Minutes of the second meeting of the technical working group for the development of an EMAS sectoral reference document for the waste management sector

Seville

28 - 29 March 2017

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Index

PREFACE

The European Commission's Joint Research Centre (JRC) is developing a **Best Practice Report** on best environmental management practice in the waste management sector. This document will describe practices that relevant stakeholders can implement in order to minimise their environmental impacts, as well as indicators that can be used to monitor the progress made and benchmarks of excellence corresponding to the performance of outstanding organisations.

The Best Practice Report will form the basis for the preparation by the European Commission of a **Sectoral Reference Document** (SRD) for the waste management sector. The development of these documents is part of the European Commission's work to implement the EU Eco-Management and Audit Scheme (EMAS) Regulation[1]. EMAS is a voluntary tool to promote continuous improvements in the environmental performance of organisations across all sectors of economic activity[2].

The Best Practice Reports and SRDs are developed in close collaboration with the stakeholders of the relevant sectors and under the guidance of a Technical Working Group (TWG) comprising experts from the sector. Further information on the SRDs and their development process can be found in the guidelines on the ***"Development of the EMAS Sectoral Reference Documents on Best Environmental Management Practice"*** [3].

SRDs 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.

For the waste management sector, the TWG was established during the year 2015 and a first meeting was organised in Leuven, in September 2015, in order to discuss the scope of the document and the proposed best environmental management practices (BEMPs). A summary of the outcome of that meeting is available on-line at: http://susproc.jrc.ec.europa.eu/activities/emas/documents/WasteManagement_TWG_KO_minutes.pdf. At the first meeting, BZL/E3, working as consultants to the JRC for this project, presented and collected feedback on a number of proposed BEMPs. These proposed BEMPs are described in a background report that was published in May 2016 and is also available on-line, at the following url: http://susproc.jrc.ec.europa.eu/activities/emas/documents/WasteManagementBackgroundReport.pdf.

After further work in identifying and refining the BEMPs by the JRC, based on the input of the TWG, a second meeting of the TWG was organised in Seville on 28 and 29 March 2017. The goal of the workshop was to steer the selection of indicators, related to the BEMPs identified and for the overall waste management sector, to be included

[1] The development of Sectoral Reference Documents is part of the implementation of the provisions of Article 46 of 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), OJ L 242/1, 22.12.2009, referred to as the "EMAS Regulation".
[2] For further information on EMAS, see: http://ec.europa.eu/environment/emas/index_en.htm
[3] http://susproc.jrc.ec.europa.eu/activities/emas/documents/DevelopmentSRD.pdf

in the Best Practice Report and subsequent SRD, as well as discussing how to set the benchmarks of excellence.

This document is a summary of the discussions held during this second meeting.

1. Background of the meeting

The agenda (Annex 1) and a support document (Annex 2) were circulated prior to the meeting. These minutes follow in terms of structure the items in the agenda and summarise the presentations given in the introductory sessions and the outcome of all the technical discussions. A copy of the presentations is given in Annex 3 to these minutes.

After a tour-de-table during which all participants briefly introduced themselves (see list of participants in Annex 4), the JRC introduced the aim of the meeting and the operational procedures followed by an overview of the development of EMAS Sectoral Reference Documents (SRDs), of the EMAS regulation and of the aim and content of the EMAS SRDs.

It was highlighted that the EMAS SRDs aim at helping organisations to improve their environmental performance, independently from the starting point and their (if any) environmental management systems (EMAS verified/ISO14001 certified or not). The main element of the EMAS SRDs is the best environmental management practices (BEMPs), i.e. techniques leading to remarkable environmental performance, which are identified studying the actions implemented by frontrunners. In order to explain the approach used for the description of the BEMPs, two examples from previous EMAS SRDs were presented (respectively on food waste management by food retailers and CO_2 recovery by beer manufacturers). For each best practice, the economic viability and the applicability conditions are essential to understand the replicability of the technique. For each BEMP, one or more *environmental performance indicators* and, where possible, *benchmarks of excellence* are also identified. The benchmark of excellence is the environmental performance achieved by frontrunners and should not be used by organisations as a target but as an inspirational value or a measure of what is possible under certain stated conditions.

Some examples of environmental performance indicators and related benchmarks of excellence were given, namely for the energy performance of retailers and for public lighting. However, not all indicators need a benchmark or can be benchmarked, and there are both quantitative benchmarks (e.g. based on a quantitative distribution of an indicator) and more qualitative benchmarks (e.g. based on the degree of implementation of a certain practice).

The role of the technical working group is key for the validation of the BEMPs, the indicators and the benchmarks, while keeping a practical view for the stakeholders' perspective.

Specifically for the EMAS SRD for the waste management sector, the JRC highlighted that it deals with the implementation of best practices by waste management companies and local waste authorities (not by national governments) and keeps a very practical view, so there is no overlapping with other discussions on waste definition and recycling targets at EU level. Therefore, issues such as the definition of municipal solid waste or the definition and methodology for the calculation of the

recycling target currently discussed in other fora for the revision of the Waste Framework Directive, are considered out of the scope of the present work and of the discussions at the meeting.

During this session, a comment was made on the usability of indicators and benchmarks; while these can be employed as internal reference for organisations, standardisation of methodologies for their calculation would be needed in order to use them for comparability across the sector. However, such standardisation does not currently exist in Europe. The JRC explained that the best practice report will include a specific chapter on common indicators for municipal solid waste and it will present how these indicators are currently calculated and what they can be used for. However, it will not propose new methodologies but rather describe the existing methodologies.

2. Scope and structure of the EMAS Sectoral Reference Document (SRD) for the waste management sector

During this session, the scope of the EMAS SRD for the waste management sector was explained in terms of type of organisations, waste streams and activities covered[4].

It was highlighted that there are already a number of regulations and instruments at European level targeting the waste management sector and its activities (e.g. landfill Directive, Industrial Emission Directive). The development of the EMAS SRD for the waste management sector aims at avoiding overlaps by focusing on those areas of the waste hierarchy (e.g. waste prevention, re-use, setting of the overall waste management strategy) which are less addressed by the other instruments. In light of this, best environmental management practices have been identified for:

- Establishing a waste management strategy (i.e. the planning of the overall system);
- Waste prevention (i.e. reducing the amount of waste generated);
- Waste collection (type of collection, vehicles/technology used, etc.);
- Operation of Extended Producers Responsibility (EPR) schemes;
- Waste treatment facilities not covered in the waste treatment BREF such as facilities performing treatments outside the scope of the Industrial Emissions Directive (IED)[5] (e.g. sorting facilities with the aim to recycle plastics).

For those areas of waste management already covered by other regulations and instruments at European level (e.g. for areas covered by the Best Available Technique (BAT) Reference Document (BREF) for the Waste Treatment Industries), the final best practice report and EMAS SRD will not describe BEMPs but refer to the relevant guidance, in terms of best available techniques. In this way, the best practice report and EMAS SRD will cover comprehensively the waste hierarchy and the waste management sector.

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[4] The scope of the document is explained in further detail in the background report available at: http://susproc.jrc.ec.europa.eu/activities/emas/documents/WasteManagementBackgroundReport.pdf

[5] Directive 2010/75/EU on industrial emissions, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0075

A suggestion from the TWG was to include cost indicators and social indicators in relevant BEMPs, e.g. jobs creation, social inclusion. Although important, the JRC explained that the exercise of developing EMAS SRDs focuses on the environmental performance and therefore strictly social aspects cannot be addressed directly; however, in the description, applicability and economics sections of the BEMPs, some indications on social aspects can be provided. As far as costs are considered, this aspect is not dealt with in indicators (those are "environmental performance indicators") but in the economics section of each BEMP. For municipal solid waste management, there is also a specific BEMP on cost benchmarking. TWG members are invited to provide inputs and comments with regards to the inclusion of both cost information and social aspects in the appropriate section when the next draft of the best practice report is shared.

3. State of play and meeting objectives

The development of the EMAS SRD for the waste management sector started in 2015 when a draft background report (presenting a number of proposed BEMPs) was produced and the technical working group was established and met for the kick-off meeting (September 2015). The work will lead, by the end of 2017, to a best practice report, which will be the basis for the production of the official EMAS SRD. After this second meeting, the technical working group will have further chances to provide comments and feedback on all elements before the final release of the best practice report. The adoption of the EMAS SRD for the waste management sector is expected over the course of 2018.

After a first phase of this project that focused on identifying and describing best practices, this second meeting of the technical working group marked the start of the second phase, dedicated to the identification of environmental performance indicators and benchmarks of excellence. The concrete objectives of the actual meeting were threefold:

1. discussing and agreeing a set of "common environmental performance indicators" for the monitoring of the performance of a municipal solid waste management system (see section 4 for further details);
2. discussing and agreeing a number of BEMP-specific environmental performance indicators (see section 8) for each of the BEMPs identified;
3. discussing the steps for identifying suitable benchmarks of excellence (see section 9).

4. Measuring the performance of municipal solid waste management

In most EMAS SRDs, environmental performance indicators are identified for each BEMP as those metrics that best assess the environmental performance of the specific environmental aspect addressed by the BEMP. However, in the case of the document for the waste management sector, given the nature of the BEMPs identified in the area of municipal solid waste management and their tight interrelation, the most important indicators for each of the BEMPs can be used for most of the BEMPs on the management of MSW (e.g. the BEMPs on setting the strategy, on waste prevention, on collection all need to be monitored with indicators on how much waste is produced and

reused or recycled rather than disposed). This had become apparent already during the discussions at the kick-off meeting. Therefore, the JRC proposed to adopt an approach, which defines a set of common indicators for municipal solid waste (MSW) management, in addition to the specific indicators (BEMP-specific) to monitor the implementation of each BEMP.

The JRC asked the group of experts to contribute to the identification of both types of indicators (common MSW indicators and BEMP-specific indicators) in the following manner:

For the identification of BEMP-specific indicators, there were 26 posters on the walls of the room (one per each BEMP) with a number of initial proposals of indicators, where the experts attending the meeting could provide feedback in writing (with the help of post-its), or express support or disagreement (by putting green or red stickers) on any proposal. On the same posters, they could also provide feedback on the concept of the BEMPs, although these already took into account the feedback collected from the group at the kick-off meeting and during further bilateral exchanges. After several opportunities for all participants to provide their feedback in this way, a specific session (in Day 2) allowed harnessing the results and discussing with the whole group any outstanding point (see section 8).

For the common MSW indicators, instead, a specific session to discuss in breakdown groups was organised. The group was split into four sub-groups which would all visit sequentially four discussion tables, each dedicated to discussing a specific topic:

- Discussion table 1 dealt with quantity-based indicators, i.e. those indicators reflecting a total amount of waste (i.e. non-fraction specific) divided by a normalising factor, such as population and year, population equivalent, area, etc.
- Discussion tables 2, 3 and 4 focussed instead on indicators, called performance-based indicators, defined as percentages, e.g. capture rates, concerning specific waste fractions. Each discussion table addressed one or a few specific material fractions: table 2 discussed about co-mingled packaging, plastics and paper; table 3 discussed about waste glass and textiles, and table 4 discussed about bio-waste and waste cooking oil.

The objectives of the parallel group discussions were to get information, discuss strengths and limitations, elaborate proposals of indicators and test the acceptability of the approach for their identification.

There was some discussion before starting the parallel sessions on how the time dimension is taken into account in the definition of the indicators. The JRC explained that indicators should reflect an absolute measure of the environmental performance of the organisation, whose change can be measured over time.

The importance of normalisation factors was highlighted and a TWG member proposed the use of non-conventional normalisation factors, such as area and population density. However, these are currently used only in research projects while a key criterion when defining environmental performance indicators is their actual use in real case examples.

It was stressed that indicators monitoring the efficiency of the separate waste collection are of essential importance.

5. Presentations by TWG members

Before digging into the discussions on the indicators, three TWG members shared their experience with indicators for monitoring waste management systems and the challenges faced in this area. The presentations were a useful input to the discussions held over the rest of the meeting. A summary of the presentation is provided below and the hand-outs can be found in Annex 3.

5.1. BiPro

Marie Dollhofer from BiPro presented an overview and some lessons learned from a study on the performance of separate MSW collection, focussed on metal, plastic, glass, paper and biowaste in 28 EU capitals that BiPro carried out for the European Commission.

Some key challenges faced in that study that would also be relevant for the setting of indicators and benchmarks for this project are: the uncertainties on what is actually included in municipal solid waste in the data for different cities (e.g. the extent to which commercial waste is included), which makes any quantity based indicator difficult to compare; the lack of composition analysis data for the waste collected as mixed waste, which would allow calculating capture rates.

5.2. ACR+

Jean-Benoît Bel from ACR+ gave a presentation on the monitoring of municipal waste management system based on the experience of the many municipalities that are members of ACR+ as well as on the European project 'Regions for Recycling' (R4R).

One of the aspects addressed was how that project dealt with defining an indicator that would be within the remit of a municipality but, at the same time, meaningful in terms of describing the progress made towards more sustainable waste management. The project proposed an indicator on “destination recycling”, which accounts for all the waste that a municipality send to a recycling facility (considering that what actually gets recycled is out of their remit).

The presentation also highlighted the complexity of waste monitoring (and some of the key challenges), and a number of waste management companies (LIPOR (PT), SINOE (FR), ARC (ES)) which have good monitoring practices and public data reporting.

5.3. LIPOR

Susana Lopes, who gave a presentation on the current monitoring of waste management practices in her region, represented LIPOR, the entity in charge for the management, collection and treatment of the MSW produced by eight municipalities in Portugal.

The main conclusion of Susana's presentation was the importance of ambitious and innovative waste management strategies and waste indicators that contribute to raise public awareness.

6. Parallel sessions

Divided into four groups, the member of the technical working group rotated to each of four discussion tables until the end of day 1. A JRC moderator, at each of the

discussion tables, captured the feedback and helped each subsequent group to build on the previous discussion and advance on the understanding of the challenges and elaboration of proposals. A summary of the findings were then given to the whole group at the beginning of day 2 (see section 7).

7. Outcome of the parallel sessions

7.1. Quantity-based indicators

The following indicators were agreed:

- **Total MSW generation per population equivalent and per year [kg/p.e./year]**. The term "population equivalent" refers to the number of inhabitants corrected by the number of non-permanent stays. For instance, municipalities with high tourist presence can calculate population equivalent data be based on the number of guest-nights spent by tourists in their territories. Municipalities whose waste generation is not significantly influenced by e.g. tourists or commuters can simply report the number of inhabitants.
- **Total household waste generation per population equivalent and per year [kg/p.e./year]**. This is the same of the first indicator but it excludes the waste from commercial activities that is considered part of MSW. The shares of household waste and commercial waste in MSW can be known (e.g. if collected separately) or estimated.
- **Mixed waste (plus rejects from waste sorting plants minus dry recyclables from MBT[6] sent for recycling) per population equivalent and year [kg/p.e./year].** This indicator reflects the amount of waste that is not sent for recycling because not separately collected (or discarded from a separately collected fraction). If MBT is used, the dry recyclables sent to recycling from MBT can be deducted because although not separately collected these are sent for recycling. This indicator can be calculated both for total municipal solid waste and for household waste only, depending on available data.
- **Waste sent to either energy recovery or disposal per population equivalent and year [kg/p.e./year]**. Disposal refers to incineration without energy recovery or landfill. This indicator can be calculated both for total municipal solid waste and for household waste only.
- **Amount of waste sent to disposal per population equivalent and year [kg/p.e./year].** Disposal refers to incineration without energy recovery or landfill. This indicator can be calculated both for total municipal solid waste and for household waste only.

The following limitations or framework conditions were identified in relation to these indicators:

[6] Mechanical biological treatment (MBT)

- When reporting on these quantity-based indicators, a municipality needs to clearly state what they include in the MSW data reported: they should explain whether WEEE, bulky waste, waste sent to preparation for reuse, etc. are excluded or included.
- The presence of a deposit refund scheme (DRS) for some types of waste (e.g. drink bottles) or a significant penetration of home composting also needs to be reported alongside the data because these are, among others, circumstances to be considered when interpreting the results of quantity-based indicators.
- The methodology used for calculating or estimating the amount of household waste (out of the total MSW) should be well defined and the reporting should specify if it is based on actual measurement, surveys, or other types of estimations.
- For the third quantity-based indicator agreed (see list above), rejects (from sorting plants) should be added to mixed waste, but data at local level may not be available (e.g. because the sorting plant may be owned by a different actor and/or treat waste from several sources). The same data availability issue may apply to the amount of dry recyclables recovered by MBT.
- The water content of the waste can have a significant impact on its weight and, thus, influences all of the quantity-based indicators identified. It is thus useful to also report the level of humidity of the waste, especially for the indicator on waste sent to energy recovery or disposal.
- It is very important to consider the context when interpreting the results of quantity-based indicators, such as average income of the population, population density, type of local economy, urban/rural environment, and other socio/economic factors. This is not only important when comparing data from different municipalities but also when analysing changes in the indicators over time, as they may be due to socio-economic changes.

  Action: Michele to send info on a methodology for the calculation of population equivalent.

7.2. Performance-based indicators for paper, metals and plastics

Two main indicators were agreed as the most useful and relevant for paper, metals and plastics, as well as collection of co-mingled packaging waste: capture rate and impurity rate.

Capture rate is a dimensionless indicator that is calculated as the quantity (tonnes) of each separately collected waste fraction divided by the total amount of waste of that same type generated. The calculation of capture rates for different waste fractions requires the systematic collection not only of the amount of separately collected waste but also of the composition of the waste collected as mixed waste. The following aspects need to be taken into account:

- Availability of waste sampling (i.e. composition analysis) data and costs of sampling;
- The total amount of waste of a certain fraction generated can be calculated by means of mass balances summing the amount that is separately collected and the amount that is found in mixed waste; however, some

waste may not be accounted, if not delivered or removed from this collection channel (e.g. collected by scavengers);
- If data allowing the calculation of indicators broken down per individual material fractions that are collected as comingled recyclables are not available, the capture rate can be calculated for the overall comingled fraction rather than by individual fraction.

Impurity rate (%): it represents the share of non-target material present in the separately collected waste stream. The following considerations were made during the discussions:

- Data is available, as it is an indicator used for commercial purposes related to the payments of the delivered fraction to the sorting/recycling facility. However, it may not always be available to the local authority and may require including an ad-hoc clause in the contract with the waste management company.
- What constitutes best practice is the use of this indicator to drive improvements in the separate collection.
- Expected impurities levels are different depending if fractions are collected as individual fractions or comingled.

By combining the two main indicators above, it is possible to define also a net capture rate.

Net capture rate: this is a dimensionless indicator, calculated for each waste fraction separately collected, by multiplying the *quality of the separately collected* fraction (100% minus the impurity rate) by the amount of each waste fraction collected and divided by the total amount generated of each waste fraction.

In addition to the above listed indicators, two additional topics were also discussed (to be taken into account in the relevant BEMPs):

- LCA approach: from the environmental point of view, some information on the final destination of waste could determine LCA-based environmental impacts.
- Proximity: the level of impurities in the collected waste depends on the collection method and the distance a household needs to cover to deliver the waste.

Some members of the TWG highlighted that, although data exist in some cases for the calculation of the capture rate, composition analysis of mixed waste is not common practice. However, it is worth keeping these indicators because they are a useful tool for monitoring and evaluating the waste generation.

As per the analysis of impurities, these data are usually available due to the commercial interest of both the recycler and the municipality or waste management organisation. Including the impurity rate indicator can trigger more municipalities to actually use those figures (and analyse their change over time) to plan actions to improve the quality of the separate collection.

Action: Susana to send LIPOR data on cost and current practice on how to characterise separately collected waste.

Action: Michele to send information on costs of composition analysis.

The UK mandates quarterly monitoring of inputs and outputs (e.g. purity of the paper, glass, etc.) at sorting facilities, as there is an identified need for better data and better management and systematic monitoring.

Action: Dominic to provide links to these data.

The use of common standards is a prerequisite for the waste composition analysis or the quality parameters reported. Otherwise, it may happen that the results of two composition analyses differ because of the different methodology/standard followed, not because of the different waste composition. France and Portugal have quality standards. It happens that in some cases the standard for waste is incompatible with the standard of the recyclate.

Action: Jean-Benoît and Susana to send information on waste composition analysis methodology/standards respectively in France and Portugal.

Action: Davide to send info on the state of the art study on composition analysis carried out by his university (in Denmark).

7.3. Performance-based indicators for glass and used textiles.

For waste glass, the capture rate and the impurity rate, as defined in the previous section, were agreed as the most useful indicators.

It was also proposed that an indication of the **presence of a deposit refund scheme for refillable bottles (y/n)** is needed, in complement to the two indicators above, because of its very significant influence on the results obtained.

For glass, a comment was made on the seasonality character of the generation in tourist locations. However, it depends on the tourism management model (e.g. waste generated in hotels is often not accounted for in MSW, e.g. in Barcelona). However, in most cases, the impact of tourists is not as relevant as that from residents and commuters.

Action: Jean-Benoît to share information on seasonal waste quantities and compositions in tourist locations.

For waste textiles, the amount of textiles separately collected (e.g. in kg/pers/year) by the collection scheme established by the local authority was agreed as indicator. This would include both used textiles sent to reuse and waste textile sent to either preparation for reuse or recycling, because the difference between used textiles sent to reuse and waste textile sent to preparation for reuse is often unclear.

Moreover, it was agreed that the **share (%) of textiles in mixed waste** is also a relevant indicator that can be used alone for monitoring this waste stream. In fact this metric allows assessing how much waste and used textiles do not follow a correct route (to recycling or reuse) and are disposed of in the mixed waste. Local authorities should work with the aim of reducing as much as possible waste textiles in mixed waste. However, this indicator is also influenced by the presence of other fractions in mixed waste (i.e. the more other fractions are separated out of mixed waste, the higher this share would be, for a constant amount of textiles).

Capture rate for waste textiles is a best practice indicator. Even if its calculation may be complicated, local authorities able to monitor the amount of waste textiles separately collected and the amount in the mixed waste (through composition analysis) can calculate the capture rate.

The TWG highlighted that a significant share of the reuse of textiles may happen also outside of the control of the municipality and/or waste management company. For instance, charities or second-hand shops may collect used textiles and process them for reuse. Therefore the indicators given above would not provide a comprehensive picture of textiles reuse in the local area.

7.4. Performance-based indicators for biowaste and cooking oil

The ***amount of biowaste per capita and year in mixed waste***, differentiated between **garden and food waste**, was agreed as common indicator. However, it was highlighted that there is no standardised approach for the definition of these two fractions.

Regarding the assessment of the quality of biowaste, the ***impurity rate*** is a suitable indicator. However it is important defining what these impurities consist of, and differentiate them for kitchen and garden waste.

Another proposed indicator was the share or quantities of produced compost and digestates of different grades, based on the monitoring of the quality of the products made from the biowaste. However, this indicator is highly dependent on the specific situation and there were questions on whether the indicator is operational. It was therefore decided that this indicator would not be included in the common indicator set.

Finally, it was proposed as indicator for biowaste the share or quantity of decentralised/home composted biowaste (which can be calculated or estimated). If decentralised/home composting is accounted for, it would also be possible to define the capture rate for biowaste, which is considered an ideal indicator. However, it would be too difficult to calculate in general and figures may not be reliable.

Regarding cooking oil, there is limited experience with indicators to monitor the performance of separate collection of this waste fractions. Moreover, in some parts of Europe, this is not considered a problem because of small quantities. Given its relevant impact on wastewater (if cooking oil is disposed of with wastewater), however, the indicator 'presence of separate collection of waste cooking oil (y/n)' would be suitable but rather in a specific BEMP than as a common indicator.

Action: Susana to share information on LIPOR cooking oil management.

8. Specific indicators for individual BEMPs

The BEMP-specific indicators are those environmental performance indicators useful to assess the environmental performance in relation to the aspect addressed by an individual BEMP rather than to the whole waste management system. For their identification, 26 posters, one per BEMP, were put on a wall of the room during the whole meeting. Each poster included a short description of the BEMP, its applicability, a list of organisations having implemented such BEMP and a number of proposals for

BEMP-specific indicators, based on the research work carried out so far. In several opportunities during the meeting, the TWG members provided feedback and further proposals of indicators on the posters: in writing with the help of post-its, or by expressing support or disagreement with green and red stickers.

During the second day of the meeting, a session was dedicated to taking stock of all the inputs and feedback collected through the posters (considering agreed those indicators for which significant support was expressed with no major disagreements) and discuss with the whole group any outstanding point. The following sub-sections (8.1 to 8.9) summarise, BEMP by BEMP, the indicators agreed as well as the main discussion points.

8.1. Cross-cutting BEMPs

8.1.1. BEMP 3.3.1: Integrated waste management strategy

The TWG agreed the following indicators:

- Overall targets for the improvement of the waste management system (e.g. based on the common indicators defined in this work) are in place (y/n).
- Specific targets for waste prevention and reuse are in place (y/n).

The following points need to be taken into account:

- The spatial density of the waste generation (e.g. tonne/km^2) is an operational parameter to be considered when setting a strategy.
- The level of taxes on landfill and incineration (which are usually set at higher level than our target group) should be mentioned as important framework conditions for the definition of the strategy.
- It would be more appropriate to show the waste hierarchy pyramid with the opposite shape (i.e. largest line for prevention at the top, smallest for disposal at the bottom).

8.1.2. BEMP 3.3.2: Life cycle assessment of waste management options

The TWG agreed the following indicator:

- Systematic application of life-cycle thinking, and, where necessary, undertaking of life cycle assessments, throughout waste management strategy design and implementation (y/n).

8.1.3. BEMP 3.3.3: Economic instruments

The TWG agreed the following indicators:

- Use of economic instruments at local level to stimulate good behaviour (y/n).
- Share of residents/businesses using a voluntary economic instrument (%).

8.2. Municipal solid waste - strategy BEMPs

8.2.1. BEMP 4.5.1: Cost benchmarking

The TWG agreed the following indicators:

- Regular participation in a detailed cost benchmarking study (y/n).

- Total MSW management cost per inhabitant per year (€/pers/year).

A TWG member proposed to relate cost to households rather than person. This would make sense in door-to-door collection systems but calculating cost per household, despite being common in the UK, is rarely used in other EU countries. Moreover, the number of households is calculated differently in different countries and the available data may not always be suitable.

8.2.2. BEMP 4.5.2: Improved waste monitoring

It was suggested that this BEMP be further developed to include:

- the important aspect, for a local authority, of being able to track waste streams all along their presence in the waste management system and even further (e.g. when used as recycled or reused materials and items);
- the use of web-based tools to communicate to citizens the details of their waste generation in order to raise awareness and improve waste prevention and better separation at the source.

The TWG agreed the following indicators:

- Use of web-based tools for tracking and reporting waste data (y/n).
- Frequency of composition analysis of mixed waste (number of months or years).

Action: Magnus and Francesco will share information on traceability systems which inform users on their waste generation without necessarily having a PAYT system.

8.2.3. BEMP 4.5.3: Pay as you throw

It was suggested that this BEMP be further developed to include:

- Importance of finding the right balance between variable (unit rate) and fixed fees. Local authorities aim at revenue stability, thus high fixed fees, but it is the variable fees (unit rate) that lead to behavioural change. Economic balance should also be sought by covering as much as possible residual waste management costs by PAYT revenues.
- Importance of covering with the PAYT system all the waste generated, including waste conferred to civic amenity sites.
- The aspect of the risk of waste leakages from the system (waste going to nearby municipalities without PAYT, illegal dumping, etc.). Local authorities should monitor the leaked waste. For instance, a serious analysis of users with zero waste generation in the PAYT system helps identify those residents disposing of their waste through alternative channels (which could include illegal dumping), so corrective actions can be implemented.
- A PAYT system may lead to higher levels of impurities in fractions (e.g. recyclables) that can be collected for free or are cheaper than mixed waste.

The TWG agreed the following indicators:

- Inclusion of waste conferred to civic amenity sites in the PAYT system (y/n).
- Share of users with zero waste generation (%).

8.2.4. BEMP 4.5.4: Performance-based waste management contracting

It was suggested that traceability and transparency of data as well as the need for independent monitoring are key aspects to be included in this BEMP.

The TWG agreed the following indicators:

- Share of the contract value depending on the achievements of the environmental objectives / environmental performance levels (%).
- Customer satisfaction (% of residents satisfied with household waste collection and specifically with the collection of the separately collected fractions).

8.2.5. BEMP 4.5.5: Awareness raising

It was suggested to develop further the BEMP in the aspect of monitoring awareness raising:

- The BEMP can explain the four different levels at which awareness raising can be measured: number of people reached by the awareness raising campaign (e.g. who received a leaflet), number of people that read it, number of people that understood it and number of people who took action.
- This forth level (i.e. number of people taking action) is the ultimate aim of any awareness raising action and it should also result in changes in the relevant common indicators. However, it may be difficult to attribute the change in an indicator solely to the effect of a certain awareness raising action.

The TWG agreed the following indicators:

- Budget spent on awareness raising (EUR per capita).
- Share of total MSW management budget spent on awareness raising (%)
- Share of population in the waste management catchment area having received awareness raising messages over a given time period (e.g. % population per month).

8.2.6. BEMP 4.5.6: Establishing a network of waste advisers

It was suggested to develop further the BEMP in the aspect of commercial waste (where relevant).

The TWG agreed the following indicators:

- Share of population in the waste management catchment area having contact with waste advisers over a given time period (e.g. % population per month).
- Number of waste advisers per 100,000 inhabitants.

8.2.7. BEMP 4.5.7: Home and community composting

The following points need to be considered in the finalisation of the text of the BEMP:

- It was recommended to change the title of the BEMP from 'decentralised composting' to 'home and community composting' (already reflected in the title above).
- The section on the applicability of the BEMP should cross-reference the BEMPs on LCA and strategy setting, in respect to the choice of the most appropriate waste management for biowaste (i.e. AD, centralised composting, home and community composting).
- The need to include the dimension of monitoring the quality of compost output was also highlighted.

The TWG agreed the following indicators:

- Share of population doing home compositing or to which community composting is available (% out of total population in waste management catchment area).
- Share of population implementing correctly home/community composting, on the basis of an annual visit and analysis of the compost produced (% out of total population doing home composting or to which community composting is available).
- System in place for the regular follow up with residents doing home composting (y/n).
- Share of home composters visited annually (% of annual visits out of total population doing home or community composting).

Note: The mass of organic waste diverted from landfill and incineration thanks to home and community composting was considered a useful indicator, but was not retained because too difficult to calculate.

8.3. Municipal solid waste – BEMPs on waste Prevention

8.3.1. BEMP 4.6.1: Local waste prevention programmes

The relation and mutual boundaries between this BEMP and the next one needs to be stated clearly.

The TWG agreed the following indicators:

- Establishment of a local waste prevention plan, including targets and provisions for regular monitoring (y/n).
- Budget dedicated to waste prevention programmes (EUR per capita).
- Share of total MSW management budget devoted to waste prevention (%).
- Number of stakeholders involved in prevention programmes.

8.4. BEMP 4.6.2: Product re-use schemes

The scope of this BEMP needs to be broaden to explicitly cover both product reuse and waste preparation for reuse because the boundary between the two activities is actually rather blurred and the same activity may be classified as either one or the other in different contexts.

The TWG agreed the following indicator:

- Number of re-use centres / community repair points per inhabitant.

No indicator on the quantity of used products and waste reused could be agreed because these operations are carried out by a variety of different actors and consolidated data is very difficult, if at all possible, to obtain. However, a TWG member highlighted that reuse and prevention network centres can be accredited based on Annex IV to the Waste Framework Directive and their output can be monitored regardless of whether the input is classified as waste or product. If such system is in place, the total quantity of used products and waste reused can be known. Given that this is not yet widespread, this element can be rather included as an element of the BEMP rather than as an indicator.

- **Action:** Berthold to send info on how his organisation accounts the output materials from reuse centres on the basis of such accreditation scheme.
- **Action:** Jean-Benoît to send info on the Flemish system to account the reuse of products in terms of reused units, and not mass reused.

8.5. Municipal solid waste – BEMPs for waste collection

8.5.1. BEMP 4.7.5: Waste collection strategy

The TWG agreed the following indicators:

- Participation rate, i.e. the share of population using the system; data is usually available, based on estimations, surveys, how often the bin for recyclables is left outside for collection, etc.
- Customer satisfaction (% of residents satisfied with household waste collection and specifically with the collection of the separately collected fractions).
- Collection on demand of bulky waste (y/n).

Other important parameters, such as waste collection frequency (per fraction), average distance between user and collection point (per fraction) and number of collection points (per fraction), are not considered environmental performance indicators, but rather operational parameters to be mentioned in the text of the BEMP.

8.5.2. BEMP 4.7.6: Inter-municipal cooperation among small municipalities

No specific environmental performance indicator was agreed for this BEMP. If an indicator is needed, it could be simply: implementation of inter-municipal cooperation with other municipalities (y/n).

8.5.3. BEMP 4.7.7: Civic amenity sites

The BEMP needs to deal more explicitly also with mobile civic amenity sites, visiting different locations at regular intervals.

The TWG agreed the following indicators:

- Number of civic amenity sites per 100,000 inhabitants.
- Presence of at least a civic amenity site (including regular periodical presence of a mobile one) in the local authority, if it has at least 1,000 inhabitants.
- Number of different fractions collected at the civic amenity sites.
- Availability of products/materials exchange areas aimed at fostering reuse in civic amenity sites (y/n).

8.5.4. BEMP 4.7.8: Logistics optimisation for waste collection

It was suggested that the BEMP could also include the element of different coloured bags for different waste streams which could be optically sorted when collected by the same waste collection vehicle. This measure allows optimising the number of routes, reducing them.

The TWG agreed the following indicators:

- Fuel consumption per tonne of waste collected. *
- GHG emissions per tonne of waste and km ($kgCO_2e/tkm$).

*: depending on the waste collection system in place (e.g. vehicles and/or pneumatic collection, type of vehicles) and the data available, more useful alternatives to this indicator can be: Primary energy consumption per tonne of waste collected, cumulative energy demand per tonne of waste collected, GHG emissions per tonne of waste collected.

8.5.5. BEMP 4.7.9: Low emission vehicles

The TWG agreed the following indicators:

- Average fuel consumption of the waste collection vehicles (litres/100km).
- Share of vehicles that are Euro 6 in the total waste collection vehicles fleet (%).
- Share of waste collection vehicles that are hybrid, electric, natural gas or biogas powered (%).

8.6. Municipal solid waste – BEMPs for extended product responsibility schemes

8.6.1. BEMP 4.8.1: Best use of incentives by PROs

This is perhaps the only BEMP that goes beyond the local level, because Producer Resonsability Organisations (PROs) are usually operating at national level. It was just decided to define indicators at both levels.

The TWG agreed the following indicators at the national level (for the overall operations managed by the PRO):

- Recycling rate (waste that is actually recycled out of the total waste collected under the EPR scheme).

- Preparation for reuse rate (waste that is delivered as inputs to a preparation for reuse centre out of the total waste collected under the EPR scheme).

The TWG agreed the following indicators at the local level (for a specific local area where the EPR scheme is in place):

- Share of EPR covered products found in residual waste based on composition analysis (% of the total quantity of residual waste).
- (For packaging PROs:) Share of EPR covered packaging that is targeted by the local selective separate collection system (% of the total quantity of EPR covered packaging put on the market).

The following indicator was also proposed but would require further research to refine its formulation:

- Extent of differentiation of the producers' fees on the basis of the ease of recycling (or reuse/preparation for reuse)

8.7. Municipal solid waste – BEMPs on waste treatment

8.7.1. BEMP 4.9.1: Sorting of co-mingled light packaging waste to maximise recycling yields for high quality output

The TWG agreed the following indicators:

- Plant sorting rate (weight %), calculated as annual quantity of materials sent to recycling divided by the annual quantity of co-mingled packaging processed. This indicator can be calculated for the overall co-mingled packaging waste as well as by individual output stream.
- Energy efficiency (kJ/t), calculated as annual total energy consumption of the plant divided by quantity of co-mingled packaging processed.
- GHG emissions (tCO_2e/t), calculated as annual total CO_2 equivalent emissions of the plant divided by quantity of co-mingled packaging processed.
- Water use (m^3/t), calculated as annual total water consumption divided by quantity of co-mingled packaging processed.

8.7.2. BEMP 4.9.2: Sorting of collected mixed plastics to maximise recycling yields for high quality output

The TWG agreed the following indicators:

- Plant sorting rate (weight %), calculated as annual quantity of materials sent to recycling divided by the annual quantity of mixed plastic packaging processed. This indicator can be calculated for the overall mixed plastic packaging waste as well as by individual output stream.
- Energy efficiency (kJ/t), calculated as annual total energy consumption of the plant divided by quantity of mixed plastic packaging processed.
- GHG emissions (tCO_2e/t), calculated as annual total CO_2 equivalent emissions of the plant divided by quantity of mixed plastic packaging processed.

- Water use (m^3/t), calculated as annual total water consumption divided by quantity of mixed plastic packaging processed.

8.7.3. BEMP 4.9.3: Treatment of mattresses for improved recycling of materials

The TWG agreed the following indicators:

- Plant sorting rate (weight %), calculated as annual quantity of materials sent to recycling divided by the annual quantity of mattresses processed.
- Energy efficiency (kJ/t), calculated as annual total energy consumption of the plant divided by quantity of mattresses processed.
- GHG emissions (tCO_2e/t), calculated as annual total CO_2 equivalent emissions of the plant divided by quantity of mattresses processed.

8.7.4. BEMP 4.9.4: Treatment of absorbent hygiene products (AHP) for improved recycling of materials

The TWG agreed the following indicators:

- Plant sorting rate (weight %), calculated as annual quantity of materials sent to recycling divided by the annual quantity of AHP waste processed.
- Energy efficiency (kJ/t), calculated as annual total energy consumption of the plant divided by quantity of AHP waste processed.
- GHG emissions (tCO_2e/t), calculated as annual total CO_2 equivalent emissions of the plant divided by quantity of AHP waste processed.
- Water use (m^3/t), calculated as annual total water consumption divided by quantity of AHP waste processed.

8.8. BEMPs for construction and demolition waste (CDW)

8.8.1. BEMP 5.3.1: Integrated CDW plans

The TWG agreed the following indicators:

- Percentage of total generated CDW that is correctly segregated and managed towards material recycling, re-use or other valorisation (%).
- Provision for pre-demolition audits aimed at preparation for reuse (y/n).

8.8.2. BEMP 5.3.2: Quality assurance schemes

The TWG agreed the following indicators:

- Share of impurities in CDW (%).
- Amount of recycled materials marketed (tonnes/year).
- Amount of recycled material sold from recycling plants under the quality assurance scheme in place (tonnes/year).
- Percentage of natural materials substituted by recycled aggregates (%).

The BEMP should stress that the produced recycled aggregates need to be actually used, in order to be accounted for as natural material substitutes.

8.8.3. BEMP 5.3.3: Improving the acceptability of recycled aggregates

The TWG agreed the following indicators:

- Percentage of total generated CDW that is correctly segregated and managed towards material recycling, re-use or other valorisation (%).
- Amount of recycled materials marketed (tonnes/year).
- Percentage of natural materials substituted by recycled aggregates (%).

8.8.4. BEMP 5.3.4: Improving source segregation and separate collection of waste plasterboard to foster recycling

The TWG agreed the following indicator:

- Waste plasterboard collection efficiency (% of plasterboard sent for recycling out of the total waste plasterboard generated)

8.8.5. BEMP 5.3.5: Management of PCB contaminated CDW

The TWG agreed the following indicator:

- Concentration of PCBs in CDW, according to the EN 15308:2008 standard, in weight (ng, µg or mg) per kg of CDW.

8.8.6. BEMP 5.3.6: Local schemes for proper management of waste asbestos removed by residents

The TWG agreed the following indicators:

- Number of collection points for asbestos waste per 100,000 inhabitants.
- Total amount of asbestos collected through the scheme, expressed in weight (tonnes) or surface (m2).
- Number of sealable bags for collection/disposal of asbestos distributed to residents.

8.9. BEMPs for Healthcare waste (HCW)

8.9.1. BEMP 6.3.1: Encouraging HCW segregation at healthcare institutions

When dealing with training sessions organised by HCW management companies, the BEMP should stress how these need to be differentiated according to the role of different categories of staff in the HCW institutions.

The TWG agreed the following indicators:

- Share of staff members of the client HCW institutions having undergone a training session about waste in the last 2 years (%).
- Percentage of correct answers given by staff members of the client HCW institutions in post-evaluation surveys about handling of waste in the HCW facility.
- Collection rates per fraction, per bed or per patient, according to the specific fractions collected in each HCW facility (kg/patient/day).

- Share of hazardous waste in the total waste generation of the HCW facility (%). The BEMP needs to explain that this indicator can be difficult to determine, because the hazardousness of the waste may be difficult to detect (e.g. contamination with blood or body fluids).

8.9.2. BEMP 6.3.2: HCW collection for citizens

The TWG agreed the following indicators:

- Number of collection points for home HCW per 10,000 inhabitants, by type (civic amenity sites, pharmacies, street containers).
- Number of individual boxes for home HCW distributed via collection points or on request.
- Quantity of home HCW collected (kg/inhabitant/year).
- Share of hazardous HCW waste (e.g. sharps) in mixed household waste (%).

8.9.3. BEMP 6.4.2: Selection of HCW alternative treatments

The TWG agreed the following indicators:

- Share of HCW managed by the HCW management company diverted to alternative treatments (%).
- Throughput of the alternative treatment plants (kg HCW per hour, day or cycle).
- Water consumption per kg of waste treated in the alternative treatment plants (l/kg); alternatively: amount of wastewater generated per kg of waste treated in the alternative treatment plants (l/kg).
- Wastewater from the alternative treatment plants treated and recovered (y/n).

Since regulations on the treatment of HCW in different EU Member States differ, further indicators on actual recycling of separated fractions could not be agreed.

9. Setting of benchmarks of excellence

In this last session, the TWG discussed on whether and how benchmarks of excellence could be set for this sector.

The JRC introduced this session clarifying that there is no need to set a benchmark of excellence for all the indicators identified. Only for indicators where relevant and reliable data are available, benchmarks of excellence will be agreed with the TWG.

It was also stressed that not all benchmarks need to be quantitative, although some good quantitative benchmarks can be very useful.

In the coming weeks and months, the JRC will evaluate the possibility to propose benchmarks of excellence for the different BEMP-specific and common indicators identified during this meeting.

The TWG highlighted that setting benchmarks of excellence would be particularly useful and relevant for some of the common indicators. All the proposed common

indicators were thus discussed one by one to select the most promising candidates to set benchmarks. For these candidates, the TWG committed to support the JRC in collecting data about the achievements of frontrunners throught the EU that can be the basis for setting a benchmarks.

Concerning the quantity-based indicators, the three indicators that were selected are:

- Total waste* generation per population equivalent and per year [kg/p.e./year]
- Waste* sent to either energy recovery or disposal per population equivalent and year [kg/p.e./year]
- Waste* sent to disposal per population equivalent and year [kg/p.e./year]

* the three indicators can become suitable benchmarks both for MSW and household waste only, depending on the data that will be available to set their value.

In terms of value for the benchmark MSW sent to either energy recovery or disposal per population and year, according to some TWG members, best performing municipalities currently reach values between 100 and 150 kg per inhabitant and year. Another proposal was 75 kg per inhabitant year, although the example of Treviso, with 53 kg per inhabitant year was highlighted as inspirational. It was also reported that all the Flemish municipalities are already below 150 kg per inhabitant year and the Netherlands has committed to achieve less than 120 kg per inhabitant year for the whole country by 2020. This discussion highlighted the need for a proper data collection and the setting of the benchmarks on actual data of European frontrunners.

The TWG also stressed that the text on the use of these benchmarks will need to explain that local authorities or waste management companies willing to compare their performance to these benchmarks would need to qualify them according to certain conditions, such as socioeconomic factors, context of waste generation (e.g. rural vs urban, dense vs disperse), etc.

Regarding performance-based indicators for specific fractions:

- The TWG supported trying to define benchmarks of excellence for the different capture rates for glass, paper, plastic (not only packaging, if possible) and metals.
- Concerning the impurity rates for the same fractions, it is expected that it may be more difficult to collect enough data, but it is worth trying, because the data should be available.
- For biowaste, both the amount of biowaste in mixed waste and the impurity rate for separetly collected biowaste could be suitable for setting benchmarks of excellence. However, the information collected needs to be qualified as far as destination treatment of biowaste (AD or composting) and moisture level are concerned. When collecting data, it is also important to clarify which fractions are included. As an example, the city of Barcelona carries out a good characterisation of biowaste collected 4 times per year in Barcelona. It was suggested to consult the methodology they use (e.g. green waste, food waste in door-to-door collection, in commercial waste).

In light of the discussions, the JRC will produce and circulate a table to the TWG for the collection of waste management data. All TWG members will be invited to provide data from their municipality/city/waste catchment area and/or frontrunner municipalities they know about. All the data collected will be processed by JRC and,

where feasible, benchmarks of excellence will be proposed for discussion and final agreement by the TWG.

10. Annexes

The following documents are available in Annexes:

Annex 1. Meeting agenda
Annex 2. Document supporting the agenda of the meeting
Annex 3. Presentations handouts
Annex 4. List of participants

European Commission

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

SEVILLA, 28 - 29 MARCH 2017

Joint Research Centre - Edificio Expo, Calle Inca Garcilaso, 3, 41092 Sevilla

FINAL AGENDA – DAY 1

09:00 – 09:30 **|** *Arrival and registration of participants*

09:30 – 10:30 | Opening of the meeting and introduction of experts

10:30 - 11:30 | Background and purpose of the meeting:

- background
- scope and structure of the EMAS SRD for the waste management sector
- state of play and meeting objectives

11:30 - 11:45 **|** *Coffee break*

11:45 - 13:00 | Measuring the performance of municipal solid waste management – An introduction

13:00 - 14:15 **|** *Lunch break*

14:15 – 18:00 | Parallel sessions - Measuring the performance of municipal solid waste management:

- quantity-based waste management indicators, definition of municipal solid waste and normalising factors for waste management indicators

(Coffee break)

- performance-based waste management indicators for specific waste fractions

18:00 - 18:15 | Wrap-up and close of the day

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

SEVILLA, 28 - 29 MARCH 2017

Joint Research Centre - Edificio Expo, Calle Inca Garcilaso, 3, 41092 Sevilla

FINAL AGENDA – DAY 2

09:00 – 09:15 | Opening of the day

09:15 – 10:30 | Outcome of parallel sessions - Indicators to measure the performance of municipal solid waste management

10:30 - 11:00 | *Coffee break*

11:00 - 13:00 | Specific indicators for the individual best environmental management practices for:

- Municipal solid waste
- Construction and demolition waste
- Healthcare waste

13:00 - 14:00 | *Lunch break*

14:00 - 16:30 | How to set benchmarks of excellence

16:30 - 17:00 | Wrap-up and close of the workshop

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Annex 2

Second meeting of the technical working group for the EMAS Sectoral Reference Document on Best Environmental Management Practices for the waste management sector

Seville, 28-29 March 2017

Supporting document to the meeting agenda

1. Background and purpose of the meeting (day 1 / 10:30 - 11:30)

1.1. Background

The first session of the meeting will focus on the framework under which the European Commission's Joint Research Centre (JRC) is developing the EMAS Sectoral Reference Document on best environmental management practice for the waste management sector. Waste management is a key sector in terms of resource efficiency where broader uptake of best practice, going beyond regulatory requirements, allows reaping large environmental and societal benefits.

The Sectoral Reference Documents include three main elements: Best environmental management practices, environmental performance indicators and benchmarks of excellence.

Best environmental management practices (BEMPs) are those techniques, measures or actions that allow organisations to minimise their impact on the environment related to all the aspects under their direct control (direct aspects) or on which they have a considerable influence (indirect aspects). BEMPs can be of a technical or technological nature, such as technology to sort different types of light packaging waste when collected together or the use of low emission vehicles for waste collection, or of a more management or organisational type, such as establishing a network of waste advisors to provide information to citizens and business and stimulate behavioural change.

Environmental performance indicators are specific expressions that allow the measurement of an organisation's environmental performance in a specific field. Environmental performance indicators are sector-specific and "shall: give an accurate appraisal of the organisation's environmental performance; be understandable and unambiguous; allow for a year on year comparison to assess the development of the environmental performance of the organisation; allow for comparison with sector, national or regional benchmarks as appropriate; allow for comparison with regulatory requirements as appropriate" (Regulation (EC) No 1221/2009 of the European Parliament and of the Council).

Benchmarks of excellence reflect the exemplary environmental performance achieved by frontrunners[1]. Benchmarks of excellence represent a high and ambitious environmental performance level, well above good or average performance, while taking also economic considerations into account. However, benchmarks of excellence do not refer to the best of the best but, as a rule of thumb, the 10% to 20% best performers among local waste authorities and waste management companies. Benchmarks of excellence are not targets for all organisations to achieve, but rather a measure of what is possible (under stated circumstances) that can allow benchmarking and inspire others.

The development of Sectoral Reference Documents (SRDs) is part of the European Commission's work to implement the EU Eco-Management and Audit Scheme (EMAS), a voluntary framework for companies and other organisations to evaluate, report and improve their environmental performance. More info about the overall activity of developing Sectoral Reference Documents can be found at: http://susproc.jrc.ec.europa.eu/activities/emas/index.html

1.2. Scope and structure of the EMAS SRD for the waste management sector

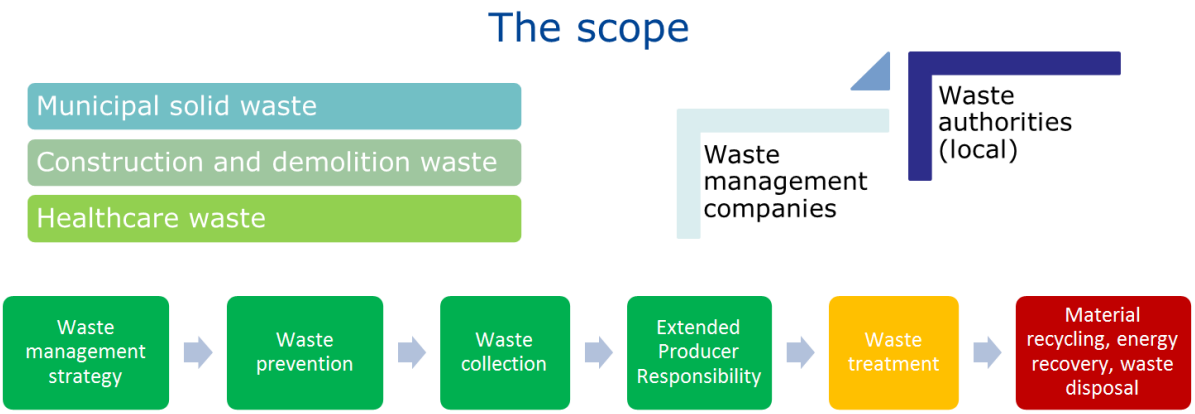
For the development of the EMAS SRD for the waste management sector, the scope has been identified according to three dimensions:

- The waste streams addressed by this work include municipal solid waste (MSW), construction and demolition waste (CDW) and healthcare waste (HCW).
- BEMPs have been identified for two main target groups: waste management companies and local public authorities in charge of waste management (waste authorities). The identification of BEMPs has covered both the main direct and indirect environmental aspects for those actors and has focused on initiatives, measures, techniques and actions implemented by frontrunner organisations within the sector.
- In terms of waste management phases, it was decided to cover the phases where best environmental practices are not already covered by other existing EU legislation and reference documents, i.e. BEMPs have been identified for:
  - Establishing a waste management strategy (i.e. the planning of the overall system).
  - 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; schemes promoting repairing and reselling of used electronic equipment and furniture that may otherwise be considered as having reached their end-of-life).
  - Waste collection (type of collection, vehicles/technology used, choice of routes, schedule of the collection, etc.).
  - Extended Producers Responsibility schemes

[1] Frontrunners are those organisations implementing, at full scale, innovative solutions that allow best environmental performance to be achieved and which do so ahead of their peers.

– 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)[2].

The figure below illustrates in the top part the waste streams and target actors and below the waste management phases in relation to the project: in green the ones covered, in yellow the one partially covered and in red the phases not addressed.



Based on such definition of the scope, the structure of the document has been developed as follows, grouping best practices by waste stream (with a few best practices, called "Cross-cutting BEMPs", addressing all waste streams) and, for municipal solid waste (where most of the best practices were identified), according to the waste management phase they address.

Draft structure of the best practice report for the waste management sector
1. General information about the waste management sector
2. Common environmental performance indicators
3. Cross-cutting issues 3.3 Cross-cutting BEMPs 3.3.1 Integrated waste management strategies 3.3.2 Life cycle assessment of waste management options 3.3.3 Economic instruments

[2] For areas covered by the Best Available Technique (BAT) Reference Document (BREF) for the Waste Treatment Industries or other reference documents, the SRD will not describe BEMPs but refer to the relevant guidance, in terms of best available techniques, provided in the BREF.

4. Municipal solid waste (MSW)

4.5 Strategy BEMPs

4.5.1 Cost benchmarking
4.5.2. Improved waste monitoring
4.5.3 Pay-As-You-Throw
4.5.4 Performance-based waste management contracting
4.5.5 Awareness raising
4.5.6 Establishing a network of waste advisers
4.5.7 Decentralised composting

4.6 BEMPs on waste prevention

4.6.1 Local waste prevention programmes
4.6.2 Product re-use schemes

4.7 BEMPs for waste collection

4.7.5 Waste collection strategy
4.7.6 Inter-municipal cooperation among small municipalities
4.7.7 Civic amenity sites
4.7.8 Logistics optimisation for waste collection
4.7.9 Low emission vehicles

4.8 BEMPs for extended producer responsibility (EPR) schemes

4.8.1 Best use of incentives by Producers Responsibility Organisations (PROs)

4.9 BEMPs on waste treatment

4.9.1 Sorting of co-mingled light packaging waste to maximise recycling yields for high quality output
4.9.2 Sorting of collected mixed plastics to maximise recycling yields for high quality output
4.9.3 Treatment of mattresses for improved recycling of materials
4.9.4 Treatment of absorbent hygiene products for improved recycling of materials

5. Construction and demolition waste (CDW)

5.3 BEMPs for CDW

5.3.1 Integrated CDW plans
5.3.2 Quality assurance schemes
5.3.3 Improving the acceptability of recycled aggregates
5.3.4 Improving source segregation and separate collection of waste plasterboard to foster recycling
5.3.5 Management of PCB contaminated CDW
5.3.6 Local schemes for proper management of waste asbestos removed by residents

6. Healthcare waste (HCW)

6.3 BEMPs for HCW segregation

6.3.1 Encouraging HCW segregation at healthcare institutions
6.3.2 HCW collection for citizens

6.4 BEMPs for the treatment of the HCW

6.4.2 Selection of alternative treatment of HCW

1.3. State of play and meeting objectives

The development of the Sectoral Reference Document for the waste management sector follows a methodology which is comprehensively presented in the publication 'Development of the EMAS Sectoral Reference Documents on Best Environmental Management Practice' available at: http://susproc.jrc.ec.europa.eu/activities/emas/documents/DevelopmentSRD.pdf. As a first step, on the basis of desk research, contacts with experts, site visits and interviews with experts, a background report was developed by BZL Kommunikation und Projektsteuerung GmbH (Germany) and E3 Environmental Consultants Ltd. (UK) under a contract with the European Commission's Joint Research Centre (JRC). The background report presents a set of proposed best environmental management practices (BEMPs) and environmental performance indicators in the fields of:

- Waste management strategy;
- Waste prevention;
- Waste collection;
- Waste treatment.

Following the publication of a first draft of the background report, in September 2015, the JRC established a technical working group (TWG), comprising experts in the sector from across Europe, to steer the work, identify the best practices and eventually validate the findings. The TWG is responsible for defining the scope of the document, supporting the identification of best practices implemented across the sector and most suitable environmental performance indicators and related benchmarks of excellence, and agreeing on the final outputs.

The first meeting of the TWG took place on 30th September and 1st October 2015 in Leuven (Belgium) and discussions focused on the proposed BEMPs elaborated in the background report, as well as any additional BEMP proposed by TWG members. The meeting led to an agreement on the list of BEMPs which will be described in the final Sectoral Reference Document. In addition, useful inputs about further case studies and information were provided by participants during and after the meeting. Part of the feedback from the TWG was taken into account by the consultants from BZL and E3 and integrated into a final version of the background report published in May 2016 and available at: http://susproc.jrc.ec.europa.eu/activities/emas/documents/WasteManagementBackgroundReport.pdf

Following the publication of the final background report and taking into account all feedback received from the TWG at the meeting and as a follow-up, the JRC[3] elaborated the final list of BEMPs. It is presented, together with a brief description of each technique, its applicability and proposed environmental performance indicators in Annex A to this document. Based on the initial discussions at the first meeting and the ensuing work, it has appeared that many of the proposed BEMPs contribute to improving environmental performance alongside key parameters that are often reflected by the same monitoring metrics, i.e. overall waste management performance indicators. This has highlighted the relevance of dedicating special attention in the forthcoming work to a set of **key indicators** capturing the overall performance of municipal solid waste management[4].

We have now entered the second phase of the development of the Sectoral Reference Document for the waste management sector, which is dedicated to identifying the most suitable environmental performance indicators and benchmarks of excellence for the sector. The second meeting of the TWG (Seville, 28th -29th March 2017) has been organised as a key element of this process. It is aimed at defining and agreeing a set of meaningful environmental performance indicators that can be used to assess the performance of a waste management system at local level. The indicators to be identified will be two-fold: on the one hand indicators for measuring the overall performance of municipal solid waste management systems; on the other hand indicators for measuring specifically the implementation and results of each individual BEMP. Moreover, discussions will also concentrate on how to eventually set the related benchmarks of excellence.

Following the second meeting of the TWG, the JRC will integrate the outcome of the discussions and all the inputs received after the meeting into a draft 'best practice report' presenting the full description of all the BEMPs and environmental performance indicators (as well as, if already elaborated, the related proposals of benchmarks of excellence). This document will be shared with all TWG members as well as all interested additional stakeholders and experts from the sector for comments. After these exchanges (during Autumn 2017), a final draft of the 'best practice report' will be circulated and published by December 2017. During 2018, on its basis, the Commission will produce the official 'Sectoral Reference Document' that will be adopted as a Commission Decision.

[3] With supporting work on specific topics from the organisations Ambiente Italia and ACR+.
[4] To be developed with supporting work from BIPRO.

1.4. Organisation of the meeting

In the context of the project described above, the second meeting will primarily aim at discussing and identifying the core indicators of greatest relevance to the sector in the ambit of environmental performance improvement.

The following sections therefore describe the meeting sessions and, based on the findings of the research carried out so far, proposes for each topic some initial inputs to discussions. These are intended as guiding thoughts for constructive brainstorming rather than established conclusions to be agreed upon as such.

2. Measuring the performance of municipal solid waste management – An introduction (day 1 / 11:45 - 13:00)

This session of the meeting will introduce the subject of assessing the performance of waste management systems at local level.

One cannot manage what one cannot measure. Not only do local authorities and waste management companies in charge of municipal solid waste need detailed data about the quantity and type of municipal solid waste generated in the territory, they also require meaningful indicators that allow effective decision making based on the best possible understanding of their waste management system.

Currently, in most cases, local waste authorities and waste management companies rely on information on the total waste generation and the share of separately collected waste. These simple indicators provide a broad picture of the waste generation on the territory considered and the level of penetration of separate collection over the total waste collected. However, they have a number of limitations:

- no useful information can be extracted about the quality of the separately collected waste streams and therefore the amount of waste which is ultimately recycled properly;
- data cannot be obtained on the share of recyclables which are actually collected separately (and then recycled) out of the total amount of recyclables which are delivered to the waste management system (i.e. disposed of in the mixed waste);
- if there is the need or potential for establishing the separate collection of a new waste stream, reliable data for predicting quantities may lack;
- a limited amount of information is available to engage with residents, for instance to motivate for further improvement of proper home waste segregation.

In light of these general constraints and others which may be more peculiar for specific cases or waste streams, the meeting will aim at identifying environmental performance indicators, already in use by frontrunner organisations, that can overcome the limitations mentioned above and enable appropriate decision making for the improvement of the waste management systems monitored.

In this session of the meeting, a few presentations will frame the problem and provide food for thought about potential solutions based on the experience of practitioners.

3. Parallel sessions - Measuring the performance of municipal solid waste management (day 1 / 14:15 - 18:00)

This part of the meeting is organised in a number of **parallel sessions** during which different topics will be discussed. Participants will be divided in groups and will have the opportunity to discuss, by rotation, the different subjects listed below.

3.1. Quantity-based waste management indicators

At this parallel session, discussions will focus on the definition of quantity-based waste management indicators. Some examples of quantity-based indicators are: total waste generation; amount of mixed waste; amount of separately collected waste; and amount of residual waste.

Quantity-based indicators assess the mass of different waste streams generated or collected, and are broadly used by local waste authorities and waste management companies. This parallel session will look at pros and cons of different quantity-based indicators and compare the different possible formulations and definitions to identify those that can be considered most useful.

For instance: are 'mixed waste' and 'residual waste' indicators used consistently? Which is more helpful to drive improvement? Is it useful to monitor total waste generation or should some fractions be excluded?

In order to make this type of indicators more meaningful (e.g. for year-on-year comparison or benchmarking), due to the changes that may occur in population and consumption levels (and in economic activity, when part of municipal solid waste is from businesses), it is important to normalise these indicators against appropriate activity data (see next section).

3.2. Definition of municipal solid waste and normalising factors for waste management indicators

This parallel session will focus on how normalising factors can be effectively used in local areas. The most common choice is the use of population based indicator (e.g. the amount of waste generated per resident / inhabitant). However, this normalising factor has a severe limitation: if a considerable quantity of commercial waste or other non-household waste is considered part of municipal solid waste (and included in the municipal solid waste data), either the amounts of household waste and non-household waste in municipal solid waste are estimated in order to calculate separate indicators, or the absolute values and the trends would be far from meaningful. An approach to overcome this limitation could be using a different normalising factor, such as the amount of waste per population-equivalent, where population-equivalent accounts for residents and businesses whose waste is collected as municipal solid waste.

This point is very closely linked to the choice of a definition of "municipal solid waste". Indeed, there are currently several definitions of municipal solid waste which are available in legislation or have been developed by different actors. Some examples are:

- Council Directive 1999/31/EC[5] (landfill directive): "Municipal waste is waste from households, as well as other waste which, because of its nature or composition, is similar to waste from households";
- Commission Decision 2011/753/EU[6]: "Municipal waste means household waste and similar waste";
- Eurostat[7]: "municipal waste consists of waste collected by or on behalf of municipal authorities, or directly by the private sector (business or private non-profit institutions) not on behalf of municipalities. The bulk of the waste stream originates from households, though similar wastes from sources such as commerce, offices, public institutions and selected municipal services are also included. It also includes bulky waste but excludes waste from municipal sewage networks and municipal construction and demolition waste";
- Regions for recycling project[8]: "municipal solid waste consist of all the waste generated by households (regardless who collects it) plus the non-household waste collected by or on behalf of the municipalities plus similar non-household WEEE and batteries collected by or on behalf of accredited bodies (e.g. a PC used by a company or school collected by (or on behalf of) the municipality, on behalf of the accredited body)".

Another issue related to the use of population data from census as normalising factor for quantity-based indicators are cities or territories where there is a relevant fluctuation of population present in the area across seasons, due to tourism or local businesses. Local waste statistics can take into consideration the variable presence of individuals on the territory, adding to the number of permanent residents (according to the official local records) the equivalent number of residents due to the presence of tourists. For instance, this can be done by adding to the number of permanent residents the yearly number of overnight stays divided by 365.

Similar considerations apply also for daily tourists and commuters, who, despite not spending nights at the location considered, can provide an additional burden to the waste management system of the municipality. However, if the calculation of resident equivalents for tourists staying overnight is already used in a number of locations to monitor waste management systems (e.g. Saladié, 2016[9]) and drive improvement, considerations on taking into account commuters and daily tourists appear less developed.

3.3. Performance-based waste management indicators

This parallel session will look at the most relevant performance-based indicators in use among local authorities and waste management companies. Performance-based indicators are those indicators

[5] Council Directive 1999/31/EC is available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31999L0031

[6] Commission Decision 2011/753/EU is available at: http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32011D0753

[7] Definition available at: http://ec.europa.eu/eurostat/web/waste/transboundary-waste-shipments/key-waste-streams/municipal-waste

[8] Definition available at: http://www.regions4recycling.eu/upload/public/Reports/R4R_municipal-solid-waste-scope.pdf

[9] The article 'Determinants of waste generation per capita in Catalonia (North-eastern Spain): the role of seasonal population' (Saladié, 2016) is available at: http://ojs.ecsdev.org/index.php/ejsd/article/view/374

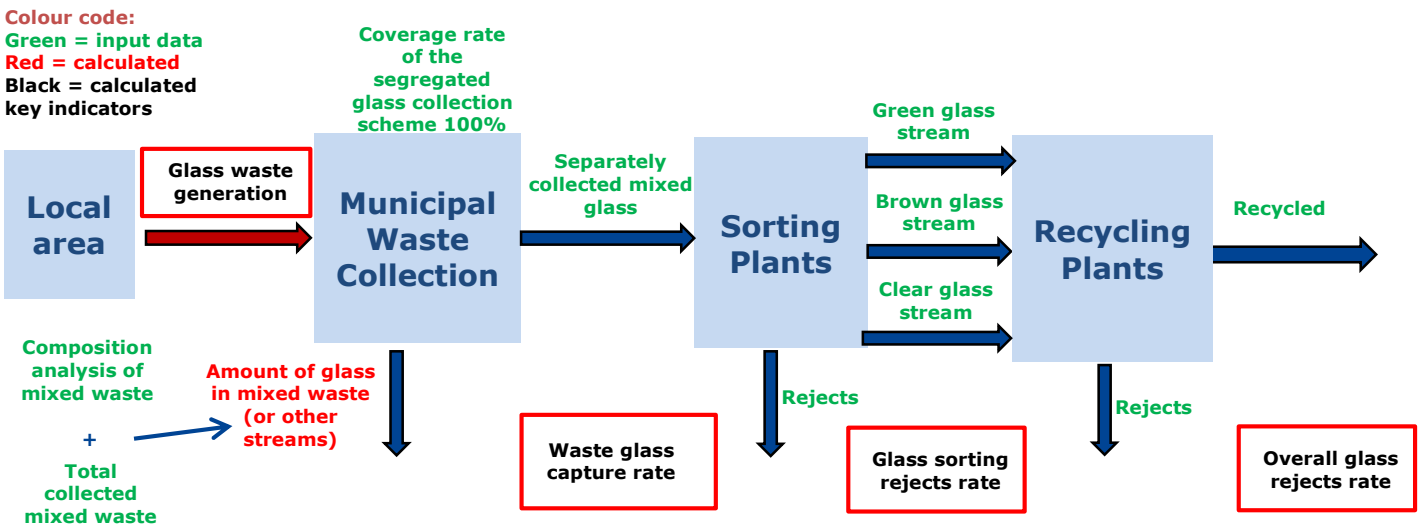
expressed as a share (percentage) of waste in a certain flow at a certain stage. Some performance-based indicators are commonly used by local authorities and waste management companies: an example is the separate collection rate, calculated for total municipal solid waste. This indicator may be useful and easy to calculate but has some relevant shortcomings:

- It may indicate the need to improve separate collection, but not necessarily the fractions where more efforts is needed and those where the performance can be considered satisfactory.
- It does not provide any indication on the quality (i.e. non-presence of non-target waste materials) of the separately collected flows.

This session will discuss those indicators (e.g. capture rates for specific waste fractions, reject rates) that can more meaningfully support decision making at local level. However, developing and calculating such indicators requires a good knowledge of the waste management systems considered. For that reason, this session will look specifically at a number of waste fractions to discuss, for the specific waste fractions, which indicators are the most practical and useful and what measurement point is the most meaningful and feasible.

One possible approach may be to identify two separate indicators for each waste fractions, assessing respectively the efficiency of the separate collection and its effectiveness (or quality). The first one could be a capture rate, corresponding to the amount of separately collected material out of the total generation for the specific waste stream (to be calculated as the sum of the separately collected waste and waste belonging to the same fraction but incorrectly conferred into mixed waste or with other fractions). The second one could be a reject rate for the specific waste stream calculated as the amount of rejects from sorting and/or recycling processes out of the total separately collected waste for that fraction.

As an example, the diagram below shows a simplified representation of the flows in a separate collection system for glass, with the indicators that can be calculated at the different measurement points according to the approach introduced above.



The discussions during this session will focus on the performance-based waste management indicators to be used for monitoring and decision-making at local level. The ongoing legislative process for the definition of new waste (e.g. recycling) targets at EU and Member State level and the related calculation methodologies (including the definition of recycling rate) will not be considered in scope.

An important pre-requisite to the calculation of advanced performance-based waste management indicators (such as capture rates) is **composition analysis** of the waste streams collected. Composition analysis allows gathering data on the range of materials, amounts and proportions in the waste streams collected and it is usually carried out on mixed waste. The reasons for which a local waste authority or a waste management company may be carrying out composition analysis are varied, and may include:

- identifying how much of the recoverable material in the household waste stream is currently being captured for treatment/recycling and how much remains in the residual waste (see diagram above);
- providing information from which forecasts can be made on how much material could be recovered from a new recycling scheme;
- deciding the most appropriate route for the mixed waste collected (i.e. whether it is suitable for incineration with energy recovery, if it makes sense to send it to mechanical biological treatment);
- comparing alternative waste management systems operating within an area, in order to implement changes;
- generating information to distribute to the public to improve transparency and communication with residents.

In some cases, however, composition analysis is carried out because requested by an external body (e.g. the producer responsibility organisation of an extended producer responsibility scheme) but not fully exploited to produce indicators and support decision making.

Composition analysis is carried out on representative samples at regular intervals, and it highlights if proper waste is collected in the mixed waste fractions (e.g. there are no recyclables in mixed waste) and whether the waste collected as separate collection fractions contains only what is supposed to. Characterisation of waste material composition typically consists of three phases:

- sampling of the waste: waste samples collected must be representative of the target area considered, be sufficient to take into account waste arising but at the same time also be economically viable to collect and process. When planning sampling of waste for composition analysis, all factors influencing waste generation in the territory (e.g. household income, residents' age, season, collection cycles) must be considered to identify the sample size and type.
- physically sorting the waste into the planned number of material fractions: the collected samples are manually sorted and classified in material types (e.g. glass, paper, organics, plastic etc.); moreover, characterisation could also involve other parameters such as size split and moisture content.
- handling and interpretation of the obtained data by calculating relevant figures: results from the characterization of the samples allow calculating relevant figures for monitoring and

improving the waste management system such as the quantity of specific recyclable streams in mixed waste, or the amount and type of wrongly sorted waste in separately collected waste fractions (e.g. bio-waste, light packaging waste).

This parallel session will thus also discuss how to effectively carry out composition analysis of waste streams collected and/or take advantage of composition analyses that are already carried out for different reasons.

4. Outcome of parallel sessions - Indicators to measure the performance of municipal solid waste management (day 2 / 09:15 - 10:30)

During this session, the main outcomes of the parallel group discussions of session 3 will be presented. There will be an opportunity to further discuss any remaining issue in order to reach a common agreement on the most relevant environmental performance indicators that allow assessing the environmental performance of municipal waste management systems at local level.

5. Specific indicators for the individual best environmental management practices (day 2 / 11:00 – 13:00)

The environmental performance indicators discussed in the previous sessions allow measuring, from different angles, the performance of a waste management system as a whole, with a view to improving the system. In fact, based on information obtained from monitoring the environmental performance, local waste authorities and waste management companies can choose in which area to take action (e.g. waste prevention, collection) and what measures to implement. In line with (environmental) management principles it is crucial to base decisions on as much as possible actual data rather than assumptions and estimations. Additionally, another useful exercise is to benchmark the environmental performance achieved against results obtained in previous periods (e.g. quarters, years) or against the performance of other waste management systems.

Once local waste authorities and waste management companies have selected specific best environmental management practices that are relevant for their own situation and they have implemented them or wish to implement them in the future, it is useful to also use indicators which are *specific* to the individual BEMPs.

During this session, the TWG will discuss about the **specific indicators** defined for assessing the implementation of each best environmental management practice identified within this work. The tables provided in Annex A summarise all the BEMPs identified, together with information on their applicability and the current proposals of specific environmental performance indicators. All TWG members are invited to support or explain the limitations of the proposed indicators, as well as suggest alternative formulations or new proposals of indicators for the different BEMPs.

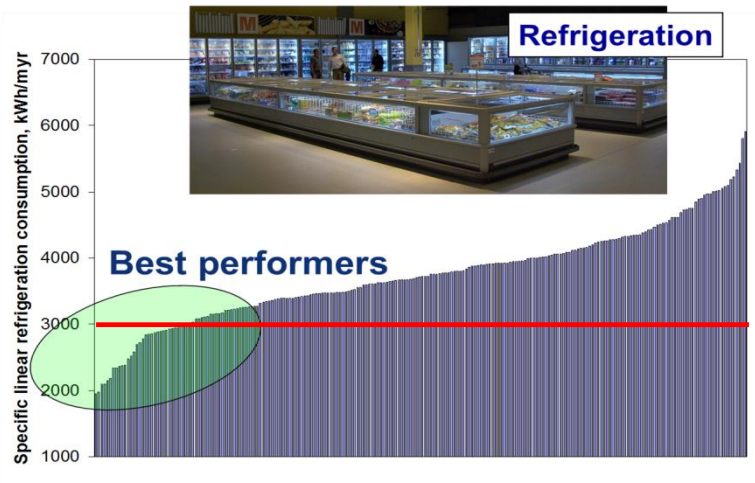
6. How to set benchmarks of excellence (day 2 / 14:00 – 16:30)

During this session, the TWG will discuss for which of the agreed general and BEMP specific indicators a meaningful **benchmark of excellence** can be set. Moreover, the members of the TWG

will have the chance to offer to provide data or point out relevant sources of information for defining the benchmarks.

As introduced earlier in this document, benchmarks of excellence reflect the exemplary environmental performance achieved by frontrunners. Benchmarks of excellence represent a high and ambitious environmental performance level, well above good or average performance, but possible to achieve taking also economic considerations into account.

Benchmarks of excellence do not simply mean the performance obtained by the best of the best but, approximately, the 10% to 20% best performers on a specific aspect among local waste authorities and waste management companies. Where there are sufficient data (which is often not the case), frequency distributions of a quantified environmental performance indicator can be used to illustrate the approach. The figure below shows an example of benchmark of excellence extracted from one of the sectoral reference documents already adopted. It is the benchmark of excellence set for the commercial refrigeration of food in retail stores (from the document for the retail trade sector). The appropriate environmental performance indicator to measure energy consumption in commercial refrigeration was identify in cooperation with the TWG for the retail trade sector as the annual energy consumption per linear metre of display case (kWh/m yr), and the benchmark of excellence was concluded to be 3000 kWh/m yr. The data in the figure below represent the annual energy consumption per metre of display case in all the stores of an average retail chain, and the benchmark of excellence was set to a level of performance which does not represent the best of the best but rather the performance reached by the 10% to 20% best performers. On top of the frequency distribution shown in the graph, the value of the benchmark of excellence was also supported by the experience of the members of the TWG.



In some cases, the TWG can decide that the implementation of a certain action can be considered a benchmark of excellence. In those cases, the benchmark of excellence can also simply be a yes or no criterion, such as whether natural refrigerants are used in refrigeration systems in retail stores or whether a retailer implements systematic supply chain improvement programmes across priority product groups. Or it can be expressed as a percentage, such as the % of stores of a retailer monitoring the energy consumption across specific processes.

It is also possible for a benchmark of excellence to be derived from a few cases, if the technical feasibility and the economic viability are proven. In any case, benchmarks of excellence represent a

high and ambitious environmental performance level, well above good or average performance. However, benchmarks of excellence are not targets for all organisations to achieve, but rather a measure of what is possible (under stated circumstances) that can allow benchmarking and inspire others.

Best Environmental Management Practices and the EMAS Sectoral Reference Documents

20 Years of PREMIUM ENVIRONMENTAL MANAGEMENT

Presentation at the

2nd Meeting of the Technical Working Group on Best Environmental Management Practice for the Waste Management Sector

Seville, 28 March 2017

Paolo Canfora, Pierre Gaudillat, Marco Dri, Ioannis Antonopoulos

European Commission – Joint Research Centre

EMAS

EMAS Performance, Credibility, Transparency

What is EMAS? EU Eco-Management and Audit Scheme

- ✓ An Environmental Management System
- ✓ An EU Regulation
- ✓ An environmental performance reporting tool

EMAS is a commitment to…

… in environmental performance

But what if you ask yourself

Look at the EMAS Sectoral Reference Documents

European Commission

Best Environmental Management Practices can help

For both EMAS and non-EMAS organisations

European Commission

The 'frontrunners approach'

European Commission

GO GREEN WITH

BEST ENVIRONMENTAL MANAGEMENT PRACTICES!

BEMP

Best practices to reduce enviromental impacts

Already in Use by Best Environmental Performers

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

A sectoral approach

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

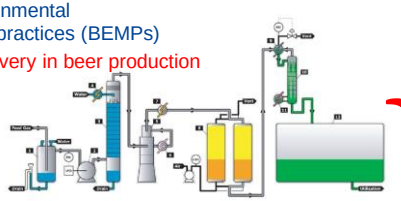
- Environmental performance indicators
  - Kg waste generation per m^2 of sales area
- Benchmarks of excellence
  - Zero food waste sent to landfill or incineration plant

An example from:

Main elements of the sectoral reference documents

The sectoral reference documents comprise 3 main elements:

- Best environmental management practices (BEMPs)
  CO_2 recovery in beer production



- Environmental performance indicators
  kg CO_2 recovered / hL beer produced
- Benchmarks of excellence
  50% of CO_2 produced by fermentation is recovered

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)

BEMP is what goes well beyond common practice

but is already fully implemented

and widely applicable

What is not BEMP:

- Obsolete techniques
- Common practice
- Good practice
- Emerging techniques
  - are available and innovative
  - not yet proved their economic feasibility
  - not yet implemented at full scale

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

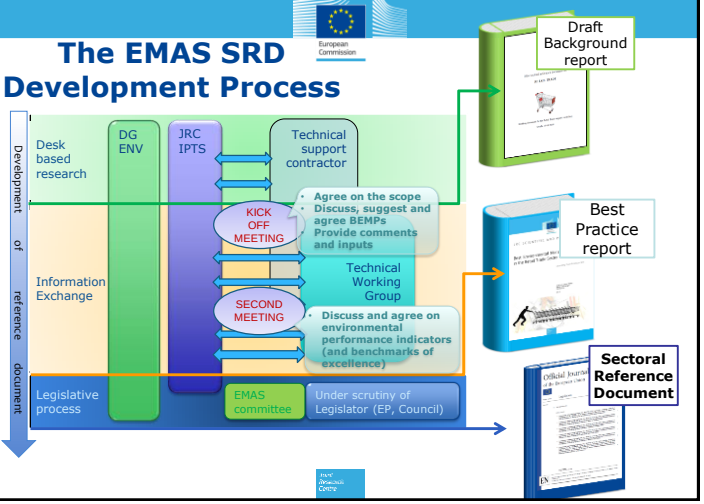
very ambitious | achieved by frontrunners | not a target but a measure of what is possible

A development process based on stakeholder involvement

Three phases:

- **Desk research** (background collection of information from literature, frontrunner organisations and experts)
- **Information exchange** within the forum of a **Technical Working Group** comprising sector experts to identify and validate the best practices identified, the indicators and the benchmark of excellence
- **Legislative process** (member state representatives in the EMAS Committee)

The EMAS SRD Development Process



The documents produced so far…

Best practice reports

Sectoral Reference Documents

Environmental performance indicators

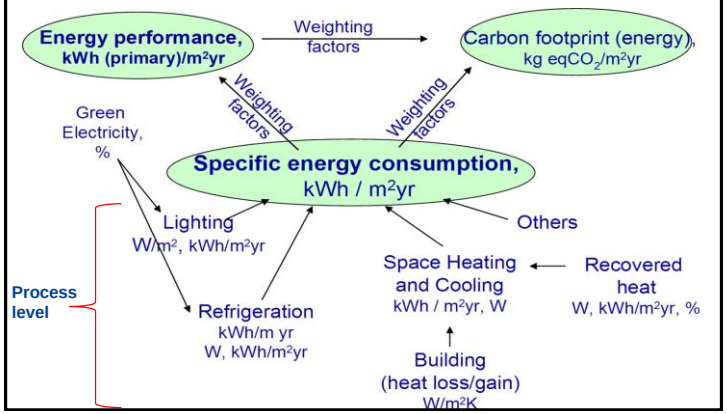
- **Environmental performance indicators:** "specific expression that allows **measurement** of an organisation's **environmental performance**" (EMAS Regulation)
  - Core indicators
  - Specific indicators
  - (Alternative indicators)

→ (i) Energy efficiency
(ii) Material efficiency
(iii) Water
(iv) Waste
(v) Biodiversity and
(vi) Emissions.

Environmental performance indicators – sector level

- Sector-specific environmental performance indicators are considered **an outcome of the whole process**
- Final selection of the indicators is made in accordance with **available data and practical/technical information** from organisations, stakeholders, literature, etc.
- Indicators should measure the environmental performance of the organisation - but as focussed on the **'process'** or **'activity' level**

An example from the retail sector



Selection of environmental indicators

- Indicators must be **actually used** by organisation of the sector and/or they must be **calculated easily**
- Indicators must be as **specific** as possible in order to allow meaningful **comparison** over time, across sites of an organisation, across organisations and against given **benchmarks**

From indicators to benchmarks

"Benchmark" levels can be defined based on many approaches e.g.:

- ~~The best~~
- Top 10 or Top 10%
- ~~Current average in sector~~
- ~~Potential average in sector using "best practice"~~
- ..... etc.

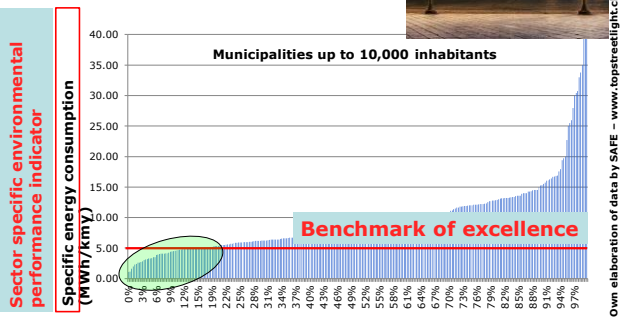
- But then what do we mean by "best practice"?
  - Achievable by ~~a few / many / most / all~~ ? → **Already achieved by a few**
  - Taking account of sector-specific economics ? → **Applicability and special circumstances are also taken into account**

Identifying benchmarks of excellence (1)

- **Frequency distributions** of a quantified *environmental performance indicator* can be used to derive the benchmark of excellence once the indicators have been identified.
- The benchmarks of excellence correspond to the performance levels achieved by **frontrunners**.
- They correspond to the performance of best performers identified e.g. as the **top 10-20%** in the industry

Quantitative benchmark: an example

Public lighting



Identifying benchmarks of excellence (2)

- Benchmarks of excellence can also be:
  - **a yes or no criterion,** e.g.: natural refrigerants are used in all refrigeration systems in all sites (from the food and beverage manufacturing sector – BEMP on improved freezing and refrigeration)
  - **a percentage of implementation of a certain BEMP**, e.g.: ≥ 50% of the animal population consist of locally adapted breeds (hybrids) (from the agriculture sector – BEMP on the use of locally adapted breeds in the farm)

Use of benchmarks

- Provide information to users of **what is potentially achievable** under certain defined circumstances.
- Possibility to **form an opinion** whether an organisation/process is performing well.
- They should be **meaningful** in terms of relevance to **environmental impact**.

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

Thank you!

Paolo Canfora
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Scope and structure of the EMAS SRD for the Waste Management sector

20 Years of PREMIUM ENVIRONMENTAL MANAGEMENT

Presentation at the

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BEMPs for the Waste Management Sector

The scope

- Municipal solid waste
- Construction and demolition waste
- Healthcare waste

Waste management companies

Waste authorities (local)

Waste management strategy → Waste prevention → Waste collection → Extended Producer Responsibility → Waste treatment → Material recycling, energy recovery, waste disposal

European Commission

Scope of the document – waste management phases and waste activities

Establishment of a waste management strategy

Waste prevention | **Waste collection**

Covered

Covered	Not covered
- Establishment of a waste management strategy - Implementation of waste prevention and product 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, CDW, healthcare waste.	

Scope of the document – waste management phases and waste activities

Operation of Extended Producer Responsibility schemes

Covered

Covered	Not covered
- Practical guidance on how to improve the effectiveness of the extended producer responsibility scheme	- Establishment of extended producer responsibility schemes

Scope of the document – waste management phases and waste activities

Waste treatment
Facilities outside the scope of the IED

Partially covered

Covered	Not covered
- Waste treatment facilities 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; - Materials recovery is not included unless: I. It is performed by a waste manager, public or private, and II. are excluded from the IED BREF waste-related best available techniques.

Scope of the document – waste management phases and waste activities

Material recycling, energy recovery, waste disposal

Not covered

Covered	Not covered
	- Landfills' operations - Disposal through incineration with or without energy recovery Production of substitute fuels (RDF, SRF or biogas) - at least at the scales covered by the IED BREFs - Remediation activities

In the best practice report, for these waste management phases and activities, references to best practices will be made to other reference document, legislation etc.

Municipal solid waste

Waste management strategy → Waste prevention → Waste collection → Extended Producer Responsibility → Waste treatment

- **Improved waste monitoring**
- **Pay-As-You-Throw**
- **Awareness raising**
- **Local waste prevention programmes**
- **Logistics optimisation for waste collection**
- **Inter-municipal cooperation**
- **Best use of incentives by Producers Responsibility Organisations**
- **Treatment of mattresses**

European Commission

Scope of the document – Structure

Structure of the best practice report	Comments
1. General information about the waste management sector	
2. Common environmental performance indicators for municipal solid waste management systems	New chapter
3. Cross cutting issues 3.3 Cross-cutting BEMPs 3.3.1 Integrated waste management strategies 3.3.2 Life cycle assessment of waste management options *3.3.3 Economic instruments*	Chapter relevant for all the three waste streams covered

Scope of the document – Structure

Structure of the best practice report	Comments
4. Municipal solid waste (MSW)	
4.5 Strategy BEMPs 4.5.1 Cost benchmarking 4.5.2. Improved waste monitoring 4.5.3 Pay-As-You-Throw 4.5.4 Performance-based waste management contracting 4.5.5 Awareness raising *4.5.6 Establishing a network of waste advisers* 4.5.7 Decentralised composting	New BEMP: 4.5.6
4.6 BEMPs on waste prevention 4.6.1 Local waste prevention programmes 4.6.2 Product re-use schemes	

Scope of the document – Structure

Structure of the best practice report	Comments
4. Municipal solid waste (MSW)	
4.7 BEMPs for waste collection 4.7.5 Waste collection strategy 4.7.6 Inter-municipal cooperation among small municipalities 4.7.7 Civic amenity sites 4.7.8 Logistics optimisation for waste collection 4.7.9 Low emission vehicles	
4.8 BEMPs for extended producer responsibility (EPR) schemes *4.8.1 Best use of incentives by Producers Responsibility Organisations (PROs)*	New chapter

Scope of the document – Structure

Structure of the best practice report	Comments
4. Municipal solid waste (MSW)	
4.9 BEMPs on waste treatment *4.9.1 Sorting of co-mingled light packaging waste to maximise recycling yields for high quality output* *4.9.2 Sorting of collected mixed plastics to maximise recycling yields for high quality output* *4.9.3 Treatment of mattresses for improved recycling of materials* *4.9.4 Treatment of absorbent hygiene products for improved recycling of materials*	New chapter

Scope of the document – Structure

Structure of the best practice report	Comments
5. Construction and demolition waste (CDW)	
5.3 BEMPs for CDW 5.3.1 Integrated CDW plans 5.3.2 Quality assurance schemes 5.3.3 Improving the acceptability of recycled aggregates 5.3.4 Improving source segregation and separate collection of waste plasterboard to foster recycling 5.3.5 Management of PCB contaminated CDW *5.3.6 Local schemes for proper management of waste asbestos removed by residents*	New BEMP: 5.3.6

Scope of the document – Structure

Structure of the best practice report	Comments
6. Healthcare waste (HCW)	
6.3 BEMPs for HCW segregation *6.3.1 Encouraging HCW segregation at healthcare institutions* *6.3.2 HCW collection for citizens*	New chapter
6.4 BEMPs for the treatment of the HCW 6.4.2 Selection of alternative treatment of HCW	

Thank you!

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State of Play and Meeting Objectives

Presentation at the

2nd Meeting of the Technical Working Group on Best Environmental Management Practice for the Waste Management Sector

Seville, 28 March 2017

Paolo Canfora, Pierre Gaudillat, Marco Dri, Ioannis Antonopoulos

European Commission – Joint Research Centre

Three logical steps

BEMPs
- First survey of best practices
- Comments and input from the Technical Working Group
- Final set of BEMPs

Indicators
- Specific indicators for specific BEMPs
- Indicators for the overall waste management sector

Benchmarks
- Selection of the suitable indicators
- Data collection
- Proposals of benchmarks

Process & milestones: achieved to date

	BEMP	EPI	BoEs
Draft background report (BZL/E3)	- First survey of best practices - BEMP proposals	- First proposals of specific indicators for specific BEMPs	
TWG (kick-off meeting)	- Agree on scope of document - Review and amend BEMP proposals, new suggestions → agreed list of BEMPs - Data for BEMP development	- Discussion of EPIs (specific BEMPs)	
Final background report (BZL/E3)	- Update of BEMPs with TWG feedback	- Update of EPIs with TWG feedback	
Draft best practice report (JRC)	- New BEMPs developed + BEMP revisions (with Ambiente Italia / ACR+) - Final list of BEMPs	- Specific indicators for new & updated BEMPs (AI / ACR+)	

Process & milestones: second TWG meeting

	BEMP	EPI	BoEs
TWG Second Meeting (now)		- Specific BEMP-related indicators: comments on existing EPIs and suggestion for potential new EPIs - Common / key indicators: in-depth discussion of principles, quantity-based indicators and performance indicators for key waste streams	- Discussion on how to set the BoEs - Identification of EPIs which could be base for BoEs - Contribution to BoE (data, references)

Process & milestones: follow-up and finalisation

	BEMP	EPI	BoEs
Revised draft BEMP report (JRC)	- Take into account TWG outcome	- Take into account TWG outcome - Research on common key indicators (BiPRO)	- First proposals of BoEs
TWG / JRC interaction	- Final review of BEMPs - Update of BEMPs with TWG feedback	- Agreement on list of EPIs	- Definition of BoEs and agreement
Final BEMP report (JRC)	- Final BEMPs	- Final list of EPIs	- Final list of BoEs
SRD process (legislative)	- Summaries of BEMPs	- incl. final list of EPIs	- incl. final list of BEMPs

Milestones and project outcomes

Background research
- Proposals for BEMPs ✓
- Proposals for environmental performance indicators ✓

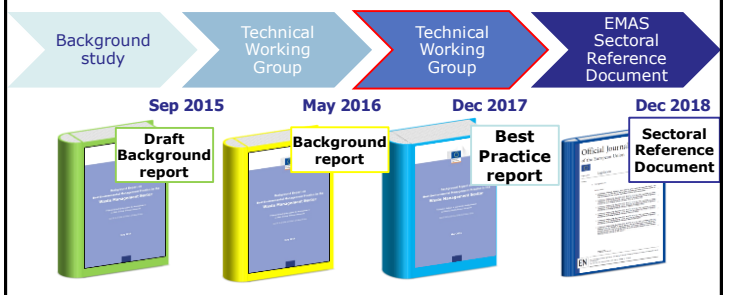
Technical Working Group – best practice report development
- Agree on scope of the document ✓
- Discuss initial BEMP proposals ✓
- Agree on list of BEMPs ✓
- Provide complementary data and inputs ✓
- Discuss common Environmental Performance Indicators ☐
- Agree specific Environmental Performance Indicators ☐
- Determine Benchmarks of Excellence (BoEs) ☐

Meeting objectives

- Validate set of BEMPs / EPIs / BoEs (final report) ☐

Sectoral Reference Document ☐
- Summarise findings on BEMPs / EPIs / BoEs

The timeline



Thank you!

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Measuring the performance of Waste Management Systems

20 Years of PREMIUM ENVIRONMENTAL MANAGEMENT

Presentation at the

2nd Meeting of the Technical Working Group on Best Environmental Management Practice for the Waste Management Sector

Seville, 28 March 2017

Paolo Canfora, Pierre Gaudillat, Marco Dri, Ioannis Antonopoulos

European Commission – Joint Research Centre

From BEMPs to indicators (the usual approach)

3.2.7. *Promote front-runner ecological products*

BEMP is to promote front-runner certified ecological products. Awareness campaigns, sourcing, pricing, in-store positioning and advertising are important components of this technique, which can be effectively implemented through development of own-brand ecological ranges.

Applicability

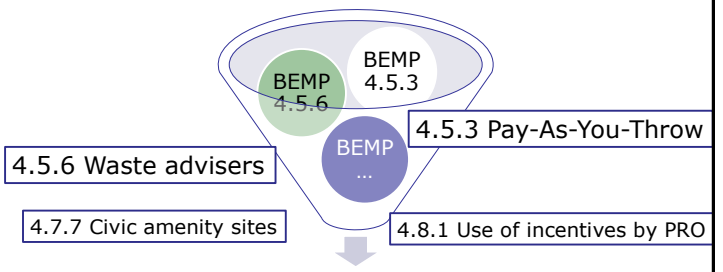
All retailers can stock and encourage consumption of front-runner ecological products. Large retailers can implement this technique more extensively, through the development of own-brand ecological ranges. Supplier costs associated with front-runner certification may be passed on to retailers. Certified front-runner ecological products are associated with significant price premiums and higher profit margins. Own-brand ecological ranges are also likely to increase a retailer's overall own-brand product sales through a positive 'halo effect'.

This BEMP is applicable to **small enterprises**.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i33) Percentage sales within a product group certified according to front-runner exemplary standards.	(b18) 10 % sales within food product groups certified as organic
(i34) Number of product groups for which front-runner ecological products are offered.	(b19) 50 % cotton sales certified as organic
(i35) Existence of an extensive own-brand ecological product range (y/n).	(b20) 10 % sales within non-food product groups certified according to official third party verified environmental labels, according to the Type-I ISO definition.

In this sector, most BEMPs target the same objectives



- **Waste prevention**
- **Better separate collection**
- **More recycling**

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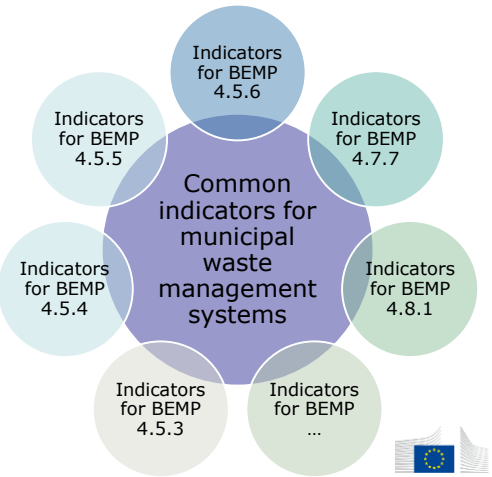
Two complementary approaches



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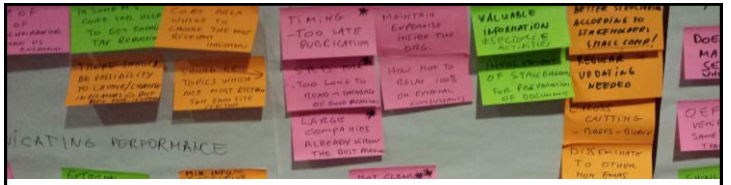


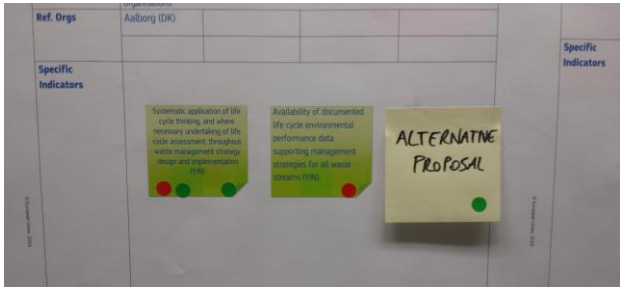
Specific indicators for individual BEMPs

1 - Show support or disagreement with the proposed indicators

2 - Propose alternative indicators

3 - Plenary discussion tomorrow morning

Providing feedback on specific indicators



- Alternative proposal? Add a post-it
- Wish to support a proposal? Add a green dot
- Found a not-so-good proposal? Add a red dot

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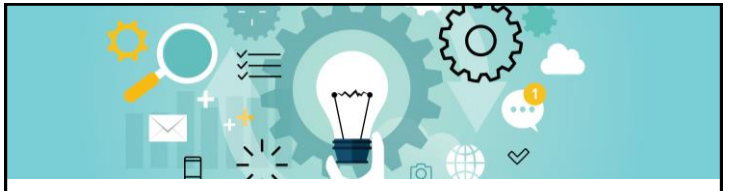
Common indicators for municipal solid waste management systems

1 - In-depth discussions in split sessions

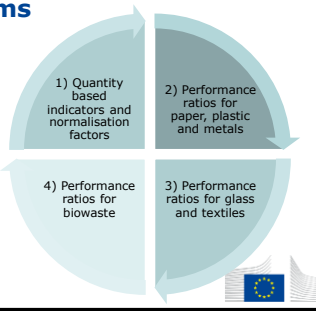
2 - Overview and final agreement in plenary tomorrow morning



Common indicators for municipal solid waste management systems

Split sessions

4 groups (A, B, C, D) rotating across 4 *stations* (1, 2, 3, 4)



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Objectives of the split sessions

- **Crowdsource information on current practices**
  - What indicators are used? Which data are available?
- **Discuss strengths and limitations of those approaches**
- **Elaborate proposals for 'best practice' indicators**
  - Based on frontrunners you know about.
- **Test acceptability and reflect on the outstanding challenges/issues**
  - What is preventing most practitioners from using them?

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Colour code for split sessions

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From Monitoring to Indicators

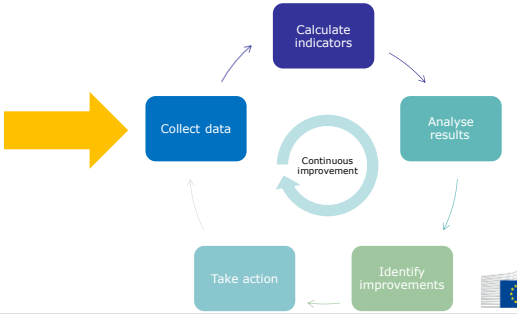
Monitoring is about:
- Knowing quantities
- Ensuring service
- Detecting change
- Checking compliance

Indicators enable:
- understanding the status quo
- evaluating the progress made
- Assessing the activities needed

Indicators allow for the conversion of raw monitoring data into a meaningful result.

Indicators support decision making.

Indicators support taking action



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Indicators can support good decision making

	Percentage of MSW that is separately collected	Capture rate for glass	Capture rate for paper and cardboard	Capture rate for plastics	Capture rate for metals
Paris	13.1%	70.1%	40.5%	8.8%	8.2%
Rome	16.3%	12.5%	16.5%	12.7%	34.5%

European Commission

Selecting indicators

- **S**pecific: understandable & unambiguous
- **M**easurable: a quantification is possible
- **A**chievable: required data and information is already available or can actually be easily collected
- **R**elevant: environmentally meaningful and related to the environmental aspects analysed
- **T**ime-bound: indicator is time-referenced and able to reflect changes

e.g. indicator is **already in use**

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Selecting indicators

We look for	We do not aim at

• Indicators for improving environmental management
  ○ Useful to many
  ○ Adaptable to specific cases
	• Harmonisation
	  ○ Indicators for everybody to use as such

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Common indicators for municipal solid waste management systems

Quantity based indicators

- MSW generation [kg/cap/yr]
- Separate collection [kg/cap/yr]

Performance based ratios

- Separate collection rate [%]
- Recycling rate [%]

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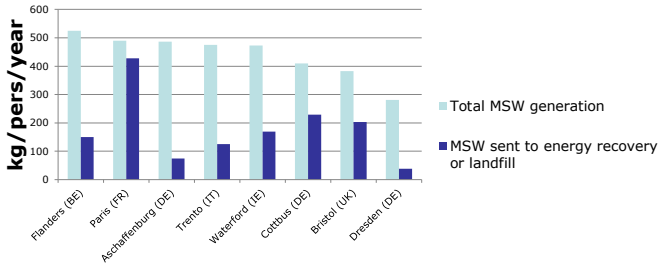
Quantity based indicators



- **Which quantity based indicators are useful?**
- **How to deal with non-household municipal solid waste?**
- **How to deal with the impact of tourists? And commuters?**

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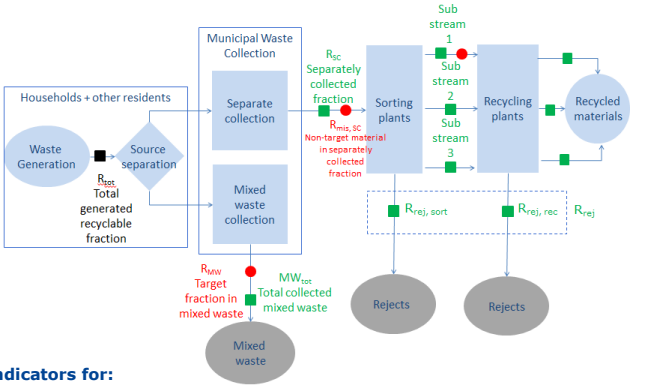
Performance-based ratios (1)



Indicators for:

- **Efficiency**: share of target materials entering the stream (which ultimately leads to recycling)
- **Effectiveness**: quality/purity of the materials collected **of the separate collection**

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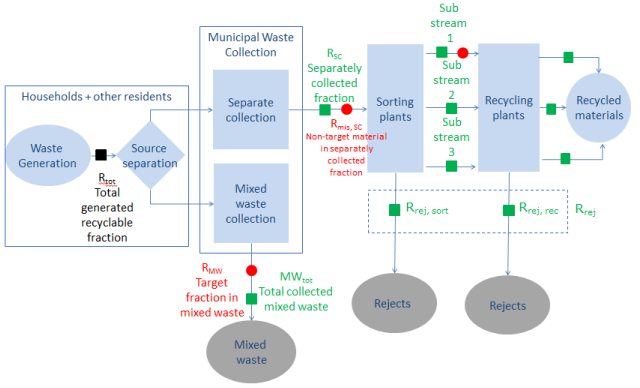
Performance-based ratios (2)



- **Is it better to monitor the percentage of separate collection MSW or the capture rates for specific waste fractions?**
- **Is it more meaningful and feasible to calculate a rejects rate or an impurity rate?**

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Thank you!

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Municipal waste management performance – Assessing separate collection performance

Second meeting of the TWG for the EMAS sectoral reference document on BEMP for the waste management sector

SEVILLA, 28 - 29 MARCH 2017

Marie Dollhofer (BiPRO GmbH part of Ramboll Environ)

EU COM study on separate collection

Objective:

- Investigate **separate municipal waste (MW) collection schemes** (public/private) in operation for **metal, plastic, glass and paper, as well as bio-waste** in 28 EU MS capitals .
- Provide a comprehensive **understanding of the design, functioning, effectiveness, and efficiency** of such schemes, including:
  - **Quantification** of separately collected waste;
  - Assessment of how **effectively** separate collection schemes are; and
  - Contribution to the aim of **achieving high-quality recycling.**

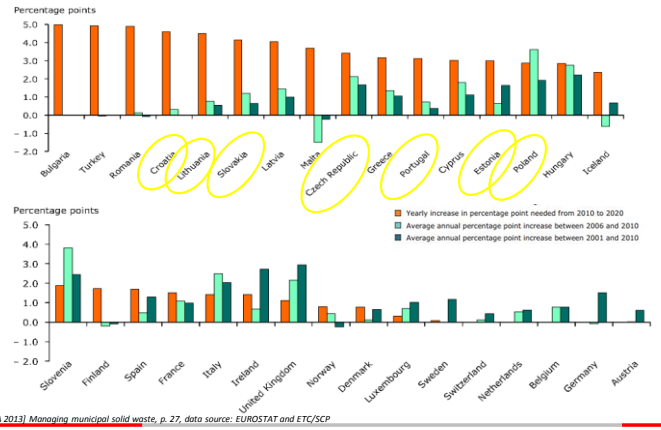
Overview of waste collection systems applied at national level in EU-28 MS

Collection type	Paper	Glass	Plastic	Metal	Bio-waste
Door-to-door (single fraction)	AT, BE, BG, CY, DE, DK, FI, HU, IT, LU, LV, NL, SI, UK	BG, FI, LU, LV, NL, SI, MT	AT, LV, NL, DK	FI, NL, DK	AT, BE, CZ, DE, FI, EE, IT, HU, LU, NL, SI, SE, IE, UK
Co-mingled (metal and plastic)			BE, BG, CY, DE, FR, IT, HU, LU, SI		
Co-mingled (3 fractions)	**RO, MT**: paper, plastic, metal **UK:** plastic, metal, glass				
Co-mingled (All in one bin)	**EL, IE:** paper, glass, plastic, metal				

Collection type	Paper	Glass	Plastic	Metal	Bio-waste
Bring pints	CZ, EE, ES, FR, HR, LT, PT, PL, SE, SK	AT, BE, DK, CY, CZ, DE, EE, ES, FR, HR, IT, HU, LT, PT, PL, RO, SE, SK	SE	AT, EE, SE	ES
			ES, HR, LT, PT, PL (all plastic/metal in one container)		
Civic amenity sites	**Primary collection: CZ** (metal waste), **SK** (metal and bio-waste), **LV** (metal) Addition collection of all waste streams: **all countries** **PL:** rare distribution of civic amenity sites				

➢ EU-28 MS rely mainly on bring systems

Annual % increase needed in EU-28 for 50% recycling in 2020



[EEA 2013] Managing municipal solid waste, p. 27, data source: EUROSTAT and ETC/SCP

Assessing capital separate waste collection systems

- **Factsheet** approach was used, **standardising and quality assuring the information** collected while also presenting/organising the collected information & **identify data gaps left.**

- The main elements of the template cover:
  - Background information on the city;
  - Detailed and overview information on collection systems;
  - Indicators on performance;
  - Qualitative information supporting understanding.

General difficulties in data normalisation

- **Aim**: Compare data on MW from the same origin across the capitals to obtain a comparable picture
- **Problem 1 MW definition**:
  - **Different definitions of MW** and what has been counted in. Some cities include household-like commercial waste in the waste quantities collected, while others distinguish between household waste and these similar wastes if applicable.
  - Cities (and local authorities) responsible for collecting the household part of MW, but generally **no indication in data of the extent to which commercial waste** is collected together with household waste.
    Only five cities (Budapest, Copenhagen, Dublin, Helsinki, and London) indicated the extent to which commercial waste is included in the generation data.

General difficulties in data normalisation

- **Problem 2 quantity based indicators**:
  - Often **large difference** between the **average national waste generation** per capita and the **generation in the capital**. Waste generation in the 28 EU capital cities ranges from around 270 kg/cap (Dublin) up to 666 kg/cap (Luxembourg), with the average at 445 kg/cap.
  - **Reasons**:
    a) **econometric factors** (such as the household size, household expenditure or gross domestic product (GDP)),
    b) **different types/sources of waste** in the statistical data on MW generation,
    c) other factors, e.g. **number of tourists** and daily **commuters** a city attracts.
- **Problem 3 reliability of data:**
  - Difficult to achieve **comprehensive data coverage** for the capitals from a **single source**. Data for the generation and collection of waste stems from multiple sources.

Waste material related difficulties in data normalisation

- **Aim**: Compare **effectiveness and efficiency** of separate collection per material.
- **Problem: Data availability for single recyclable materials**:
  - Several cities did not have **data per single materials** collected available, e,g. metals and plastics collected from co-mingled collection. Disaggregation of the figure is not possible.
  - Separately collected amounts of materials from **civic amenity sites** was not available.
  - Materials collected from **bring sites** is reported **together with door-to-door** separately collected paper.
  - **Deposit return scheme and producers responsibility** data exist at national level but it is not possible to separate data to scale the data for the capital.

Difficulties with composition of waste generated

- Few cities report the **composition of generated waste**.
  - For the five fractions in question **10 cities had composition data**: Amsterdam, Bratislava, Brussels, Dublin, Paris, Prague, Tallinn, Vienna, Vilnius and Zagreb.
  - Another 3 cities (Berlin, Ljubljana and Rome) provide **partial composition data**.
- For cities with no or partial composition data identified the generated amounts of the five fractions had to be **estimated** based on **national compositions** (www.wastemodel.eu).
- The **capture rates**, estimated as the ratio of collected vs. generated amounts per fraction, might not include the amount collected from sources other than households.

Amounts collected separately via different systems

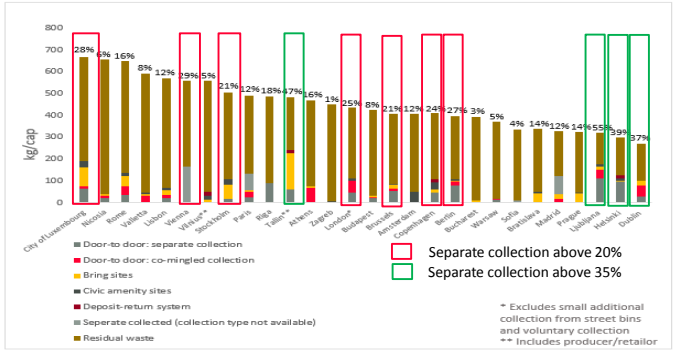
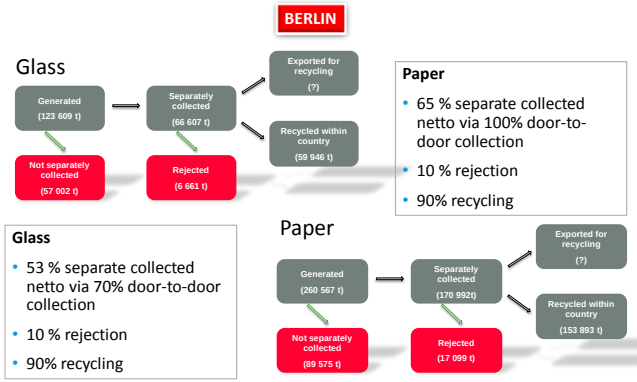


Figure 6-3: Separately collected amounts of five fractions in the 28 EU-capitals*

***Note:** Figures on top of city columns denote the percentage of the five fractions separately collected compared with total MSW generation

Example of a complete data set of material flows



Headline scoreboard

On this basis 13 indicators were chosen to form a "**headline scoreboard**" to assess the performance of the 28 capitals.

Indicators	
MSW generation (kg/capita)	Glass capture rate (%)
Residual waste from total MSW generation (%)	Paper capture rate (%)
Quantity of waste fractions separately collected by all systems (%)	Plastic capture rate (%)
Quantity of waste fractions separately collected door-to-door (%)	Metal capture rate (%)
Co-mingled stream capture rate (%)	Bio-waste capture rate (%)
Bio-waste collection rate (kg/cap)	Paper collection rate (kg/cap)
Glass bring point city coverage (No. of bring points/100 000 inhabitants)	

Results

The capture rate

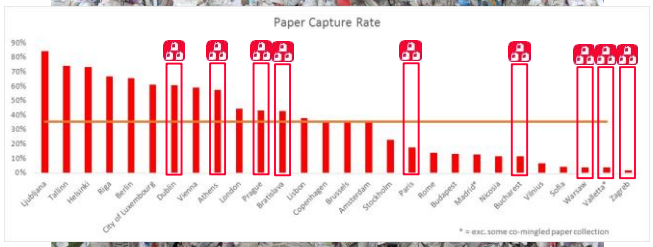
- The share of the generated quantity of a given material that is separately collected:
  - Paper, glass, plastics, metal, metal + plastics combined

TOTAL AMOUNT GENERATED

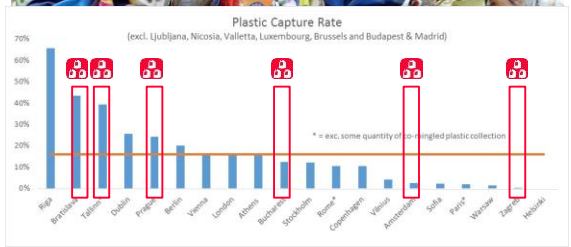
% COLLECTED SEPARATELY

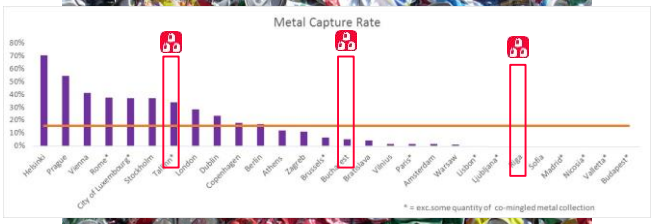
- This usually requires sorting analysis of residual waste (available at city or national level).

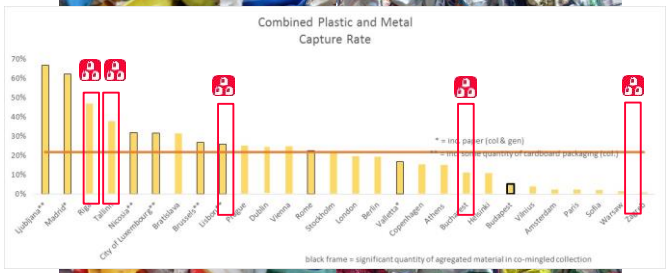
With bring points only

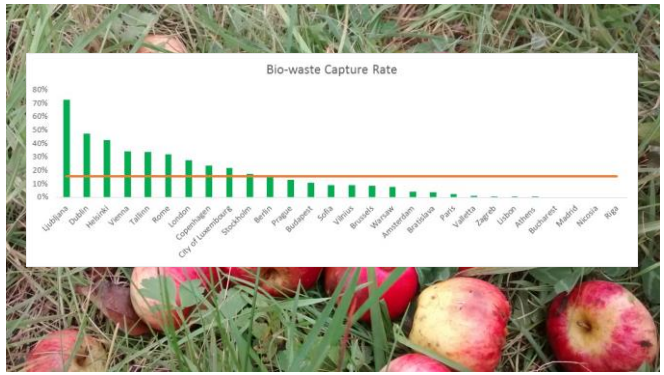


With bring points only


Plastic Capture Rate
(excl. Ljubljana, Nicosia, Valletta, Luxembourg, Brussels and Budapest & Madrid)
70%
60%
50%
40%
30%
20%
10%
0%
* = exc. some quantity of co-mingled plastic collection
Riga
Bratislava
Tallinn
Dublin
Prague
Berlin
Vienna
London
Athens
Bucharest
Stockholm
Rome*
Copenhagen
Vilnius
Amsterdam
Sofia
Paris*
Warsaw
Zagreb*
Helsinki


Metal Capture Rate
80%
70%
60%
50%
40%
30%
20%
10%
0%
* = exc.some quantity of co-mingled metal collection
Helsinki
Prague
Vienna
Rome*
City of Luxembourg*
Stockholm
Tallinn*
London
Dublin
Copenhagen
Berlin
Athens
Zagreb
Brussels*
Bucharest
Bratislava
Vilnius
Paris*
Amsterdam
Warsaw
Lisbon*
Ljubljana*
Riga
Sofia
Madrid*
Nicosia*
Valletta*
Budapest*


Combined Plastic and Metal
Capture Rate
70%
60%
50%
40%
30%
20%
10%
0%
* = incl. paper (col & gen)
** = incl. some quantity of cardboard packaging (col.)
black frame = significant quantity of agregated material in co-mingled collection
Ljubljana**
Madrid*
Riga
Tallinn
Nicosia*
City of Luxembourg**
Bratislava
Brussels**
Lisbon*
Prague
Dublin
Vienna
Rome
Stockholm
London
Berlin
Valletta*
Copenhagen
Athens
Bucharest*
Helsinki
Budapest
Vilnius
Amsterdam
Paris
Sofia
Warsaw
Zagreb*


Bio-waste Capture Rate
80%
70%
60%
50%
40%
30%
20%
10%
0%
Ljubljana
Dublin
Helsinki
Vienna
Tallinn
Rome
London
Copenhagen
City of Luxembourg
Stockholm
Berlin
Prague
Budapest
Sofia
Vilnius
Brussels
Warsaw
Amsterdam
Bratislava
Paris
Valletta
Zagreb
Lisbon
Athens
Bucharest
Madrid
Nicosia
Riga

Summary of some main findings

- As regards measuring performance and indicators, the following was noted:
  - Quantity based indicators such as kg/cap/year separately collected materials include a certain uncertainties, e.g. as regards inclusion of commercial waste.
  - They also don't show the entire picture.
  - Capture rates have shown to be a more reliable indicator as regards the performance of the separate collection system.
  - However, there are limitations, e.g. for bio-waste where the capture rate does not provide the entire picture.

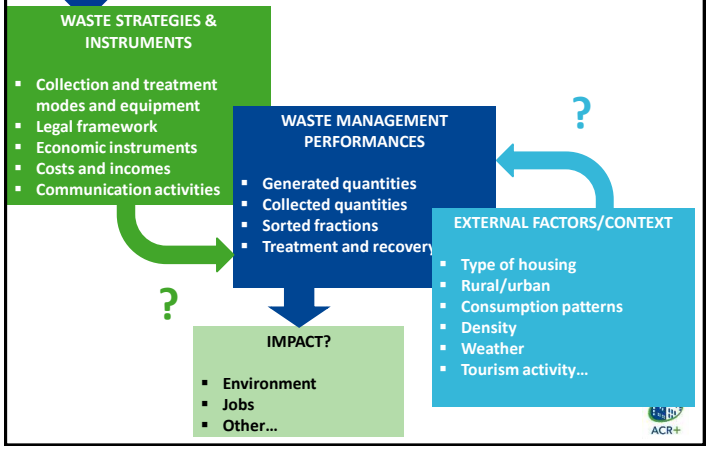
Municipal waste monitoring

IBGE, Bruxelles, 16 février 2017 – Jean-Benoit Bel – ACR+

Objectives

- Compliance to quantitative targets
- Monitoring the activities:
  - Implementation and effectiveness of different instruments
  - Identification of challenges (malfunctions, areas with poor performances)
- Definition of new strategies/targets…

Different types of indicators



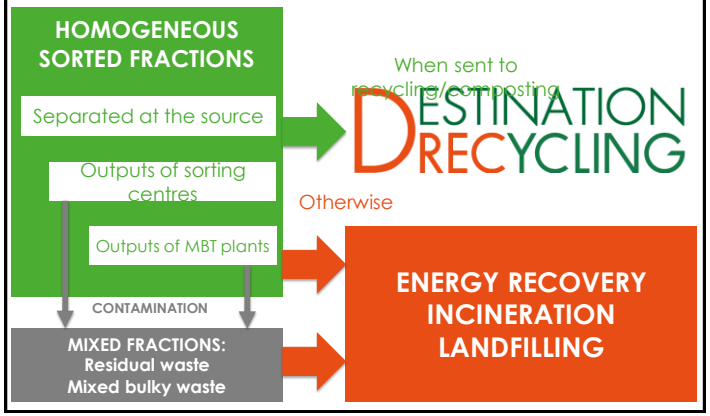
Challenge: scope

R4R project:

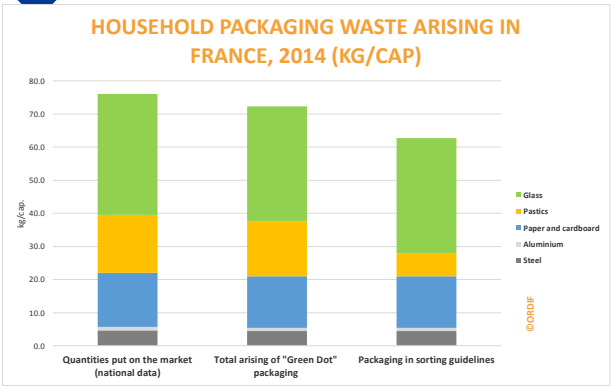
Challenge: scope

R4R project:

Challenge: recycled quantities?



Challenge: recycling rate?

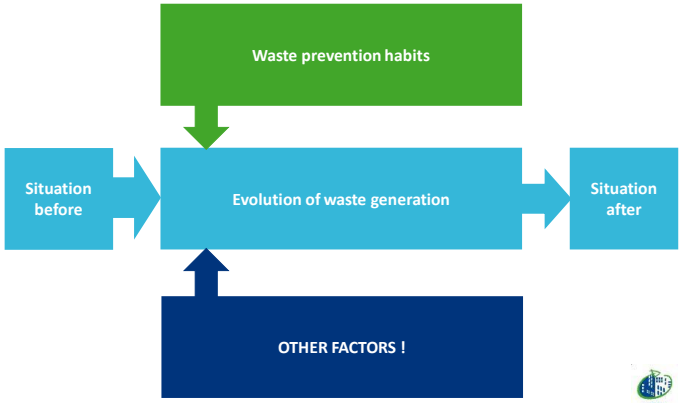


or composition analysis?

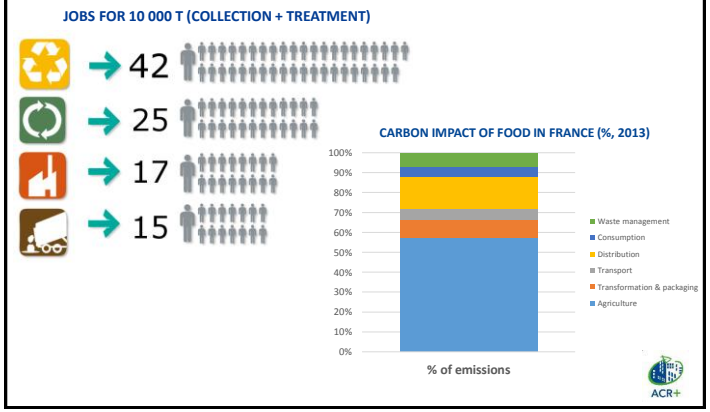
Beyond the DREC?

- DREC = recycling ?
  - In general: quality check by recyclers, reported as residues if noncompliance => same requirements for all ?
  - Downcycling // closed-loop recycling ?
  - Exports ?
- Recycling rates for material fractions:
  - Reliability of composition analysis ?
  - Consistency of local composition analysis ?
  - Composition analysis for bulky waste and mixed fractions in civic amenity sites
- Re-use + deposit systems ?

Challenge: prevention

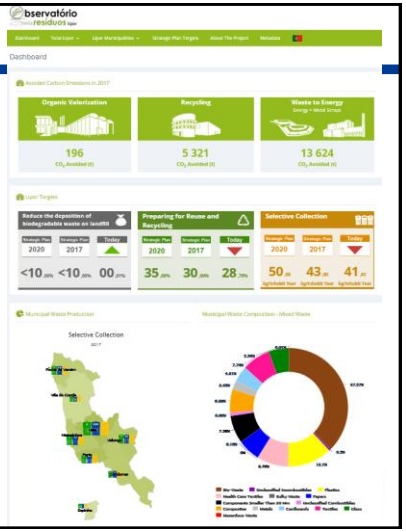


Beyond “waste indicators”

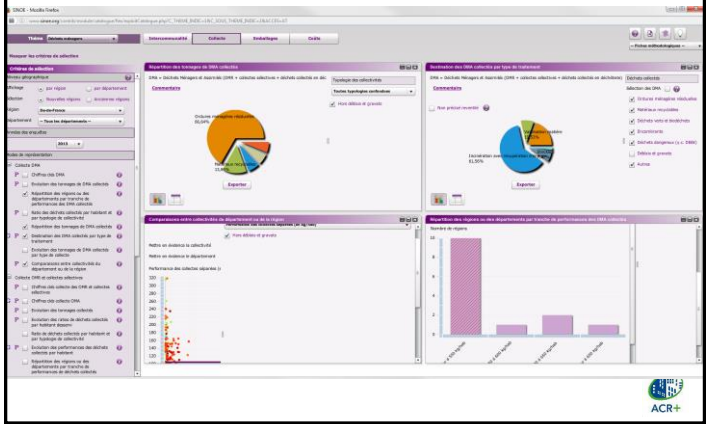


Good practice

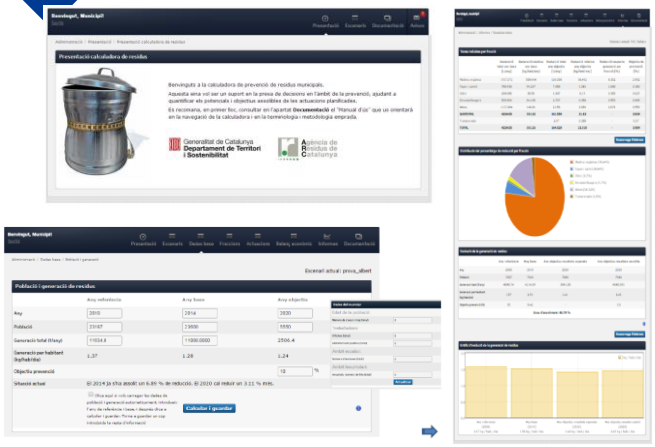
LIPOR (Porto, PT)



Good practice: SINOE (FR)



Good practice: ARC (ES)



Thank you

www.acrplus.org

Contact: jbb@acrplus.org

35 lipor

YEARS OF LIFE WITH THE FUTURE IN OUR HANDS

1

Susana Lopes | susana.lopes@lipor.pt

28th | March | 2017

LIPOR | About us…

LIPOR – Inter-municipal Waste Management of Greater Porto

Is the **entity in charge for the management, recovery and treatment of the Municipal Solid Waste** produced by the eight municipalities: Espinho, Gondomar, Maia, Matosinhos, Porto, Póvoa de Varzim, Valongo and Vila do Conde.

It was built as a **Municipalities' Association in 1982**.

The motto of **LIPOR's strategy** - **Towards Sustainability** - represents a sustainable management, that combines the three main principles of **Sustainable Development** and defines **LIPOR's current and future action**.

About LIPOR… Mission and Vision

WASTE MANAGEMENT lipor

Mission: To design, adopt and implement **sustainable waste management solutions**, taking into account the needs of our partners and the communities we serve.

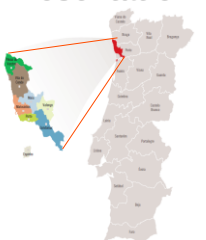
Academy lipor

Vision: Wherever we are, we want to be a **reference brand** in the area of the environment.

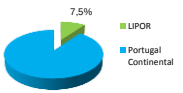
3

LIPOR Presentation

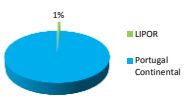
- **8 Municipalities**
- **Area** : 648 km²
- **Population (2016)** : 956.863 inhabitants
- **MSW (2016) :** 486.289 tonnes
- **MSW Per capita (2016) :** 508 kg/inhab.year
- **Carbon Footprint :** ≈ 331 000 tonCO_2eq
- **Certifications** NP EN ISO 9001, NP EN ISO 14001, OHSAS 18001, SA 8000, NP 4457



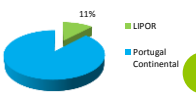
Population



Geographic Area



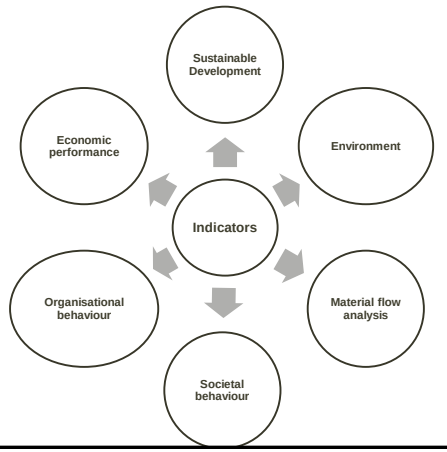
MSW Production



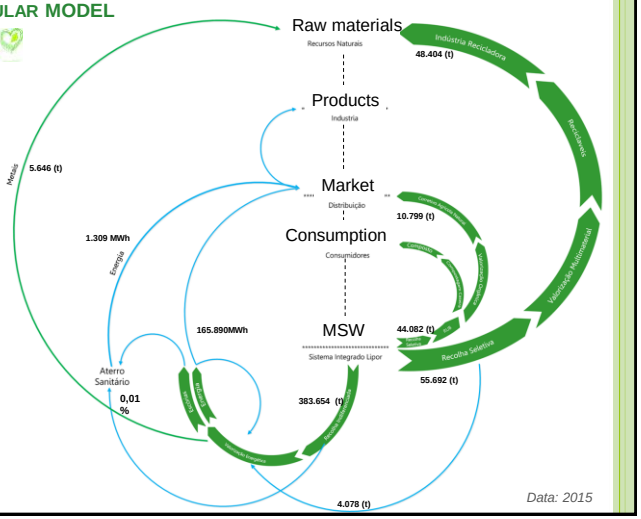
4

Lipor Experience

The role and relevance of Indicators



CIRCULAR MODEL



Data: 2015

Awareness and public involvement

EcoShop : Lipor's Loyalty card

Purpose

- Increase the participation of citizens;
- Promoting citizens' commitment to environmental practices;
- Increase the quantity of source separation.

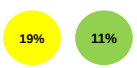
How it works?

According to the amount of recyclable waste delivered in the civic amenity site, citizens receive a certain number of points that, by accumulation, can be exchanged for goods or services (eg. Movie tickets, riding lessons, composters, etc.)

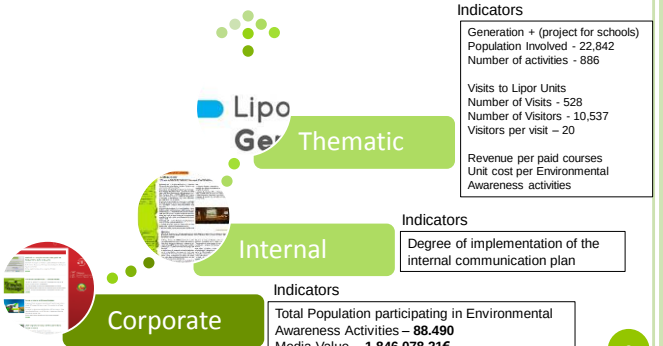
Indicators used

Number of loyalty cards distributed: 1079

Number of visits to civic amenity sites: more **17%** compared the latest year



The importance of Comunnicating



Indicators

Generation + (project for schools)
Population Involved - 22,842
Number of activities - 886

Visits to Lipor Units
Number of Visits - 528
Number of Visitors - 10,537
Visitors per visit – 20

Revenue per paid courses
Unit cost per Environmental Awareness activities

Indicators

Degree of implementation of the internal communication plan

Indicators

Total Population participating in Environmental Awareness Activities – **88.490**
Media Value - **1.846.078,21€**
Number of website visitors – **143.633**
Level of customer satisfaction– **4,67 (1 to 5)**

Final Remarks

- The implementation of an appropriate MSW management strategy requires a **strong mobilization** of the **population**. Thus, **environmental awareness and communication** are essential.
- **Indicators** should provide insights and **raise public awareness** on the global effects of production and consumption.
- **Indicators** should be linked to specific **policy objectives** and have the effect of **supporting and driving those objectives**.
- **Indicators** must encourage **innovative solutions**.

Thank for your attention!

Susana Lopes | susana.lopes@lipor.pt

Annex 4

LIST OF PARTICIPANTS

Second meeting of the technical working group for the EMAS Sectoral Reference Document on best environmental management practices for the waste management sector

SEVILLE, 28 – 29 MARCH 2017

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Di Maria	Francesco	University of Perugia
Dollhofer	Marie	BiPRO
Ekholm	Magnus	Inobric AB
Ferreira	Monica	Maiambiente EM
Galves Martos	Jose Luis	E3
Giavini	Michele	ARS ambiente
Gomes	Ana Margarida	NOVA University - Lisbon
Gregorič	Jože	Municipality of Ljubljiana
Hogg	Dominic	Eunomia Research & Consulting
Kriekouki	Aliki	European Environmental Bureau
Krzyczkowski	Maciej	General Directorate for Environmental Protection -Poland
Lopes	Susana	Municipality of Porto - LIPOR
Lopez	Joaquim	Bidons Egara
Nessi	Simone	Politecnico di Milano
Oliveira	Celeste	Municipality of Lisbon
Passalacqua	Maria	Club EMAS Catalunia
Rosa	Ferran	Zero waste Europe
Rossi	Raphael	Formia Rifiuti Zero
Sautenet	Christine	SYBERT
Schleich	Berthold	Standort Graz, ARGE Abfallvermeidung, Ressourcenschonung und nachhaltige Entwicklung
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Svensson Myrin	Eva	MILAV
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Tonini	Davide	Technical University of Denmark
Vanya	Veras	Municipal Waste Europe
Vila	Marta	Barcelona Urban Ecology Agency
Canfora	Paolo	European Commission - JRC
Canova	Michele	European Commission - DG ENV
Dri	Marco	European Commission - JRC
Eder	Peter	European Commission - JRC
Gaudillat	Pierre	European Commission - JRC
Heutling	Susanne	European Commission - DG ENV
Villanueva	Alejandro	European Commission - JRC