to submit useful material and information:

Yorg - info on potential indicator which considers the geographic spread of centres;

Francesco - info on mobile recycling centres, especially for hazardous waste.

Logistics optimisation (BEMP 3.10.7)

There was a general agreement among participants on the concept of this BEMP. One of the main comments raised during the discussion was the need to emphasise in the text of the BEMP (applicability section) that the priority is to collect high quality waste, rather than solely reducing the number of collection routes/vehicles (e.g. street collection with larger vehicles vs door-to-door with smaller vehicles; more compacting vs better quality).

Another issue (especially for waste from commercial activities) is that in some cases waste management companies may have economic interest to collect more frequently even if the waste bins are not full and collection could be made more efficient; this could also be mentioned in the text of the BEMP.

A comment was made on the possibility to include some examples of waste underground storage (e.g. underground containers) and pneumatic systems which can reduce the frequency or substitute the standard waste collection. However, the cumulative energy demand and CO₂ indicators of these alternative systems should take into account the electricity demand for their operation.

It was also mentioned during the discussion that the application of a PAYT systems provides useful data for the optimisation of the waste collection. Georeferenced data on waste generation by households is otherwise seldom available.

Additionally, participants suggested reviewing the proposed environmental indicators, especially to ensure that they capture all impacts of collection (overall system performance, not fraction by fraction) and the aspect of trade-off between targeted collection with stream quality and saving on transport.

Several participants anticipated their intention to submit useful material and information:

Aida - data on remote sensors for detecting how full the bins are;

Dominic - examples of software for route optimisation.

Low emission vehicles (BEMP 3.10.8)

There was a general agreement among participants on the concept of this BEMP. An item which could be added in the text is considering, as relevant for the environmental impact generated, the energy requirements of compressing natural gas when this is used to run waste collection vehicles. Additionally, the applicability section should stress the importance of upfront investments which may limit the implementation of the BEMP.

Several participants anticipated their intention to submit useful material and information:

Maria - info on adaptation of collection vehicles running on waste cooking oil;

Francesco - info on a case study in Perugia analysing natural gas collecting vehicles (energy requirements of compression);

Dominic - info on the use of landfill gas for collecting vehicles in UK from the company SUEZ UK.

Possible additional BEMP for this chapter

Participants mentioned a number of areas to be investigated in order to identify further potential best practices:

- Pneumatic systems for waste collection - these serve 20% of Stockholm households and 5% of Barcelona households;
- Maximise the opportunity for the customers of waste management companies to recycle or prepare materials for re-use. This potential new BEMP (mainly for waste management companies providing services to commercial companies) could be a stand-alone best practice or could be integrated in the BEMP on the waste collection strategy at the beginning of this chapter, but that BEMP was mainly written for public administrations;
- Reverse logistic (bring back waste to retailers or re-use centres) could be explored in this chapter (or maybe in the Extended Producer Responsibility chapter), especially in light of the experience of a case study in Flanders (**Yorg** to send info).

XII. MUNICIPAL SOLID WASTE - TREATMENT

Sorting of co-mingled packaging waste (BEMP 3.12.1)

There was a general agreement among participants on the concept of this BEMP, provided that the text of the BEMP is improved to make clearer that the focus is about maximising the recycling efficiency of sorting plants, rather than recommending co-mingled collection of packaging waste. Moreover, there are important trade-offs between the amount of materials which are rejected and the level of contamination accepted in the sorted material. These would need to be investigated and presented in the BEMP.

This BEMP could also be cross-referenced to the awareness raising BEMP, because of the importance of the quality of the waste streams collected and received at the sorting facility. It was also brought to the attention that workers' safety in sorting facilities could be mentioned in the text as an important aspect of operating such plants, given that they often achieve best performance thanks to use of hand sorting. Regarding the environmental performance indicators proposed, some participants suggested that they need to reflect separation efficiency and quality of outputs. Maybe, an indicator could reflect the destination of the sorted materials (e.g. up-cycling vs down-cycling). It may also be useful to include a secondary indicator on energy efficiency, which however would need to be of a lower priority compared to the key separation effectiveness indicators.

Several participants anticipated their intention to submit useful material and information:

Susana - info on a LIPOR sorting plant reaching 8% rejects;

Christian - info on an efficient sorting plant in Austria;

Macjei - info on co-mingled waste sorting plants in Poland;

Eva - info on efficient sorting plants in Norway.

Decentralised composting (BEMP 3.12.2)

Participants agreed that this BEMP needs to be substantially redrafted; all the members of the technical working group were invited to send contributions about the position of this technique in the report (waste management strategy chapter or waste treatment chapter) and specific comments on the text.

In general, it was mentioned that it is required to make clearer that this BEMP is about how to do best home composting when decentralised composting is implemented. It was also brought to the attention that there is a need to redraft, in order to avoid possible controversy on prescriptions for management of woody waste, the parts on LCA studies on long term organic carbon stored in soils.

Regarding the environmental performance indicators, how many households are reached with decentralised composting could be added (rather than a metric based on volumes of organic waste, which is more difficult to assess).

Several participants anticipated their intention to submit useful material and information:

Ana - info on Belgian project on mandatory training of home composters;

Ingrid - examples of home composting (central and decentralised) in Flanders;

Marco - info on "SCOW project" on small-scale, low-cost community composting;

Aurélie - updated figures about the municipality of Besançon including residual waste characterisation changes since implementation of decentralised composting;

Jean Marc - info on the implementation of urban community composting in north of Spain.

Possible additional BEMP for this chapter

Participants mentioned a number of areas to be investigated in order to identify further potential best practices:

- Recycling technologies not covered by IED (e.g. recycling diapers, textiles, mattresses) which may be included either as BEMPs or as emerging technologies (to be investigated) – **Orsola** to provide information;
- communication/ awareness campaigns, public reporting and open days of waste management companies - maybe this could be included under the BEMP on awareness raising;
- Residues from street cleaning – this topic would be better addressed under the chapter on establishing an integrated waste management strategy.

XIII. Extended Producer Responsibility

The discussion on this chapter took the form of a brainstorming of what could be really best practices for local public administrations and waste management companies in the field of extended producer responsibility.

Starting from the fact that good EPR schemes value the quality of materials collected and not only the quantity, the first idea proposed was about investigating successful examples of close cooperation among different actors involved in EPR; a BEMP could be when organisations running EPR schemes and public authorities (establishing the waste management strategy) closely and successfully cooperate. Another proposal instead suggested looking at the EPR schemes achieving good results in increasing the

re-use and not only the recycling of waste. A useful source of information in this field could be the Zero Waste Europe report on the performance of EPR schemes in Europe. Additionally, it was highlighted that EPR schemes could also include measures to prevent littering and, part of the revenue of the scheme, could be invested in prevention projects (like in Austria).

The bonus/malus system in the French EPR scheme could be another example providing inspiration for best practices.

Several participants anticipated their intention to submit useful material and information:

Christophe – info on bonus/malus system (determining the recyclability of different products) in the French EPR scheme;

Maciej - info about EPR systems in Poland;

Yorg - info on a project in Flanders of magazines/paper producers in EPR/prevention and on OECD report on EPR to be released in early 2016.

XIV. Construction and demolition waste

Common EU Construction and Demolition Waste Protocol

Participants were briefed about an initiative, led by DG GROW, on an EU construction and demolition waste (CDW) protocol. The overall aim of this protocol is to increase confidence in the CDW management process and in CDW recycled materials. This will be achieved by (i) improved waste identification, source separation and collection, (ii) improved waste logistics, (iii) improved waste processing, (iv) quality management, and (v) appropriate policy and framework conditions.

The protocol will develop a common set of technical, environmental and managerial principles, which are applicable in the entire EU and based on the highest common standards in each stage of the waste management chain that would be recognised in all Member States.

It was finally stressed that the initiative of DG GROW on the EU construction and demolition waste protocol and the activity of identification of best environmental management practices led by the JRC will be well coordinated and duplication of work avoided. There will be mutual referencing between the two documents produced and concepts and definitions will be consistent.

Integrated construction and demolition waste plans (BEMP 4.2.1)

There was a general agreement among participants on the concept of this BEMP.

It was recommended to include the requirement of on-site sorting of CDW, to better specify in the text the elements of the CDW management plan and to cross-reference to the document on best environmental management practices for the construction sector (which is more site specific, with a different target group).

The discussion also highlighted the challenge of having a construction and demolition waste plan at regional level. Once a CDW management plan is implemented, non-compliance fees for publically-funded projects could be important control points for municipalities.

In 2016 a new Austrian ordinance that will focus on re-use of CDW will be released and it may contain relevant information for local municipalities.

Another topic of discussion was whether the proposed indicator included or excluded excavation soils. This is also relates to whether back-filling is considered as re-use of CDW and back-filling should be defined in the text of the BEMP (see also EU CDW

protocol). An aspect to consider for back-filling but more in general for CDW is that the cost and the environmental burdens of transportation are very relevant and CDW is never transported more than 20-30 km. This is very relevant to consider because recycling capacity is not in place in many locations.

Finally, during the discussion it was highlighted that data quality for construction and demolition waste are currently quite poor and this prevents deep analyses and the identification of measures for a better management as well as the identification of suitable environmental performance indicators.

Some participants recommended that on-site sorting and final waste stream destination should be reflected in the indicators of the plan e.g. % of material sorted on-site recorded in the plan. It was also said that indicators should not push for high rates of useless recycled material but rather for recycled aggregates that are fit for purpose.

Several participants anticipated their intention to submit useful material and information:

Iñigo - details on CDW plan in the north of Spain for onsite sorting;

Berthold - data on German network of component reuse;

Jan Marten - share best practices on CDW plans from the work on the EU construction and demolition waste protocol;

Jean-Benoît - available to seek details on the CDW plan for greater Paris;

Dominic - info on mobile crushing of CDW;

Antonio - info on pre-audits to ensure appropriately planned deconstruction that maximises separation and recycling.

Voluntary agreements for CDW (BEMP 4.2.2)

Participants agreed that this BEMP needs to be substantially redrafted or merged in another BEMP. In fact, it was questioned whether this is actually a BEMP for local public authorities. Participants recommended looking if there are examples of voluntary agreements at local level. Moreover, there is only a thin line between voluntary agreements and quality assurance schemes. During the discussion **Jan Maarten** expressed the intention of providing details on voluntary agreements targeting specific target groups (e.g. voluntary agreement for demolition companies in the Netherlands) from the work on the EU CDW protocol.

Quality assurance schemes (BEMP 4.2.3)

There was a general agreement among participants on the concept of this BEMP. A comment raised during the discussion was about the need to clarify in the text the distinction between quality assurance schemes and end of waste criteria. Moreover, the BEMP should distinguish between quality of process (leading to confidence in materials) rather than quality of materials, which will be appreciated by final customers who will decide according to their level of requirements.

Two participants anticipated their intention to submit useful material and information:

Iñigo - info on end-of-life criteria in the Basque country;

Jan Maarten - details on the EQAR quality assurance scheme.

Plasterboard recycling (BEMP 4.2.4)

There was a general agreement among participants on the concept of this BEMP. It was firstly recommended to change the title of the BEMP (e.g. "improve recovery...") to be consistent with scope of the chapter that excludes "recycling". Additionally, the BEMP should stress the aspect that recycling plasterboard allows having other waste streams of a better quality. This is in fact one of the main benefits of this BEMP, because it enables the recycling of other fractions (e.g. concrete) in the CDW. The possibility to cover automatic robotic sorting was also mentioned.

Finally, it was raised the issue of the target group of this BEMP; in order to achieve plasterboard recovery, there is a need of on-site sorting and separation and therefore this aspect should be clarified.

A number of existing research projects on circular approach to CDW (e.g. cement-to-cement, windows glass recycling) are on-going and **Iñigo and Antonio** expressed the intention of providing information on them (e.g. H2020 projects)

PCBs release prevention (BEMP 4.2.5)

There was a general agreement among participants on the concept of this BEMP. The text of the BEMP should be improved clarifying when PCB concentrations are measured: before or during deconstruction.

Possible additional BEMP for this chapter

It was questioned why the removal and management of asbestos are not covered with a BEMP. Regulation for the removal of asbestos applies to specialised enterprises only, not small-scale builders or renovators. There are specific local schemes run by local public administrations or waste management companies to facilitate the management and removal of asbestos. It was therefore recommend investigating further this topic.

XV. Healthcare waste

Integrated healthcare waste collection (BEMP 5.2.1)

It was agreed that this BEMP needs to be reconsidered. The point of view of the BEMP does not fit with the target group of this document (e.g. cost savings are for producers of medical waste, actions to implement are for health care facilities, quantities and final destination depends on producers not on waste managers).

One aspect of the BEMP, the traceability of waste, is mandatory and not a BEMP, unless this goes much further common practice (e.g. traceability by container with data by hospital unit). Additionally, the text of the BEMP should ensure a consistent and coherent use of the terminology "health care waste (HCW)" rather than "medical waste".

The new BEMP could cover the provision of trainings to hospital staff by waste management companies, waste audits in hospitals, awareness raising campaigns (e.g. posters/leaflets). It is in fact important to correctly classify waste prior to waste collection.

Some environmental performance indicators suitable for the new BEMP would be e.g. % of staff from the facility management company acting as waste manager in hospitals and clinics trained in HCW management, % reduction of "hazardous waste" generation.

Several participants anticipated their intention to submit useful material and information:

Marco - info on EU project on training staff and contacts at Mengozzi Rifiuti Sanitari (a company collecting, transporting and treating HCW with traceable containers);

Jean-Benoit - info from regional HCW training plan and on a French EPR scheme for HCW generated at home managed by pharmacies;

Jan Gerd - info on EU project on standardised training of WMO staff in HCW management and also on German guidelines;

Giuliana - info on Italian law regarding health care waste (HCW);

Maria - info on waste contractor training in HCW.

Alternative treatments (BEMP 5.2.2)

Participants agreed that this BEMP needs to be reconsidered. The new BEMP should take into consideration the importance of pre-shredding, large autoclaves and that the environmental benefits depend on counterfactual fates, which may still be landfill in some countries and municipalities. Moreover, the applicability of the BEMP is highly affected by quantities of waste treated and e.g. in Germany it was found non-economic to use alternative treatment options.

Several participants intend to submit specific comments on the current version of the BEMP, moreover, **Jan Gerd** will share information on alternative treatment definitions.

Possible additional BEMPs for this chapter

Participants mentioned a number of areas to be investigated in order to identify further potential best practices:

- Recovery of metals from sharps;
- HCW-like waste generated at home;
- Where healthcare facilities use radio-active processes, test all HCW for radioactivity (even MSW-like waste) at collection in order to avoid problems at waste delivery site;
- Recollection of pharmaceuticals from consumers (e.g. in France and Germany);
- Logistics optimization.

Terry expressed the intention to send some case studies for some of the areas where new BEMPs could be developed.

XVI. Cross-cutting issues

Integrated waste management strategy (BEMP 2.3)

There was a general agreement among participants on the concept of this BEMP. There was agreement that the overall waste management strategy is key, i.e. to have an integrated waste management plan containing specific measures for all single waste streams. Participants recommended ensuring consistency of definitions in the text with current legislation and the circular economy package.

Life cycle assessment of waste management options (BEMP 2.4)

There was a general agreement among participants on the concept of this BEMP. The discussion focused on the importance of LCA studies to base the decisions for waste management and LCA is often applied in strategic environmental assessments undertaken by regional authorities, required by national governments. However, LCA can also be misused, coming to wrong conclusions and should not be an incentive to depart from the waste hierarchy. Some participants mentioned the possibility to integrate in the BEMP also aspects of social LCA and life cycle costing.

Orsola expressed the intention of providing info on a number of successful case studies of implementation of LCA for waste management.

ANNEX A - AGENDA

KICK-OFF MEETING OF THE TECHNICAL WORKING GROUP FOR THE EMAS SECTORAL REFERENCE DOCUMENT ON BEST ENVIRONMENTAL MANAGEMENT PRACTICES FOR THE WASTE MANAGEMENT SECTOR

LEUVEN, 30 SEPTEMBER – 1 OCTOBER 2015

Venue: Hotel Novotel Centrum
Vuurkruisenlaan 4, 3000 Leuven, Belgium

DRAFT AGENDA – DAY 1

Wednesday 30 September 2015 – Venue: Hotel Novotel Centrum Leuven		
Arrival and registration of participants (Welcome coffee)		09:30 – 10:30
Opening and welcome		10:30 – 10:45
Introduction of experts		10:45 – 11:15
Purpose and goals of the meeting		11:15 – 11:30
Introduction of the sectoral reference documents on best environmental management practice (BEMP) and lessons learnt so far		11:30 – 11:45
Scope of the sectoral reference document for the Waste Management sector		11:45 – 12:30
Overview and environmental aspects of the Waste Management sector		12:30 – 13:00
Lunch break		13:00 – 14:15
Identification of best environmental management practices in: Municipal solid waste – Establishing an integrated waste management strategy		14:15 – 16:15
Coffee break		16:15 – 16:30
Identification of best environmental management practices in: Municipal solid waste – Waste prevention		16:30 – 17:00
Identification of best environmental management practices in: Municipal solid waste – Waste collection		17:00 – 18:00
Wrap-up and close of the day		18:00 – 18:30

Draft Agenda – Day 2

Thursday 1 October 2015 – Venue: Hotel Novotel Centrum Leuven		
Opening of the day		09:00 - 09:15
Identification of best environmental management practices in: Municipal solid waste – Re-use		09:15 - 09:45
Identification of best environmental management practices in: Municipal solid waste – Waste treatment		09:45 - 10:15
Identification of best environmental management practices in: Municipal solid waste – Producer responsibility		10:15 - 10:45
Coffee Break		10:45 - 11:15
Identification of best environmental management practices in: Construction and demolition waste		11:15 - 13:00
Lunch break		13:00 - 14:15
Identification of best environmental management practices in: Medical waste		14:15 - 15:15
Identification of best environmental management practices in: Cross-cutting issues		15:15 - 16:15
Coffee Break		16:15 - 16:45
Summary of the working group discussions		16:45 - 17:15
Wrap-up and close of workshop		17:15 - 17:30

ANNEX B – LIST OF PARTICIPANTS

Tudor	Terry	Centre for Sustainable Waste Management
Passalacqua	Maria	Club EMAS Catalunya
Anthouli	Aida	D-Waste company
Kriekouki	Aliki	EEB
Ekholm	Magnus	Envac
Taraskin	Aleksandr	Environment Department of Tallinn
Kühling	Jan-Gerd	ETLog Health GmbH
Hogg	Dominic	Eunomia Research & Consulting Ltd.
Heidelberger	Alain	Hazardous Waste Europe (HWE)
Mendes	Carlos	Maiambiente EM
Svensson Myrin	Eva	Miljö- och avfallsbyrån i Mälardalen AB
Di Monaco	Delia	Sogesid
São João	Celeste	Municipality of Lisbon - Waste Department
Aerts	Yorg	OVAM - Public Waste Agency of Flanders
Nessi	Simone	Politecnico de Milano
Lübben	Stefan	Stadtreinigung Hamburg
Schleich	Berthold	Standort Graz, Arge Abfallvermeidung, Ressourcenschonung und nachhaltige Entwicklung
Krenn	Christina	STENUM
Diard	Aurélie	SYBERT
Vegas	Iñigo	Tecnalia
Neubauer	Christian	Umweltbundesamt GmbH
Devos	Sandrine	UEPG, European Aggregates
Di Maria	Francesco	Università degli Studi di Perugia
Caniato	Marco	University of brescia
Piller	Robert	Energie AG Oberösterreich Umwelt Service GmbH
Witte	Sonja	VKU (German Association of Local Utilities)
Abramczyk	Olga	Ecorys
De Vet	Jan Maarten	Ecorys
Krzyczkowski	Maciej	General Directorate for Environmental Protection (Poland)
Bolognani	Orsola	Ambiente Italia
Salteris	Nikolaos	Eurocert
Lopes	Ana	LIPOR
Lopes	Susana	LIPOR

Guerin	Julie	FNADE - French Federation of Waste Management and Environmental Services
Pace	Isabelle	Veolia
Vandenbroucke	Ingrid	Flemish Compost and Digestate Organisation
Lopez	Joaquim	Bidons Egara, S.L.
Schiavon	Giuliana	Ecoltecnica Italiana S.p.A.
Speziale	Lighea	CEWEP - Confederation European Waste-to-Energy Plants
Bel	Jean-Benoît	ORDIF
Rossi	Raphael	Formia Rifiuti Zero
Scius	Christophe	Suez Env
Dollhofer	Marie	Bipro GmbH
Simon	Joan Marc	Zero Waste Europe
Schoenberger	Harald	BZL
Styles	David	E3
Canova	Michele	EC - DG ENV
Paquot	Sebastien	EC - DG ENV
Paparella	Antonio	EC - DG GROW
Gente	Vincenzo	EC - DG RTD
Antonopoulos	Ioannis	EC - JRC
Dri	Marco	EC - JRC
Canfora	Paolo	EC - JRC
Gaudillat	Pierre	EC - JRC
Zambrzycki	Bartosz	EC - DG SANTE

ANNEX C – SCOPE PROPOSAL

Waste streams

- Municipal solid waste (MSW): household waste and assimilated (including organic, plastic, metal, paper, glass, bulky items, batteries, exhaust oils/lubricants, light bulbs, etc.).
- Construction and demolition waste (CDW).
- Medical waste (MW).

Target group

- Waste management companies (public and private), including companies implementing producer responsibility schemes.
- Waste authorities (public administrations in charge of waste management, mainly at local level).

The study will not cover organisations which generate waste and do not belong to the waste management sector (i.e. most organisations). In fact these other organisations would be addressed in the SRDs for their respective sectors.

Waste management phases

Best environmental practices in several areas of waste management are already set out in European legislation and other European reference documents, such as:

- The Best Available Techniques Reference Documents (**BREFs**) for **waste incineration** and **waste treatment** developed under the IPPC and then IED Directives.
- The EU **landfill directive** (99/31/EC) which aims to prevent and reduce negative effects on the environment from the landfilling of waste.
- End-of-waste criteria (developed under the **Waste Framework Directive**) which specify when certain waste ceases to be considered waste and obtains a status of a product (or a secondary raw material).

This project will cover the phases where best environmental practices are not already covered by other existing EU legislation and reference documents. More specifically, the study will cover the following phases:

- Establishing a **waste management strategy** (i.e. which options are best for each waste stream under which conditions; which kind of collection; how many fractions; which treatments; which final disposal; etc.).
- **Waste prevention** (i.e. reducing the amount of waste generated, for instance reducing the food waste generated at household level thanks to information campaigns and courses; measures aimed at influencing consumers to ask for more environmentally friendly products and less packaging; etc.).
- **Waste collection** (vehicles used, choice of routes, schedule of the collection, etc.).
- **Waste re-use** (e.g. schemes promoting repairing and reselling of end-of-life electronic equipment and furniture).

- **Waste treatment facilities** not covered in the waste treatment BREF such as facilities performing treatments outside the scope of the IED (e.g. sorting facilities with the aim to recycle plastics).

For other phases (i.e. other waste treatment and disposal facilities, recycling and recovery operations) reference will be made to the relevant reference documents, legislation, or criteria. The figure below illustrates the waste management phases in relation to the project: in green the ones aimed to be covered, in yellow the one partially covered and in red the one not addressed.



ANNEX D – PRESENTATIONS

Purposes and goals of the kick-off meeting



Marco Dri

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Sustainable Production and Consumption Unit
Institute for Prospective Technological Studies
(IPTS)

Joint Research Centre (JRC)
European Commission

Title of the meeting: Kick-off meeting of the Technical Working Group for the EMAS sectoral reference documents on Best Environmental Management Practices for the Waste Management Sector

What is it???



Environmental Management System (EMS)

An EMS:

- is a tool that provides organisations with a method to systematically manage and improve the environmental aspects of their (production) processes.
- It helps organisations to achieve their environmental obligations and performance goals.



EMAS

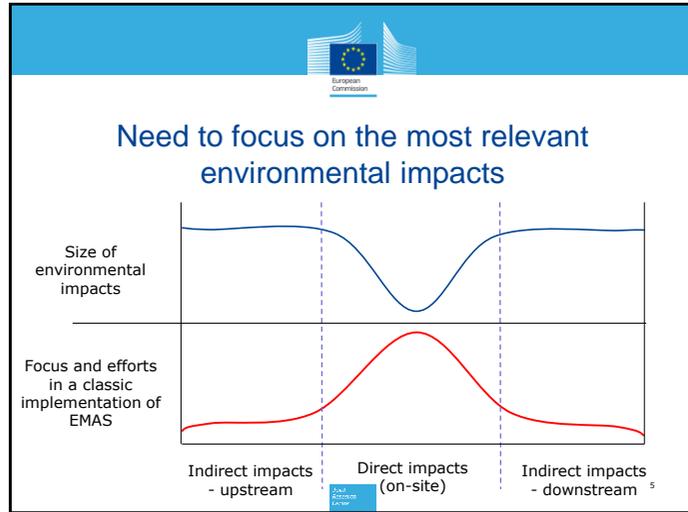
EU Eco-Management and Audit Scheme (EMAS) is established by EU regulation (EC) No 1221/2009



EMAS is:

- Open for companies and other organisations;
- A voluntary management tool to evaluate, report and improve the environmental performance;





According to the EMAS Regulation, the European Commission shall develop EMAS Sectoral Reference Documents on Best Environmental Management Practices (BEMPs)

BEMPs help your organisation to improve its environmental performance and are a key element of the **EMAS** framework.

GO GREEN WITH BEST ENVIRONMENTAL MANAGEMENT PRACTICES!

BEMP
Best practices to reduce environmental impacts
Already in Use by Best Environmental Performers

→ **Practical Guidance** + **Environmental Performance Indicators** + **Benchmarks of Excellence**

Source: European Commission

BEMPs for 11 sectors

The European Commission cooperates with experts and stakeholders from different sectors to identify BEMPs. As a result of this cooperation, Sectoral Reference Documents for 11 sectors are currently under development.

WORKING GROUPS
JRC & DG Environment in close cooperation with:

- Research centres and universities
- Industry associations
- Companies
- EMAS verifiers
- Member States
- EMAS organisations
- Environmental NGOs
- Technology providers

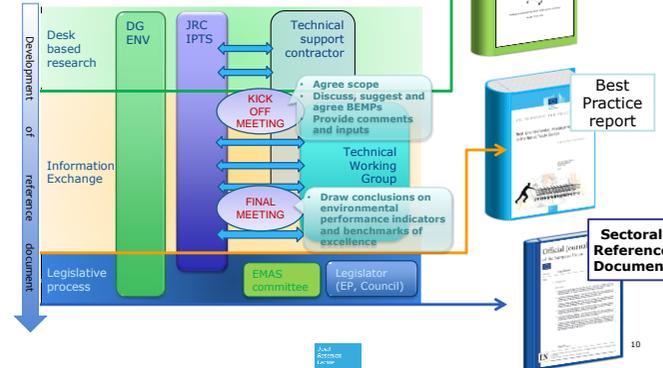
Sectors included: Agriculture, Telecommunications, Public Administration, Construction, Food and Beverage Manufacturing, Car Manufacturing, Retail Trade, Tourism, Waste Management, Metal Products Manufacturing, and Electrical and Electronic Manufacturing.

Methodology for developing the SRDs

Each SRD is developed according to the following logical steps:

- Define the scope of the document and identify relevant actors;
- Target processes associated with greatest environmental impact;
- Identify relevant environmental performance indicators for each process;
- Identify frontrunner actors for particular processes;
- Describe best environmental practices with reference to frontrunner application;
- Derive "benchmarks of excellence" from front-runner performance;
- Clearly state applicability.

The EMAS SRD Development Process



Purposes and goals of the meeting

- to know each other
- to exchange views
- to discuss the development of the Sectoral Reference Document (organisation of the information exchange)
- to discuss the timing

Purposes and goals of the meeting

To discuss:

- Scope of the document for the waste management sector
- Environmental aspects of the waste management sector
- Proposals for best environmental management practices
- First ideas about environmental performance indicators



Thank you!



**Paolo Canfora
Marco Dri
Ioannis Antonopoulos
Pierre Gaudillat**

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Introduction to the sectoral reference documents and lessons learnt



Pierre Gaudillat

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European Commission

Main elements of the sectoral reference documents

The sectoral reference documents comprise 3 main elements:

- Best environmental management practices (BEMPs)

Food waste minimisation by retailers



- Environmental performance indicators

Kg waste generation per m² of sales area

- Benchmarks of excellence

Zero food waste sent to landfill or incineration plant

An example from:



Best Environmental Management Practices (BEMPs)

What is BEMP:

- those techniques, measures or actions that allow organisations of a given sector to **minimise their impact on the environment**
- **direct** and **indirect** aspects
- **technical/technological** as well as **management/organisational** type
- **fully implemented** by best performers
- **technically feasible** and **economically viable**



Best Environmental Management Practices (BEMPs)

What is not BEMP:

- **BEMP is what goes well beyond common practice**
- **but is already fully implemented**
- **and widely applicable**
- Obsolete techniques
- Common practice
- Good practice
- Emerging techniques
 - are available and innovative
 - not yet proved their economic feasibility
 - not yet implemented at full scale



Best Environmental Management Practices (BEMPs)

Description of BEMPs (requires detailed technical information):

- Description
- Achieved environmental benefit
- Appropriate environmental indicator
- Cross-media effects
- Operational data
- Applicability
- Economics
- Driving force for implementation
- Reference organisations
- Reference literature

Structure similar to Best Available Technique Reference Documents (BREFs) according to Industrial Emission Directive



Environmental Performance Indicators and Benchmarks of Excellence

- **Environmental performance indicators**
 - "specific expression that allows measurement of an organisation's environmental performance" (EMAS Regulation)

already in use

environmentally meaningful

can be a proxy

- **Benchmarks of excellence**
 - exemplary environmental performance

very ambitious

achieved by frontrunners

not a target but a measure of what is possible

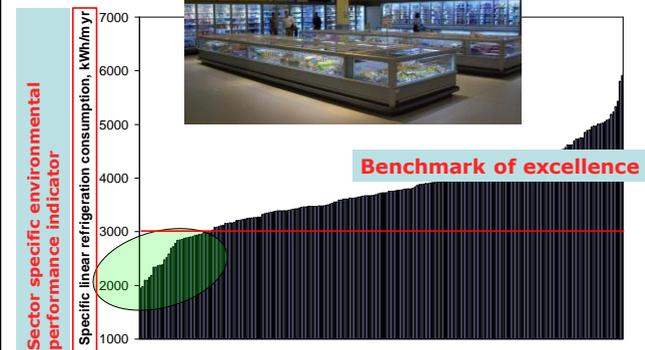


How to identify BEMPs

The frontrunner approach



An example of BEMP, environmental performance indicator and benchmarks of excellence



Benchmark of excellence

Sector specific environmental performance indicator

Specific linear refrigeration consumption, kWh/m³

Development of EMAS Sectoral Reference Documents: Two final outputs



The documents produced so far...

Best practice reports

Sectoral Reference Documents



Use of the EMAS SRDs

- **EMAS registered organisations:** According to the EMAS regulation "Where sectoral reference documents [...] are available for the specific sector, the assessment of the organisation's environmental performance shall take into account the relevant document" (Regulation EC 1221/2009 Article 4.1(d)).
 - Information on (likely) most relevant environmental aspects.
 - Inspiration on what measures can be implemented next for continuous environmental performance improvement.
 - Recommended environmental performance indicators.
- Value beyond EMAS: Reference documents for all organisations in the sectors covered which intend to improve their environmental performance

Lessons learnt

Environmental performance indicators and benchmarks

- In many cases, clear conclusions on environmental indicators and also on benchmarks of excellence could be drawn.
- Quantitative distribution not always available but other effective methods for benchmarking can be used.
- **A key role of the technical working group is to validate the findings, and to draw conclusions on environmental performance indicators and benchmarks of excellence**

Lessons learnt

Technical Working Group:

- allows access to a wider network
- constructive and supportive but very different contribution intensities
- composition may change from kick-off to final meeting

Feedback framework

- comments were submitted in an informal way (no template).
- using a template may discourage to send comments

Thank you!



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Waste management: Scope and structure of the Sectoral Reference Document



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European Commission

Setting the scope of the SRD

- Which target groups?
- Which waste streams?
- Which waste activities?

- In principle:
 - Waste management companies (public/private) and
 - Public administrations in charge of waste management

- But:
 - Very broad and diverse sector
 - European legislation and reference documents already available in several areas of waste management



Scope definition: Need to select waste phases, waste activities and waste streams

Setting the scope of the SRD – other instruments

Best Available Technique Reference Documents (BREFs)

- Developed under the IPPC and IED directives
- BREF on Waste Treatment
- BREF on Waste incineration



EC/99/31 – Landfill Directive

- which aims to prevent and reduce negative effects on the environment from the landfilling of waste

End-of-waste criteria

- developed under the Waste Framework Directive, which specifies when certain waste ceases to be considered waste and obtains a status of a product (or a secondary raw material).

Comparison between EMAS SRD and BREF

	BREF	SRD
Legal basis	Industrial Emissions Directive (IED – 2010/75/EU)	EMAS Regulation (Regulation (EC) 1221/2009)
Main elements	Best Available Techniques (BAT)	Best Environmental Management Practices (BEMP)
Character	Environmental performance levels associated with the use of BAT, especially on emissions (BAT-Associated Emissions Levels - BAT-AELs).	Benchmarks of excellence (i.e. performance achieved by the 10-20% best performers)
	BAT conclusions are the reference for setting IED permit conditions. Emission Limit Values (ELVs) in permits must be set within the BAT-AEL range (mandatory)	The implementation of BEMPs is voluntary. EMAS registered organisations must take the SRDs into account.



Comparison between EMAS SRD and BREF

	BREF	SRD
Scope of activities covered	Installation-based (i.e. gate to gate approach) Only industrial installations	Life-cycle thinking (i.e. cradle to grave approach) All actors along the value chain. For the waste management sector, consider plants which do not fall under the IED
Size of installation/companies covered	Large manufacturing installations only For instance, the recovery, or a mix of recovery and disposal, of non-hazardous waste is covered by the IED if it involves one or several of the activities listed under point 5.3(b) of Annex I and the installation capacity exceeds 75 tonnes per day	Companies of all sizes
Approach	Based on analysis of current emission and consumption levels and related applied technologies / techniques	Based on analysis of best performers (front-runner approach)



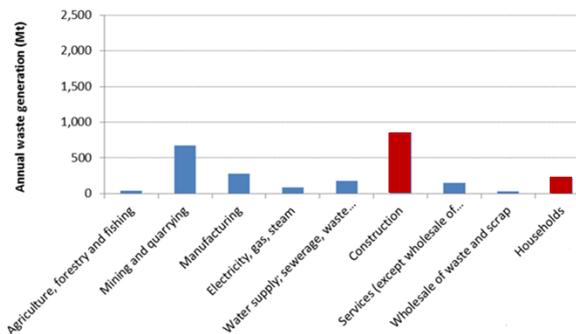
Scope definition – target groups

- Waste management companies either public or private, including companies implementing producer responsibility schemes.
- Waste authorities (public administrations in charge of waste management, mainly at local level).
- **Not covered:**
 - Organisations, which generate waste and do not belong to the waste management sector* (i.e. most organisations).

*: In fact these other organisations would be addressed in the SRDs for their respective sectors.

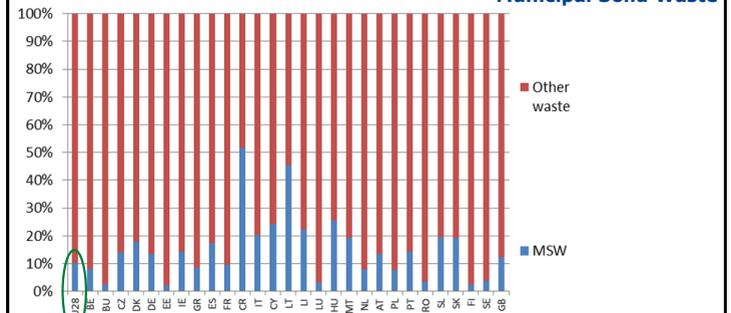


Total waste generation across different sectors



Scope definition – waste streams

Municipal Solid Waste



- Approximately 10% of the total waste generation is MSW

Scope definition – waste streams

Municipal Solid Waste

- MSW is one of the most polluting waste categories and has the highest potential for environmental improvement
- According to Eurostat (2014), 3% of GHG emissions are directly attributable to waste management activities
- Food waste, textiles and nappies/sanitary products make the largest contributions to GHG emissions, followed by plastics
- From 60 to 90 % of total MSW comes from households:
 - the rest amount is from commercial activities with similar waste composition as households e.g. offices, administration services etc.

Scope definition – waste streams

Construction and Demolition Waste

- Account for approximately 34% of the total waste generated in Europe for the year 2012
- Waste authorities and waste management companies are either directly or indirectly responsible for the main environmental aspects of CDW
- Heterogeneity of CDW stream, thus:
 - This work considers CDW as the waste generated in the activities of companies belonging to the construction sector and included in category 17 of the European List of Wastes (p. 42, Table 1.3 in the [Background report](#)), comprising mainly concrete, ceramic and bituminous waste
 - This work does not consider CDW other fractions that fall into the scope of commercial waste in MSW management (e.g. packaging), or other schemes (take back system for wood pallets, recycling for metals, etc.).

Scope definition – waste streams

Medical Waste

- Waste generated in the operation of health services (public/private) for humans and animals
 - Prevention measures of MW are the most important but excluded from this document since they affect the activities of the health care sector
- The World Health Organisation (2014) estimates that a total of 85% of HCW generated in a hospital is non-hazardous and could be carefully managed under other schemes (e.g. for MSW)

Scope definition – waste management phases and waste activities



Activities of organisations:

- Establishing waste management strategies
- Implementing waste prevention and waste re-use schemes
- Collection of non-hazardous solid waste within a local area
- The collection of hazardous wastes is included, if they fall under the scope of this document i.e. MSW, hazardous streams of CDW, hazardous fractions of Medical waste.

Scope definition – waste management phases and waste activities

Waste treatment
Facilities outside the scope of the IED

Partially covered

Activities of organisations:

- Waste treatment facilities are covered as far as they are not covered in the BREF, such as facilities performing treatments outside the scope of the IED (e.g. sorting facilities with the aim to recycle plastics)
- Treatment and disposal of hazardous waste are excluded
- Materials recovery will be included only if:
 - I. performed by a waste manager, public or private, and
 - II. are excluded from the IED BREF waste-related best available techniques.

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Scope definition – waste management phases and waste activities

Material recycling, energy recovery, waste disposal
Reference will be made to other reference document, legislation etc.

Not covered

Activities of organisations:

- Landfill's operations are excluded
- Disposal through incineration with or without energy recovery is excluded
- Production of substitute fuels (RDF, SRF or biogas) is excluded at least at the scales covered by the IED BREFs
- Remediation activities will be considered selectively:
 - E.g. Remediation activities for soils, asbestos, lead containing paints and other toxic materials from construction waste management activities may be included in the scope of the document.

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Scope definition – Overall proposal

Establishment of a waste management strategy

Waste prevention Waste re-use Waste collection

Covered

Waste treatment
Facilities outside the scope of the IED

Partially covered

Material recycling, energy recovery, waste disposal
Reference will be made to other reference document, legislation etc.

Not covered

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Structure

- The SRD is mainly structured on a waste stream basis
 - MSW chapter
 - Sub chapter: Enabling Techniques on MSW strategies
 - CDW chapter
 - MW chapter



Additionally, there is also a 'Cross cutting chapter' including BEMPs suitable for all the waste streams

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Thank you!



**Paolo Canfora
Marco Dri
Ioannis Antonopoulos
Pierre Gaudillat**

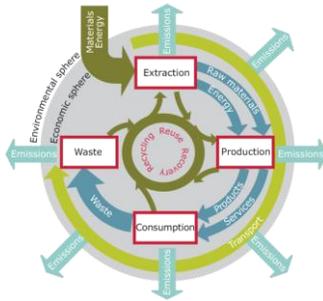
European Commission
Joint Research Centre
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Sustainable Production and Consumption Unit

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<http://susproc.jrc.ec.europa.eu/activities/emas>

OUR ECONOMIC SYSTEM

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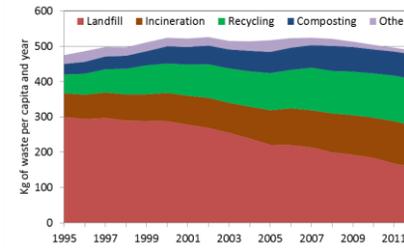


- A circular economy, as in the EU long term vision, extensively re-uses and recycles materials and wastes
- Efficient waste management is key for this development to happen
- However, prevention policies are still to have an impact...

WASTE MANAGEMENT IN EUROPE

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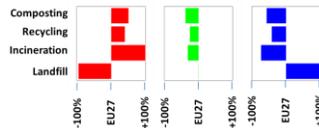
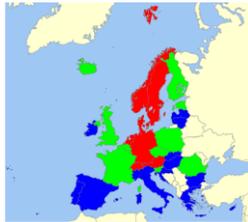
MSW EU 27 PER CAPITA, per treatment



Although the technology has changed the landscape of the sector, no significant waste reduction has been achieved.

WASTE MANAGEMENT IN EUROPE

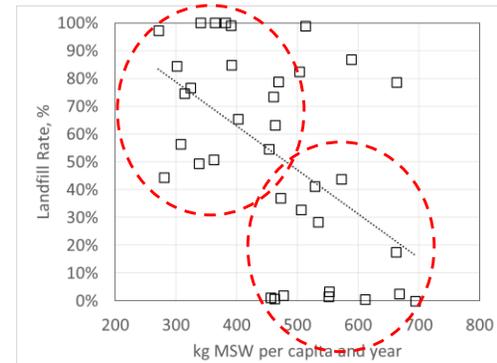
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Waste Management Practices over Europe are very heterogeneous. A simple statistical analysis can identify where frontrunners are more likely to be located.

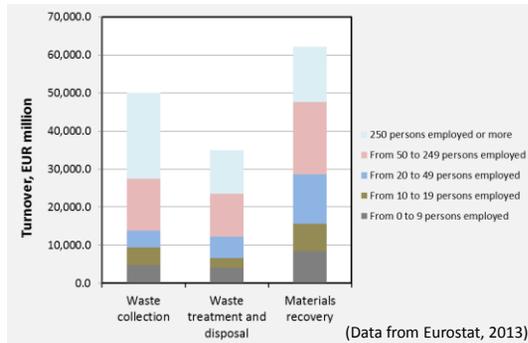
WASTE MANAGEMENT IN EUROPE

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STRUCTURE OF THE SECTOR

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STRUCTURE OF THE SECTOR

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Country	% market share of largest 3 operators
Spain	57
France	47
Netherlands	44
Belgium	41
Germany	38
UK	23

(2007)

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EMAS REGISTER – WASTE MGMT.

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Country	Number of sites	Number of companies
Austria	367	33
Belgium	27	8
Bulgaria	2	1
Cyprus	2	2
Czech Rep.	4	2
Germany	30	21
Denmark	105	18
Spain	81	61
France	2	2
Greece	14	9
Hungary	2	2
Italy	247	194
Lithuania	2	1
Norway	10	10
Poland	19	11
Portugal	25	5
Romania	1	1
United Kingdom	2	2

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ENVIRONMENTAL BURDENS

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- Direct environmental burdens
 - GHG emissions: 141 Mt CO₂e/yr (3% EU 28)
 - NH₃ emissions: 95 kt/yr (3% EU 28)
 - NMVOCs: 77 kt/yr (1% EU 28)
 - Trivial share NO_x and SO_x emissions
 - Toxic emissions: dioxins, heavy metals, PCBs (officially small, but uncertain, significant contribution from illegal activities)
 - Litter and plastic pollution
- Indirect environmental burdens
 - Embodied burdens in disposed products
 - Greater magnitude than direct burdens!

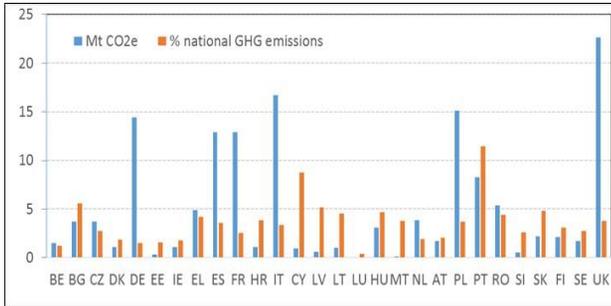
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DIRECT GHG EMISSIONS

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141 Mt CO₂e (3 % EU 28 emissions), but variable across member states...



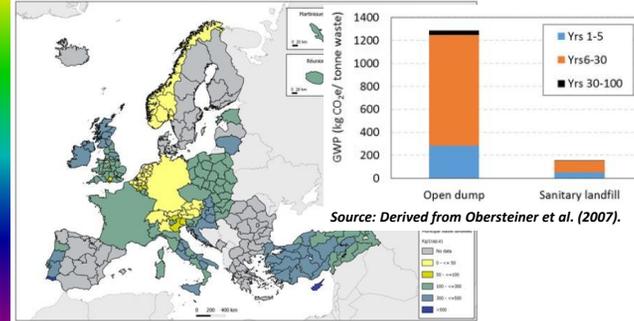
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LANDFILL

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Regulatory requirements to phase out, but still prevalent in some member states (CH₄, leachate burdens...)



Source: Derived from Obersteiner et al. (2007).

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WASTE TRANSPORT

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- MSW collection = start-stop driving in residential areas
- Traffic, noise, GHG emissions and emissions that damage health and contribute to ozone formation including NO_x, PM and VOCs
- 7.2 L/tonne separated organic waste collection in Denmark (Fruergaard and Astrup, 2011)
- Overall, relatively minor compared with embodied and disposal burdens

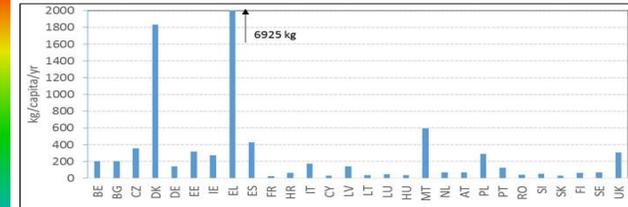


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HAZARDOUS WASTES

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- Figure above reflects differences in classification and reporting
 - A large share of waste hazards not reported (illegal dumping, etc.)
- 1-5 % of demolition waste is hazardous (asbestos, PCBs containing waste, paints, etc.)
- PCB content of cement, concretes and CDW is increasing

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LITTER & PLASTIC POLLUTION

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Eriksen et al. (2014). Plastic fragments in oceans c.0.1% of annual production, but significant ecotoxicity

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ILLEGAL DUMPING

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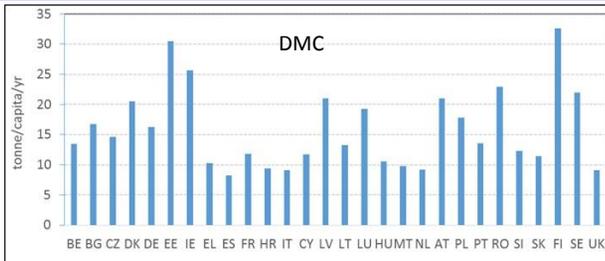
- Visual pollution
- Leakage of refrigerants (high GWPs)
- Leaching of hazardous compounds (soil contamination)
- Illegal burning: dioxins, particulates, VOCs, odour...
- Inappropriate dumping of medical waste: pathogen transfer risk

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INDIRECT BURDENS

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- Domestic Material Consumption (DMC) is a useful indicator of resource intensity within an economy
- A high % of burdens arise outside of EU (imported products)

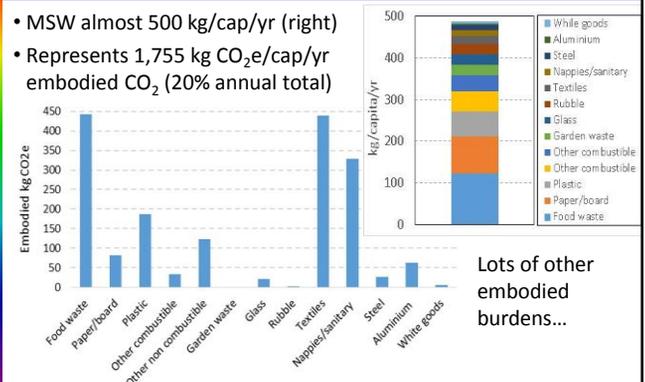
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INDIRECT BURDENS

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- MSW almost 500 kg/cap/yr (right)
- Represents 1,755 kg CO₂e/cap/yr embodied CO₂ (20% annual total)



Lots of other embodied burdens...

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INDIRECT BURDENS

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Embodied burdens for some materials, per kilogram, below

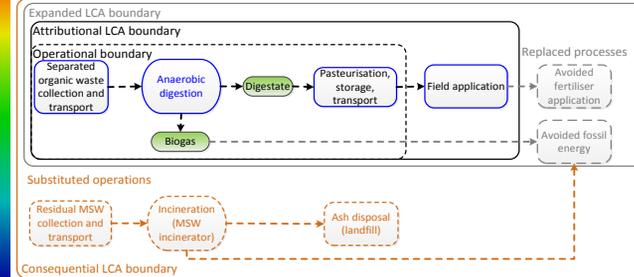
Raw material	Global warming potential, kg CO ₂ e	Eutrophication potential, kg PO ₄ e	Acidification potential, kg SO ₂ e	Fossil resource depletion potential, MJe	Human toxicity, kg 1,4-DCBe
Steel	2.32	0.0035	0.0095	26.8	0.975
Aluminium (cast alloy)	3.18	0.0080	0.025	39.7	4.86
White packaging glass	1.15	0.0013	0.0096	15.4	0.628
Paper pulp	1.27	0.0037	0.0067	19.1	0.49
PET granules	3.08	0.0034	0.0152	72.2	0.921
PVC bulk	2.2	0.0012	0.0065	49	0.237
Cotton (knit)	22.8	0.040	0.139	267	5.99

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LCA APPROACH: BIOWASTE E.G.

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Need to consider replaced processes and avoided resource consumption: boundary expansion

Wider effects of moving from one type of practice to another: consequential LCA

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LCA ORGANIC WASTE E.G.

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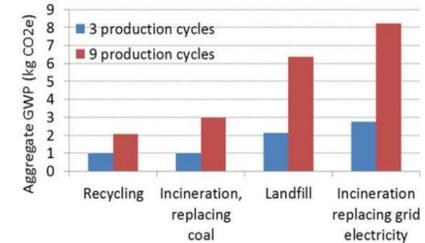
Treatment	Global warming potential, kg CO ₂ e	Eutrophication potential, kg PO ₄ e	Acidification potential, kg SO ₂ e	Fossil resource depletion potential, MJe
Sanitised landfill (70 % CH ₄ capture and energy recovery)	517	0.14	0.42	-1,563
Compost (use as soil improver)	170	0.83	1.81	500
Anaerobic digestion (electricity generation and digestate used as fertiliser)	-95	0.50	0.59	-2,788

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LCA APPROACH: PLASTIC E.G.

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- Recycling incurs smaller burdens than extraction of virgin material
- Additional recycling loops improve relative performance of recycling
- Incineration with energy recovery-has low conversion efficiency; electricity may therefore have higher carbon footprint (CF) than replaced grid electricity, BUT improved energy balance and lower land requirement compared with landfill (need for multi-burden LCA)

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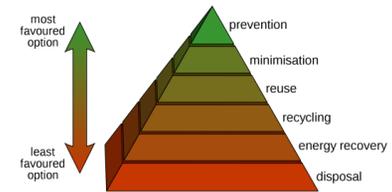
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Kick-off Meeting of the Technical Working Group
for the EMAS Sectoral Reference Document on
**BEST ENVIRONMENTAL MANAGEMENT PRACTICES
FOR THE WASTE MANAGEMENT SECTOR**
Leuven, 30 September – 1 October 2015

MUNICIPAL SOLID WASTE



3.5. MUNICIPAL SOLID WASTE STRATEGIES



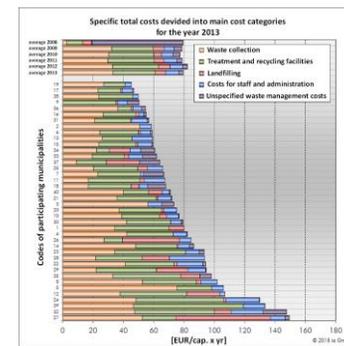
3.5 MSW WASTE STRATEGIES

Portfolio of techniques

Sub-chapter	Proposed BEMPs
3.5. Waste Strategies for MSW	3.5.1. Cost benchmarking
	3.5.2. Waste monitoring
	3.5.3. Pay-As-You-Throw
	3.5.4. Awareness raising
	3.5.5. Interaction with deposit refund schemes

BEMP: Best Environmental Management Practice

3.5.1. COST BENCHMARKING



3.5.1. DESCRIPTION

BZL e³

- Perform **cost-benchmarking** between a sufficient number of municipalities/cities and counties with comparable conditions with the help of an independent third-party organisation
- Consider cost figures for all waste streams (paper/cardboard, glass, plastics including composite packaging, bio waste, green cuttings, scrap metal, non-ferrous metals, hazardous waste, etc.)
- Costs for waste management services, for disposal of certain waste streams as well as revenues gained from marketing of recyclables are taken into account.

3.5.1. INDICATORS AND ENV. BENEFIT BZL e³

Proposed indicator

- The regular participation in a dedicated cost benchmarking system (YES/NO) is the appropriate environmental indicator.

Environmental benefit

- Cost benchmarking is not directly associated with an improved environmental performance. However, it can contribute to an optimisation of services such as the collection of the different waste fractions. In this respect, it can encourage municipalities to intensify waste collection as the figures demonstrate that advanced collection system do not necessarily lead to significantly higher costs.

Information sought: Case studies and data

3.5.2. WASTE MONITORING

BZL e³



3.5.2. DESCRIPTION

BZL e³

- All waste streams/fractions collected and processed are characterised (composition) and quantified (weighing).
- Data are annually compiled to see the development to be used for optimising the waste management strategy and measures.

3.5.2. INDICATORS AND ENV. BENEFIT **BZL e³**

Proposed indicator

- The determination of the quantities and also of the composition of all relevant waste streams/fractions (YES/NO). Listing of the waste streams which are fully quantified (weighted).

Environmental benefit

- There is no direct environmental benefit but the accurate determination of the quantities of the different waste streams is a prerequisite to follow the continuous improvement process.

Information sought: Case studies and data on monitoring the different waste streams.

3.5.3 PAY-AS-YOU-THROW



3.5.3. DESCRIPTION **BZL e³**

- Realise the polluter pays principle in a fair way by charging inhabitants according to the amount of waste they generate (PAYT - also known as variable rate pricing, unit pricing, differentiated tariff system).
- Introduce a system where citizens pay per weight or bag of residual waste generated and where bio waste and bulky waste is also weighted.

3.5.3. INDICATORS AND ENV. BENEFIT **BZL e³**

Proposed indicator

- Recycling rates for the different waste streams which can be recycled such as paper/cardboard, glass, waste plastic and composite packaging, bio waste, green cuttings, etc. and residual waste to be disposed of in (kg/capita/yr).

Environmental benefit

- The amount of residual waste significantly decreases and the amount of recycled waste increases accordingly, provided the infrastructure to collect and to process the recyclables is available and efficient. Recycling rates of 70 % and more, up to 85 % in case of weight-based systems, are achieved.

Information sought: Case studies and data on effectiveness

3.5.4. AWARENESS RAISING



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3.5.4 DESCRIPTION

- Educate citizens on waste prevention and management
- Clearly advertise availability of, and details for, waste management services
- Engage staff in best practice
- Ensure consistency and clarity of communications with well-defined aims and objectives.
- Create clear messages appropriate to, and directed at, well-defined target audiences
- Ensure efficient delivery through the integration of activities and clear lines of responsibility

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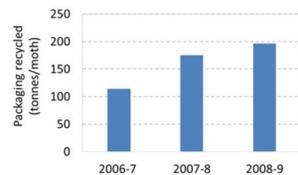
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3.5.4 INDICATORS AND ENV. BENEFIT BZL e³

Proposed indicator

- Total waste generated (kg/capita/yr)
- Percentage of waste collected separately and delivered to recycling (% annual mass)

Environmental benefit e.g. for packaging recycling rate in Attiki, Greece



Information sought: Case study examples, evidence of efficacy

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3.5.5. INTERACTION WITH DEPOSIT REFUND SCHEMES



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3.5.5 DESCRIPTION

A local authority has not the capability, the resources and the regulatory capacity to implement a deposit-refund scheme. But, some approaches can be considered to constitute best practice:

- Participate or establish local pilot programmes on deposit schemes for some packaging waste.
- Establish and run redemption centres when the availability of deposit points is scarce.
- Enforce antilittering regulations to help the initial stages of implementation of the scheme.
- The deposit refund scheme is part of the training, education or raising awareness campaigns maintained at local level.
- Get involved in the steering of the deposit refund systems, through participation in municipalities associations.

3.5.5 INDICATORS AND ENV. BENEFIT

Proposed indicator

- Capture rate, %
- Brought back to re-use, %
- Brought back to recycling, %
- Participation in pilot programmes on deposit schemes (Y/N)
- Deposit-refund schemes are part of the awareness raising campaigns (Y/N)
- Etc.

Environmental benefit

High rates of recovery from deposit schemes

3.5.5 REMARKS

- Pilot schemes at local level have shown increased revenues due to increased collection rates and to higher quality
- However, these benefits do not go directly to the MSW system; reduction in collection, however, is able to reduce overall management costs
- Benefits at local level also include the reduction of littering

Information sought: Case study examples of local DRS and their evidence of efficacy

3.5 MSW STRATEGIES

Proposed BEMPs

Cost benchmarking

Waste monitoring

Pay-As-You-Throw

Awareness raising

Interaction with deposit refund schemes

More ideas?

3.7. MUNICIPAL SOLID WASTE PREVENTION



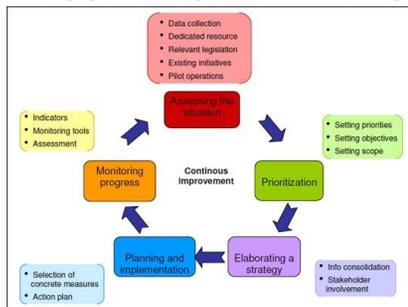
3.7 MSW WASTE PREVENTION

Portfolio of techniques

Sub-chapter	Proposed BEMP
3.7. Waste Prevention	3.7.1. Local waste prevention programmes

3.7 MSW PREVENTION

3.7.1 LOCAL WASTE PREVENTION



3.7.1. DESCRIPTION

- Introduce and raise awareness waste prevention measures on the local and regional level.
- Set up and perform or stimulate waste prevention measures
 - for individuals and families (little package, my bag and my cup, re-usable package, repair, refillable products, donation, reduction of food waste, re-usable nappies, etc.).
 - for municipalities, cities, counties or private organisations (mobile dishwasher for festivals, lunch boxes, repair shops, pay-as-you-throw system, etc.).

3.7.1 INDICATORS AND ENV. BENEFIT **BZL e³**

Proposed indicator

- Reduction rate for the total municipal waste as well as for the different waste streams considered, expressed in kg per capita and year (kg/capita/yr).

Environmental benefit

- Although waste prevention has high priority, so far, the prevention potentials appear to be relatively small in relation to the total municipal waste, only 1 – 3 % has been reported; For some individual waste streams, the percentage can reach the order of some 10 %.

Information sought: case studies and data on effectiveness

3.7 MSW PREVENTION **BZL e³**

Proposed BEMPs

Local waste prevention programmes

More ideas?

3.8. MUNICIPAL SOLID WASTE REUSE **BZL e³**



3.8. MSW WASTE RE-USE **BZL e³**

Portfolio of techniques

Sub-chapter	Proposed BEMP
3.8. Waste Re-use	3.8.1 Re-use schemes

3.8.1. RE-USE SCHEMES



3.8.1 DESCRIPTION

- Collect items for re-use and distribute to organisations for sale or onward distribution
- Establish effective information exchanges to advertise the demand for, and market the availability of, re-usable “waste” products
- Develop re-use networks
- Especially relevant for municipalities and third sector organisations

3.8.1 INDICATORS AND ENV. BENEFIT BZL e³

Proposed indicator

Mass of potential waste stream diverted to re-use in the waste management catchment, expressed as:

- tonnes/yr
- kg/capita/yr

Environmental benefit e.g. per tonne product re-used

Category	Avoided global warming potential (kg CO ₂ e)	Avoided abiotic resource depletion (kg Sb e)	Avoided fossil resource depletion (MJe)
Clothing	-7,510	-0.039	-57,100
Home furniture	-30	-0.004	-5,000
Home electricals	-3,290	-0.030	-67,100

Source: WRAP (2014).

Information sought: Case study examples

3.8. MSW WASTE RE-USE

Proposed BEMPs

Re-use schemes

More ideas?

3.10. MUNICIPAL SOLID WASTE COLLECTION



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3.10. MSW WASTE COLLECTION

Portfolio of techniques

Sub-chapter	Proposed BEMPs
3.10. Waste Collection	3.10.5 Waste Collection Strategy
	3.10.6. Infrastructure to recycle or to recover waste streams and to dispose of hazardous compounds
	3.10.7. Logistics optimisation
	3.10.8. Low emission vehicles

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3.10.5. WASTE COLLECTION STRATEGY



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3.10.5. DESCRIPTION

- Separate out organic waste so that residual waste can be collected less frequently.
 - Fortnightly collections of residual waste may be an effective option in temperate climates.
- Devise a collection strategy that cost-effectively maximises the rate of *selective* collection.
- Choose among bring centres, separate kerbside collection or co-mingled collection in accordance with population density and citizen behaviour.

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3.10.5. INDICATORS AND ENV. BENEFIT **BZL e³**

Proposed indicator

- Quantity of separated waste streams collected per household per year (kg/hh/yr) or per person per year (kg/capita/yr)
- Percentage of MSW generated that is selectively collected (%)
- Percentage of MSW generated that is recycled (%)

Environmental benefit

Significant increases in recycling rate possible, leading to resource savings and avoided impacts of incineration

Information sought: Case studies and data

3.10.6. INFRASTRUCTURE TO RECYCLE OR TO RECOVER WASTE STREAMS AND TO DISPOSE OF HAZARDOUS COMPOUNDS **BZL e³**

3.10.6. INFRASTRUCTURE TO RECYCLE OR TO RECOVER WASTE STREAMS AND TO DISPOSE OF HAZARDOUS COMPOUNDS



3.10.6. DESCRIPTION **BZL e³**

- Provide the required infrastructure to collect a considerable number of waste streams/fractions in order to re-use, to recycle or to recover them.
- In addition to door-to-door collection, this means the installations of recycling centres where the different wastes are received and kept separate as much as (reasonably) possible for efficient re-use, recycling and, in some cases, for recovery.

3.10.6 INDICATORS AND ENV. BENEFIT **BZL e³**

Proposed indicator

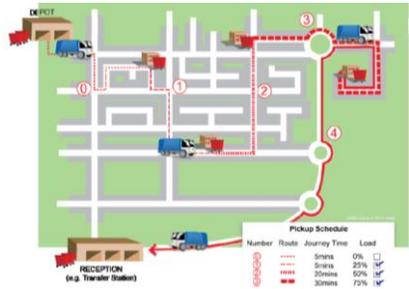
- For a county or a city, the number of recycling centres per 100 000 capita can be used as an indicator or the weight of the different waste fractions per capita collected via recycling centres.

Environmental benefit

- Savings of raw materials and energy; the separate collection and environmentally friendly disposal of hazardous substances reduces the contamination of waste streams and the environment. The separate collection of the different fractions usually enables higher recycling rates and thus lower losses of raw materials.

Information sought: Case studies and data on effectiveness

3.10.7. LOGISTICS OPTIMISATION



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3.10.7 DESCRIPTION

- Logistics operations are optimised using Computerised Vehicle Routing and Scheduling (CVRS) technology or equivalent software.
- Environmental metrics are integrated into optimisation.
- Performance is benchmarked using appropriate efficiency indicators, e.g. cumulative energy demand and CO₂e.
- Opportunities with collaboration with neighbouring waste management organisations are explored.
- Telematics equipment installed in collection vehicles, and drivers trained in eco-driving techniques.

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3.10.7 INDICATORS AND ENV. BENEFIT

Proposed indicator

- Fuel consumption per tonne of waste fraction collected (L/tonne)
- Cumulative Energy Demand (CED) per tonne of waste fraction collected (MJ/tonne)
- GHG emissions per tonne of waste fraction collected (kg CO₂e/tonne)

Environmental benefit

CVRS can reduce transport distances and fuel consumption by c.15 % and increase productivity by c.9 %. Telematics and driver training can reduce fuel consumption by c.12 %.

Information sought: Case studies and data

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3.10.8. LOW EMISSION VEHICLES



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3.10.8 DESCRIPTION

- Purchase or lease refuse collection vehicles that are:
 - fitted with stop-start and idle shut-off technology and electrically operated bodies
 - dual-fuelled or fully fuelled with natural gas, ideally biogas where available
 - or hybrid electric vehicles.
- Retrofit existing refuse collection vehicles with sufficient remaining planned years of service to justify the cost to run on natural gas, or biomethane where available.
- Use low rolling resistance tyres .

3.10.8 INDICATORS AND ENV. BENEFIT

Proposed indicator

- Fuel consumption per tonne of waste collected (L/tonne)
- Cumulative Energy Demand (CED) per tonne of waste fraction collected (MJ/tonne)
- GHG emissions per tonne of waste fraction collected (kg CO₂e/tonne)

Environmental benefit

	SO _x	NO _x	VOCs	PM	Ozone promoters	Aromatic compounds
CNG vs. petrol*		-52 %	-92 %		-96 %	-99.9 %
CNG vs. diesel**	-44 %	-44 %	-21 %	-25 %		

* Tassan et al. (2013); ** Rose et al. (2013), relative to diesel refuse collection truck

Information sought: Case studies and data

3.10. MSW COLLECTION

Proposed BEMPs

Waste Collection Strategy

Infrastructure to recycle or to recover waste streams and to dispose of hazardous compounds

Logistics optimisation

Low emission vehicles

More ideas?

3.10. MUNICIPAL SOLID WASTE TREATMENT

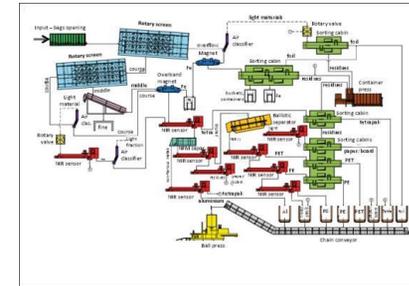


3.12. MSW WASTE TREATMENT

Portfolio of techniques

Sub-chapter	Proposed BEMPs
3.12. Waste Treatment	3.12.1. Sorting of co-mingled packaging waste 3.12.2. Decentralised composting

3.12.1. SORTING OF CO-MINGLED PACKAGING WASTE



3.12.1. DESCRIPTION

In case light packaging waste is collected together, **implement high efficiency sorting of co-mingled packaging waste** to recycle and to recover as much as possible plastic, composite packaging, paper/cardboard, ferrous and non-ferrous metals.

However, compared to the separate collection of different waste streams, the quality of the recycled fractions may be lower.

3.12.1 INDICATORS AND ENV. BENEFIT

Proposed indicator

- Recycling rates for plastic such as PET and polyethylene, composite packaging, paper/cardboard, ferrous and non-ferrous metals.

Environmental benefit

- The sorting of co-mingled recyclables enables the recycling of plastic (different fractions), paper/cardboard, ferrous metals and non-ferrous metals. Thus, the material cycle can be closed or, when co-incinerated, the recyclables can substitute primary fuels, provided the quality of the fractions is sufficient.

Information sought: Case studies and data on effectiveness

3.12.2. DECENTRALISED COMPOSTING



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3.12.2 DESCRIPTION

This technique may only be considered best practice in specific circumstance, where e.g. constrained finances do not allow separate collection of wet organic waste for anaerobic digestion and woody waste for energy recovery.

- Evaluate the feasibility of anaerobic digestion of wet organic waste before pursuing a decentralised composting strategy.
- Provide information and equipment to households to support home composting.
- Establish community-run decentralised composting facilities in urban areas.

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3.12.2 INDICATORS AND ENV. BENEFIT BZL e³

Proposed indicator

- Mass of organic waste diverted from landfill or incineration through decentralised composting, kg/household/yr
- Percentage of organic waste present in collected residual waste (% mass)

Environmental benefit

- Avoided waste collection burdens; possible soil improvement, peat- and fertiliser-replacement benefits
- BUT, poorly managed composting may lead to CH₄ and N₂O emissions; risk of nutrient over-application in domestic gardens

Information sought: Case studies and data on effectiveness

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3.12. MSW TREATMENT

Proposed BEMPs

Sorting of co-mingled packaging waste

Decentralised composting

More ideas?

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Succeeding in achieving the target of 70% of C&D Waste recycled by 2020 in all the EU:

Towards a Common Construction and Demolition Waste Management Protocol

**Antonio Paparella
DG GROW-Unit C1-Clean technologies and products**



Why a common Protocol?

- **Increasing attention for managing C&D waste**
 - Roadmap to a Resource Efficient Europe COM (2011) 571
 - Resource Efficiency in the Building Sector COM (2014) 445;
- **Achieving sustainable growth of the construction sector and a long term competitive position is possible only by qualitative recycling of C&D waste**
 - Low perceived quality → lack of confidence → no waste derived secondary materials market
- **Quality and confidence are key!**



Why a common Protocol?

- **Role of the EC in developing the Protocol**
 - Expected by stakeholders
 - Incentivising lagging MS, regions and actors



What is a common Protocol?

- **Name**
 - Common EU Construction & Demolition Waste Management Protocol
- **Overall aim**
 - A common set of technical, environment and quality management principles
 - Applicable in the entire EU
 - Based on the highest common standards in each stage of the waste management chain that would be recognised in all Member States

What is a common Protocol?

➤ Specific aims

- Common structure with clear indicators and process-oriented
- Should be able to be audited and certified by independent experts
- Form a basis for standardised and frequent reporting of reliable C&D waste statistics
- Link to existing business management standards
- Voluntary in adoption, committing to implementation

What is a common Protocol?

➤ Scope [what should the Protocol cover?]

- **Success criteria**
 - Acceptability, Adoptability
 - Enforceability, Transparency
 - Traceability
- **Dimensions to be included**
 - Sound Recycling Principles
 - Waste Management Cycle
 - Process and product quality management
 - Policy ?



How to build the Protocol: The Roadmap

➤ The realisation of the Protocol will be steered by DG GROW with Ecorys' assistance, but development depends on the active input from:

- Industry associations
- Associated individual (industry) experts
- Member State government representatives
- Other DG representatives (DG ENV, DG RTD, JRC)

How to build the Protocol: The Roadmap

➤ Together, committed experts will work in either of two Task Forces

- **TF1 Quality Recycling, Building Confidence**
 - Responsible for developing the technical content
 - Strong representation from industry
 - "Bring your knowledge, not your products or services"
 - Specialised knowledge of waste management principles or processes



How to build the Protocol: The Roadmap

➤ Together, committed experts will work in either of two Task Forces:

- **TF2 Setting conducive framework conditions**
 - Focus on relevant framework conditions that either affect functioning of the Protocol or that will be facilitated by the Protocol
 - Strong policy representation [EC officials, national governments representatives] as well as EU Level Industry Association experts
 - Mirror Group to Task Force 1 [providing feedback and guidance]
- **EU level industry associations act as intermediaries between individual industry experts and Task Force 2 policy experts**



How to build the Protocol: The Roadmap

➤ Roles and responsibilities

- **Task Force 1** Technical development of the Protocol
- **Task Force 2** Guide and steer the development of the Protocol from public policy perspective; ensure public endorsement
- **DG GROW** Initiator of the project; Liaise for commitment/input other DGs; Provide inputs to Task Force 2
- **Ecorys** Management and final development of the Protocol
- **Associations** Intermediaries for industry experts; Experts Task Force 2



How to build the Protocol: The Roadmap

➤ Main stages of the work

- **Stage 1 - June - August '15**
 - Selection of experts, stock-taking, concept definition
- **Stage 2 - Sept. - May '16**
 - Development of the Protocol
- **Stage 3 - June – August '16**
 - Validation of the results
- **Stage 4 - Sept. – Dec. '16**
 - Dissemination of the Protocol



Way forward - Practicalities

➤ Meeting dates and topics

- | | | |
|---------------------------|-------------------|------------------------------------|
| • 26 June 2015 | All | Kick-off Meeting |
| • 15 October 2015 | F1 – Meeting 1 | Waste generation |
| • 12 November 2015 | TF2 – Meeting 1 | Monitoring & Statistics / Landfill |
| • 10 December 2015 | TF1 – Meeting 1.1 | Incorporating feedback |
| • 4 February 2016 | TF1 – Meeting 2 | Waste processing/treatment |
| • 17 March 2016 | TF2 – Meeting 2 | Public Procurement / Adoption |
| • 7 April 2016 | TF1 – Meeting 2.1 | Incorporating feedback |
| • 12 May 2016 | TF1 – Meeting 3 | Waste logistics and markets |
| • 30 June 2016 | All | Validation Workshop |

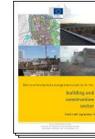
Kick-off Meeting of the Technical Working Group
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Leuven, 30 September – 1 October 2015

CONSTRUCTION AND DEMOLITION WASTE



INTRODUCTION



Construction and Demolition Waste is addressed also in the document on Best Environmental Management Practice of the Building and Construction (mainly from the point of view of construction companies and building designers)

There are two ongoing projects at the EC on Construction and Demolition Waste:

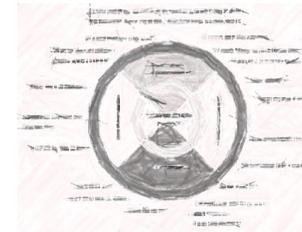
1. Study on **Resource Efficient Use of Mixed Wastes**, DG-ENV, BioS, BRE, and others
2. Development of an EU **C&D Waste Management Protocol**, DG GROW/DG ENV, ECORYS



TECHNIQUES PORTFOLIO

Management aspect	Proposed BEMPs	BEMPs in the Building and Construction document
Strategy	4.2.1. Construction and Demolition Waste Planning	Site waste management plans Use of recycled materials
	4.2.2. Voluntary Agreements for CDW	
	4.2.3. Quality assurance schemes	
Prevention	-	Designing out waste, Site waste prevention and management Material use efficiency
Collection	4.2.4. PCBs release prevention	Site waste prevention and management Selective deconstruction of buildings Selection of environmentally friendly deconstruction / demolition techniques
Re-use	-	Re-use of materials
Treatment	4.2.5. Plasterboard recycling	Construction and demolition waste sorting and processing

4.2.1. INTEGRATED CONSTRUCTION AND DEMOLITION WASTE PLANS



4.2.1 DESCRIPTION

A Best Practice plan

- Focuses on the prevention, generation, collection, treatment and recycling of construction and demolition waste at local level
- Sets ambitious targets for recycling and landfill diversion based on the local and regional markets
- Identifies and estimates waste streams, prioritises prevention, involves industrial stakeholders and calculates the costs of implementation
- Provides clear guidance to the industry, especially for SMEs and small producers, on best practices and awareness raising

4.2.1 INDICATORS AND ENV. BENEFIT

Proposed indicator

The percentage (%) of total generated waste, correctly segregated and managed towards materials recovery, re-use or any other type of valorisation

Environmental benefit

A 95% recovery rate of certain material streams observed (e.g. for clean concrete wastes)

4.2.1 REMARKS

- It is applicable to local communities or counties with important development activities
- Very heterogeneous situations across Member States
- Requires the allocation of resources from the administration or a market driven approach (e.g. where a demand for recycled aggregates exist)
- Risk of illegal dumping

Information sought: Case study examples on local implementation and data from the monitoring of plans

4.2.2. VOLUNTARY AGREEMENTS



4.2.2 DESCRIPTION

BZL e³

This is a high level instrument, usually implemented by the industry among competitors.

An exemplary approach was the “*Halving Waste to Landfill Commitment*” in the UK, which comprises these actions:

- Procurement includes waste prevention and reduction recommendations.
- Waste is designed out by suppliers, architects and designers.
- Waste management contractors optimise waste management on site along with contractors to maximise recovery.
- Implement site waste management plans and monitor waste and its treatment.

Participation in agreements where these or similar rules apply are considered to constitute a BEMP.

4.2.2 INDICATORS AND ENV. BENEFIT

BZL e³

Proposed indicator

Same as for Integrated CDW Management plans

Environmental benefit

Implemented along with other BEMPs, benefit from a higher awareness and business environment.

The UK Halving waste to landfill commitment increased recovery to over 90% (excluding excavation waste).

4.2.2 REMARKS

BZL e³

- Participation in VA is part of the Integrated CDW Management plan
- Adopted at national level, needs to be implemented at local level, and articulated in public administration by:
 - GREEN PROCUREMENT (e.g. through use of recycled materials)
 - HELPING SMALL PRODUCERS (e.g. CDW fractions in recycling centres)
 - INVOLVING LOCAL INDUSTRY (e.g. through site waste management plan implementation)
 - Etc.

Information sought: Case studies

4.2.3. QUALITY ASSURANCE

BZL e³



4.2.3 DESCRIPTION

BZL e³

This technique is oriented to support the market for recycled aggregates:

- By providing **confidence** to the construction sector on the use of recycled materials
- By identifying the **quality criteria** required for the application in high grade applications (e.g. structural concrete)
- By **encouraging better segregation** at source

Waste managers voluntarily participating in a quality assurance scheme working under these prescriptions can be considered a BEMP.

The European Commission is developing a **CDW management protocol** to support this. Many schemes are running at national and international level.

4.2.3 INDICATORS AND ENV. BENEFIT

BZL e³

Proposed indicator

Recycling rate, %;

Rate of substitution of natural aggregates, % (this is for specific projects but can be sampled as a indicator of quality)

Environmental benefit

In regions where QA schemes apply for RA, recycling rates higher than 90% are observed (Baden-Württemberg and Berlin)

Treatment	Global warming potential, kg CO ₂ e/t	Primary Energy, MJ/t	Land Use PDF*, m ² a/t
Collection	6	100	0.15
Landfill	15	300	0.80
Recycling	2.5	45	0.18

4.2.3 REMARKS

BZL e³

- Quality assurance needs a case-by-case approach, i.e. per project, and per final application (structural/non structural/subbase material/backfilling).
- The availability of cheap natural aggregates has a strong influence on the market of recycled aggregates.
- Extra quality requirements are in place for recycled aggregates, e.g. leachability – these are not in place for natural aggregates.
- The construction industry is highly traditional and cost driven. Innovative solutions should always be supported by standards (e.g. EN 12620:2013).

Information sought: Case studies of the local implementation of these schemes, with regard to market uptake improvements

4.2.4. PLASTERBOARD RECYCLING

BZL e³

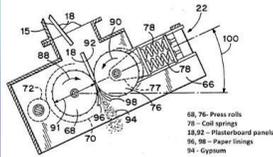


4.2.4 DESCRIPTION

BZL e³

Plasterboard wastes can be fully incorporated to the manufacture of new plasterboard, which also accepts gypsum wastes e.g. from desulphurisation.

The environmental management practices around gypsum plasterboard value chain can be considered exemplary for other materials:



- It can be easily re-used and cutting wastes designed out.
- Virtually, manufacturers can incorporate 100% gypsum-based wastes (only 25% from plasterboard waste).
- Its segregation is key for the recycling of other CDW streams.

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4.2.4 INDICATORS AND ENV. BENEFIT

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Proposed indicator

Several indicators are in use by the industry and waste managers:

- Reprocessed materials use rate, %
- Waste plasterboard recovery efficiency, %
- Sulfate content in CDW, %

Environmental benefit

Due to the heating cycle to manufacture new plasterboard, recycling benefits are not high (Maximum GWP reduction of 5%); however, its segregation produces huge benefits to CDW recycling.

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4.2.4 REMARKS

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- EoW criteria developed at national level in the UK, Germany to follow.
- Quality assurance standards are in place (e.g. PAS 109:2013)
- Internal recycling in the manufacturing process is around 5-6%; that leaves only to use 20% waste plasterboard. However, waste flows at European level indicate that 100% recycling is virtually possible.
- The availability of local natural gypsum is a barrier to the applicability of this practice.

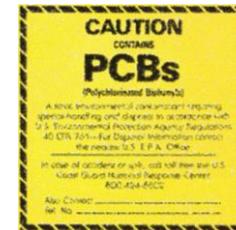
Information sought: Local collection points of waste plasterboard (case studies), proposal of other closed-cycle material streams examples

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4.2.5. PCB MANAGEMENT

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4.2.5 DESCRIPTION

Due to the extensive use of PCB-containing sealants, waste produced from demolition of buildings from the **period 1950 – late 1970s** need to be inspected for PCBs concentrations higher than **50 mg per kg**. This is considered a hazardous waste.

In Denmark, municipalities are preventing the suitability of CDW to produce recycled aggregate if the content is higher than **100µg per kg of waste**.

BEMP:

- Regulating the screening of buildings and developments with potential for high PCB-content and establish action protocols (Public authority)
- To determine the suitability of PCB-containing waste for the production of recycled materials (WMO)

4.2.5 INDICATORS AND ENV. BENEFIT

Proposed indicator

- Concentration of PCB in CDW (e.g. mg/kg)
- Existence of protocols for the management of PCB-containing waste

Environmental benefit

PCBs elimination and avoidance of health risks.

Information sought: Case studies, also for other hazardous waste streams

4.2.5 REMARKS

- A study on Danish construction sites found an average PCB-concentration of 17 µg/kg; however, it is thought to be increased.
- Higher concentration in mixed aggregates and non-inert fractions

Material	Range resp. maximum concentrations measured from buildings, mg/kg
Primary Sources	
Sealant	960 – 752,000
Adhesives	3.9 – 3,100
Surface coatings	140 – 255
Paint	0.7 – 89,000
Ceiling tiles	57 – 51,000
Glazing	Up to 100 % liquid PCB
Light ballast	1,200,000
Electric wiring	14

CONSTRUCTION AND DEMOLITION WASTE

Proposed BEMPs

Integrated Strategy

Participation in Voluntary Agreements

Quality Assurance

PCB management

Plasterboard recycling

More ideas?

Kick-off Meeting of the Technical Working Group
for the EMAS Sectoral Reference Document on
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Leuven, 30 September – 1 October 2015

MEDICAL WASTE



INTRODUCTION

Healthcare waste is the waste generated at medical institutions, including:

Non-hazardous

- MSW-like
- Offensive waste (odour, wetness or appearance)

Hazardous MW

- Infectious waste
- Toxic and infectious waste
- Toxic waste

Others (radioactive, batteries, etc.)

TECHNIQUES PORTFOLIO

Waste Stream	Bag/bin colour code	Description	Disposal route	
Infectious clinical waste, 18 01 03*	Orange bag, UN system	Waste from the treatment of infectious patients, as personal protective equipment, plasters bandages, empty bags and tubing, etc.	Alternative treatment methods and/or incineration	
Offensive waste, 18 01 04 and 20 01 99	Yellow bag with black stripe or stripes (tiger bag)	Waste from the treatment of non-infectious patients, as personal protective equipment, wipes, plasters, bandages, sanitary towels, empty bags, etc.	Incineration with energy recovery, recycling	
Non-medicine contaminated sharps, 18 01 03*	Orange lid on e.g. yellow container	Sharps waste from the treatment of infectious patients (needles, syringes, blades, scissors, etc.).	Alternative methods plus incineration with energy recovery or high temperature incineration	
Cytotoxic and cytostatic waste 18 01 03*, 18 01 08*	Purple lid on e.g. yellow container	Waste in the treatment of infectious patients and used for the administration of cytotoxic and cytostatic medicines.	Must be disposed by high temperature incineration	
Medicine contaminated infectious clinical waste, 18 01 03* and 18 01 09	Yellow bag or yellow container	Waste in the treatment of infectious patients consisting of bag, tubing and chemically contaminated waste. Sharps should be disposed in appropriate containers	Must be disposed by high temperature incineration	
Medicine waste, 18 01 09		Non-cytotoxic, non-cytostatic waste medicines	EPR scheme if available to recycle packaging or incineration	
Municipal solid waste and similar, 20 03 01 and others, e.g. WEEE	Black or clear bag for residual waste Similar identification system as those used for MSW separated fractions: e.g. blue for paper, green for glass etc.	Same categories as used for municipal waste	Recycling, EPRs, and other recovery operations. Incineration with energy recovery.	

(Example from the Department of Health of the UK)

TECHNIQUES PORTFOLIO

Enabling techniques (*out of the scope*)

- Waste management plans in hospitals and other heavy producers
- Traceability

Proposed Best Environmental Management practices:

- Integrated segregation and collection of wastes, including non-mandatory fractions and MSW-like waste
- Alternative treatments

Out of the scope:

- Prevention measures at source

5.2.1 INTEGRATED MEDICAL WASTE COLLECTION



5.2.1 DESCRIPTION

A best practice waste collection system for health-care waste is that achieving:

- Segregation of health-care waste (HCW) minimising the amount of waste leading to highest environmental impact treatment methods (landfill or high-temperature incineration).
- Training of all the personnel handling HCW and any other type of waste.
- Documentation of all the procedures, protocols and monitoring the performance, according to a similar standardised system to ISO 14000 or EMAS.

5.2.1 INDICATORS AND ENV. BENEFIT

Proposed indicator

- Percentage of MSW-like HCW generated that is selectively collected (%)
- Percentage of MSW-like HCW generated that is recycled (%)

Environmental benefit

- Avoidance of high-impact treatments and increase of recycling rates.
- An improved training of HCW handlers diverted 50% of waste from high temperature incineration to recycling in Opole, PL.

5.2.1 REMARKS

- Ensuring hygiene and infection control is a top priority. Environmental performance is a secondary priority.
- Less waste fuel would be supplied to the dedicated incinerator.
- Huge costs savings for WMO.
- Not applicable to small producers.
- Mercury amalgam needs to be segregated separately.

Information sought: Case studies, economics of segregation changes at contractor level

5.2.2 ALTERNATIVE TREATMENTS



5.2.2 DESCRIPTION

Alternative treatments constitute BEMP when the waste is rendered safe, e.g. by:

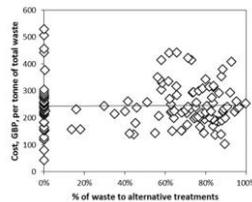
- For infectious waste: ability to reduce the number of infectious organisms in order to reduce risks of infection, the minimum level required is a Level III STAATT inactivation
- For anatomical waste: it should be destroyed in a way that it is no longer generally recognisable.
- For other HCW: it destroys the shape and form of syringes, needles and other sharps, so it becomes *unusable* and *unrecognisable*.
- For pharmaceuticals waste: destroy the component chemicals to a non-hazardous, non-polluting form.

5.2.2 INDICATORS AND ENV. BENEFIT

Proposed indicator

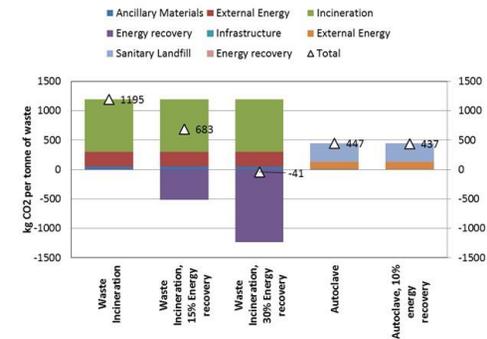
% of waste to alternative treatment

kg of waste to alternative treatment per bed per year or per m² per year (for healthcare organisations)



5.2.2 INDICATORS AND ENV. BENEFIT

Environmental benefit



5.2.2 REMARKS

- Many applications are not suitable for bulky and certain fractions of HCW.
- Diversion of waste from high temperature incineration creates trade-offs on the consumption of fossil fuel.
- Cost of alternative treatment is lower, but the overall impact does not show a better economic performance.
- The application of alternative treatments is not, per se, a best practice, but requires further assessment

Information sought: Case study examples, evidence of performance (oriented to set the limits to this BEMP)

MEDICAL WASTE

Proposed BEMPs
Integrated Management
Alternative Treatments

More ideas?

Kick-off Meeting of the Technical Working Group for the EMAS Sectoral Reference Document on BEST ENVIRONMENTAL MANAGEMENT PRACTICES FOR THE WASTE MANAGEMENT SECTOR

Leuven, 30 September – 1 October 2015

CROSS-CUTTING ISSUES



TECHNIQUES PORTFOLIO

Sub-chapter	Proposed BEMPs
2. Cross-cutting issues	2.3. Integrated waste management strategies
	2.4. Life cycle assessment of waste management options

2.3. BEST ENVIRONMENTAL MANAGEMENT PRACTICES FOR INTEGRATED WASTE MANAGEMENT STRATEGIES



2.3 DESCRIPTION

- Based on mass stream and life cycle thinking, define a short-term and long-term strategy for all the different waste streams in order to:
 - Increase prevention
 - Maximise recycling rates for all recyclable fractions
 - Minimise residual waste quantity
 - Maximise overall resource efficiency and minimise overall environmental burdens
- Design appropriate mix of different approaches, including technical, economic and psychological aspects.

2.3 INDICATORS AND ENV. BENEFIT

Proposed indicator

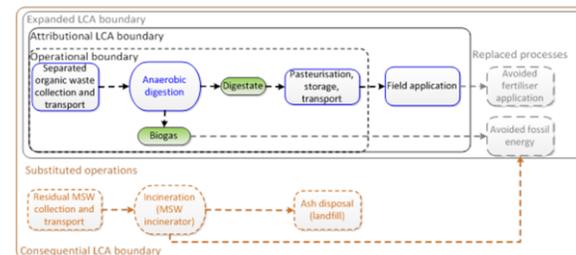
- Waste generation (kg/capita/yr)
- Residual waste generation (kg/capita/yr)
- Recycling rates for each waste stream (kg/capita/yr)

Environmental benefit

This BEMP will lead to considerable resource and environmental savings, as documented for BEMPs described subsequently throughout the document.

Information sought: Case study examples of overall waste strategy optimisation

2.4. LIFE CYCLE ASSESSMENT OF WASTE MANAGEMENT OPTIONS



2.4 DESCRIPTION

BZL e³

- Mass stream and life cycle thinking to determine strategies for each waste stream, to maximise resource and environmental efficiency
- Consider multiple, pertinent impact categories
- Appropriate functional units and expanded boundary approach to account for inter-system effects (and CLCA approach for indirect effects)
- Small WMOs: review of relevant studies to identify generic best practice options with best overall performance
- Large WMOs: bespoke LCA for complex waste streams where appropriate

2.4 INDICATORS AND ENV. BENEFIT

BZL e³

Proposed indicator

- Demonstrated life cycle evaluation (Y/N)
- Recycling rates for each waste stream (kg/capita/yr)
- LCIA indicators (e.g. kg CO₂e or MJe per tonne waste)

Environmental benefit

		Glass	Board	Wrapping paper	Dense plastic	Plastic film	Metals
Avoided	kg	920	1,600	1,510	3,320	2,630	12,000
Recycled	CO ₂ e/t	390	1,080	990	1,200	1,080	3,300

Source: WRAP (2011), Ecoinvent (2010).

Information sought: Case study examples

CROSS-CUTTING ISSUES

BZL e³

Proposed BEMPs

Integrated waste management strategies

Life cycle assessment of waste management options

More ideas?

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